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Environmental Ethics and The Electric Power Grid: A Case for Technological Momentum

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SALVE REGINA UNIVERSITY

ENVIRONMENTAL ETHICS AND THE ELECTRIC POWER GRID:

A CASE FOR TECHNOLOGICAL MOMENTUM

**A DISSERTATION SUBMITTED TO
THE FACULTY OF THE HUMANITIES PROGRAM
IN CANDIDACY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY**

BY

PAUL A. POVLOCK

NEWPORT, RHODE ISLAND

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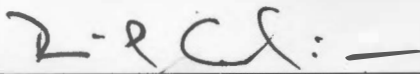
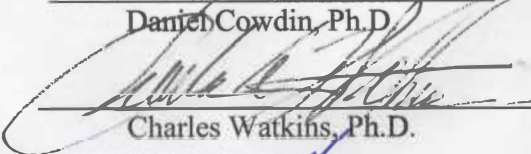
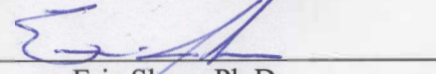

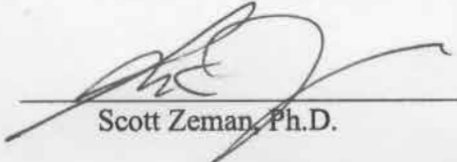
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GRADUATE STUDIES

This dissertation of **Paul A. Povlock** entitled "**Environmental Ethics and the Electric Power Grid: A Case for Technological Momentum**" submitted to the PhD Program in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Salve Regina University has been read and approved by the following individuals:

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In memoriam of
James P. Povlock, 1929-2015, electrical engineer and father,
and
Eric J. Shaw, 1957-2016, mentor and friend.

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ABBREVIATIONS

AC	Alternating current
AEC	Atomic Energy Commission
AIEE	American Institute of Electrical Engineers
AAAS	American Association for the Advancement of Science
ASRI	Audubon Society of Rhode Island
CEQ	Council on Environmental Quality
CLF	Conservation Law Foundation
DC	Direct Current
EAB	Environmental Appeals Board
ECRI	Environment Council of Rhode Island
EDF	Environmental Defense Fund
EPA	Environmental Protection Agency
DOI	Department of the Interior
DDT	Dichloro-Diphenyl-Trichloro-ethane
FERC	Federal Energy Regulatory Commission
FTC	Federal Trade Commission
Hz	Hertz
IEEE	Institute of Electrical and Electronic Engineers
ISO	Independent System Operator
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt-hours

MW	Megawatt
MWH	Megawatt hours
NALF	Naval Auxiliary Air Field
NASA	National Aeronautics and Space Administration
NEES	New England Electric System
NEPA	National Environmental Policy Act
NEPA	New England Power Association
NEPEX	New England Power Exchange
NEPOOL	New England Power Pool
NWF	National Wildlife Federation
PG&E	Pacific Gas & Electric
PSI	Pounds per Square Inch
PUCHA	Public Utility Holding Company Act
PURPA	Public Utility Regulatory Policies Act
REMVEC	Rhode Island-Eastern Massachusetts-Vermont Energy Control
RIBBA	Rhode Island Beach Buggy Association
RICA&M	Rhode Island College of Agriculture and the Mechanic Arts
RICE	Rhode Island Committee on Energy
RIPUC	Rhode Island Public Utilities Commission
RIMS	Rhode Island Mobile Sportsfishermen
RIPS	Rhode Island Public Service
RIWF	Rhode Island Wildlife Federation
SEC	Security and Exchange Commission

UEP	United Electric Power
UER	United Electric Railways
V	Volts
WPI	Worcester Polytechnic Institute

ABSTRACT

This qualitative analysis examines the effects of a growing environmental ethic on the electric power grid in southeastern New England from the late nineteenth century to the start of the new millennia. The increased awareness of the environment evolved into a new belief system of the population and altered the methods of construction, operation and maintenance of the advanced technology system of the electric power grid. The manner in which this occurred suggests that technological momentum is a better concept than technological determinism with which to examine the development of technological systems in the modern world.

This dissertation examines the trinity of actors affecting this process. The electric power companies, with the New England Electric System as the main protagonist, attempted to expand the electric power grid to meet expected consumer demand and economic opportunities. A devoted cadre of nascent environmentalists, dismissive of the commercial and technological requirements of the electric power grid, suggested to the population that the new idea of protecting the environment should instead take priority. The interaction of these two forces led to a governmental response that attempted to continue to meet the population's demands while preventing the degradation of the environment. The resultant transformation of the population's perception of the electric power grid, its regulation by the government, and its operation by the system members, suggest that advanced technology systems are influenced as much by philosophical concerns as any technical constraints.

INTRODUCTION

There's a powerful, obedient, swift, and effortless force that can be bent to any use and which reigns supreme aboard my vessel. It does everything. It lights me, it warms me, it's the soul of my mechanical equipment. This force is electricity.

- Captain Nemo to Professor Aronnax in Jules Verne's *Twenty Thousand Leagues Under the Sea*

The development of the electric power grid in the United States transformed the nation into an energy-intensive society. Americans had shown interest in electricity from the days of Ben Franklin's earliest experiments and had profited from his workman-like accounts of his lightning rod to make their homes safer.¹ Application of electric energy as a major power source was still over a century away however and electricity remained more of a curiosity than a source of power for society. In the 1800s electricity was used to power the telegraph stations that formed the communications network of the Victorian era and to energize other minor applications.² Power to drive the Industrial Revolution was chiefly provided by coal-fired steam plants or water mills running intricate systems of belt-driven machines, while on the farms animal and human power predominated.³ This methodology, though grueling for the majority of the population involved in agriculture or industry, was nonetheless sustainable.

1. E. Phillip Krider, "Benjamin Franklin and Lightning Rods," *Physics Today*, 59, no. 1 (January, 2006): 42.

2. Steve Parker, *Electricity* (London: Dorling Kindersly, 1992), 31, 37.

3. Vaclav Smil, *Creating the Twentieth Century* (New York: Oxford University Press, 2005), 14.

Thomas Edison's electric power generation prototype built in New York City in 1882, showed how electricity could be used to drive industrial activities and fill consumer desires.⁴ Over the course of only a few years, Edison developed and built a pilot electric generation station in New York City, the transmission lines from its coal-fired dynamos to the electric load locations and all the electrical connections, circuit breakers and fuses necessary to energize the lights in the selected buildings.⁵ Edison's construction was the first electric power grid in history, a combination of subsystems that generated electric power, transmitted it across metal cables to the designated establishments and then distributed the energy to the lightbulbs within those buildings.⁶

Under the guiding light of a host of ingenious inventors, engineers, and financiers, this system of electric power generation, transmission and distribution system rapidly expanded throughout the nation. By the middle of the twentieth century, the network of electric power plants and supporting systems provided a reliable and economic source of energy to all facets of society. This mature technology seemed poised to take the next great leap forward in the continuous quest for greater effectiveness and efficiency. Instead, the flood tide of technological development was altered by forces that had seemed insignificant when the electric power grid had been created.

Concurrent with the technological culmination of the electric power grid was the emergence of various schools of environmental ethics that took hold in popular

4. Ibid., 49-60.

5. Thomas P. Hughes, *Networks of Power* (1983; repr., Baltimore, MD: The Johns Hopkins University Press, 1983), 47.

6. Ibid., 40-43.

conception and gained political traction. The new social construction of environmental ethics acted to alter the course of development of the electric power grid in southern New England from one based purely on technical efficiency and effectiveness to a vector that had to account for principled concerns for the environment. How this occurred is the central research question to be examined in this dissertation. More generally, this action demonstrates that the concept of technological momentum is a more insightful hypothesis than technological determinism when investigating the progress of advanced technology systems.

Purpose

The theories of technological determinism as initially proposed by Lewis Mumford and then expanded on by Jacques Ellul suggest likely outcomes for any advanced technological society. Both authors discussed the effects of the tightening vise grip of advanced technology on modern society. For Mumford, the “monotechnics” of industrial age society acquired an internal inertia based on the generation of greater human control and power.⁷ Earlier technological endeavors based on life itself such as improved farming tools or home-spun woolen clothes were displaced by this quest for authoritarian control over nature and society. Ellul later posited a more general theory for the expansion of technology in human society. To Ellul, technology had led to the modern form of “*technique*” that had displaced all previous human endeavors.⁸ With its

7. Lewis Mumford, *The Pentagon of Power, Myth of the Machine Volume Two* (New York: Harcourt Brace Jovanovich, 1964, 1970), 155.

8. Jacques Ellul, *The Technological Society*. Trans. John Wilkinson (New York: Vintage Books, 1964), 4.

characteristics of rationality, artificiality, self-augmentation, universality and autonomy, *technique* diffused throughout and engulfed all elements of society. Future progress became solely based on *technique's* internal demands to achieve the one best way, the most efficient one.⁹ Slowly but surely all human activity was swept up and subordinated in this effort while earlier human desires and longings were brushed away as the technological drive increased without bound.

Thomas P. Hughes' discussion of technological momentum provides a different and perhaps more insightful hypothesis describing technological activity, one that allows advanced technology systems to be affected by social concerns as much as the technical demands of the maturing structure. The advanced technology systems do acquire a considerable developmental velocity, yet the mass of interrelated organizations, devices and schemes is not irresistible. Instead, much like any object in motion, forces affecting these organizations can lead to a change in direction in the development of the technological system. This is more difficult to achieve as a technology matures and organizational stakeholders resist any system disruption, but other humans still retain agency to alter the future development of the system.¹⁰

The discourse between these two hypotheses suggests an intriguing space in the investigation of a particular advanced technology system. The electric power grid, one of modern society's underpinnings, certainly meets the requirements of an advanced technology system in all of these authors' conceptions. When the development and

9. *Ibid.*, 21.

10. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Penguin Books, 1989), 470-471.

operation of the electric power grid over the past few decades in southern New England is examined, one notes that this system developed somewhat differently than the theoretical construct of technological determinism would have predicted. The political mandates rising from the increased concerns of the population regarding environmental issues led to changes in the way the electric power grid was constructed and operated. The rise of this environmental consciousness and ethic acted as a dampening force on the electric power grid's technological trajectory and is more supportive of Hughes' hypothesis than Ellul's or Mumford's deterministic route. Examining how this occurred is the purpose of this investigation.

Interdisciplinary Analysis

Analyzing the evolution of the electric power grid in southern New England requires an interdisciplinary approach to better comprehend how the summation of forces affected the operation, maintenance, and construction of this advanced technology system. Certainly an appreciation of the technology of the electric power grid itself is the necessary entering argument for this examination. A general comprehension of the processes of generation, transmission, and distribution of the electric power grid is important in understanding how they function together to provide electricity to the consumer, affect the overall efficiency of the system, or inflict the greatest damage to the environment. In an examination of how technology informs technique to promote the most efficient system possible, one must be acquainted with the major advances in electric power technology.

Yet the knowledge and comprehension of the kilowatt ratings or carbon dioxide emission production of any individual plant is not sufficient to fully comprehend what is

transpiring. Theories of technology as proposed by Ellul, Mumford and Hughes are used to provide the hypotheses with which to examine the electric power grid's development as a system of advanced technology. Propositions regarding the ethical consideration of the environment mandate attention as these evolving concepts motivated individuals attempting to change the electric power grid's mode of operation. The ethical standards of the electric power grid's operators must also be considered in this analysis as another force that affected the system's development and growth. Such theoretical constructs were influenced by the technological advances that had been accomplished, but also provided feedback into the system on what should be done in the future.

Finally, the historical influences on the electric power grid and its operators and critics cannot be disregarded. The basis for human action regarding this advanced technology system evolved under the stresses of numerous contingent forces. Humans were affected by political and economic events even as they attempted to enjoy the benefits from the electric power grid and minimize its shortcomings. For example, the 1973 Yom Kippur War had economic ramifications that led to great changes in fuel prices and subsequently on many other aspects of the electric power grid well beyond the results on the battlefield.

The combination of these three perspectives provides an opportunity to attain a more balanced comprehension of the numerous forces affecting the electric power grid and how the resultant development should be considered. A reductionist methodology attempting to only examine the proximate causes of merely one of these forces is inadequate to fully comprehend what is occurring. Instead all of these unprivileged

viewpoints needs to be considered. Indeed, it is the careful synchronization of these perspectives that shines the greatest light on the development of the electric power grid.

Method and Structure

This qualitative analysis is divided into seven chapters. The inquiry will examine how the operation of the electric power grid in southeastern New England, with an emphasis on Rhode Island, was altered by the development of environmental ethical concerns of the population. While other factors will be considered, such as political, economic, and technological, the focus of this investigation will be on the environmental ones that disturbed the equilibrium of the electric power grid. The analysis will follow a general historical timeline but will branch off into a parallel construction in the examination of the particular issues.

Chapter One will be an introductory chapter which will contain a literature review. The chapter will consider Mumford's and Ellul's views on technological determinism as well as Hughes' concept of technological momentum. This review will consider other authors' critiques on the subject of technological determinism and momentum to provide a well-structured notion of these concepts. A discussion of the electric power grid and a systems analysis of its components, physical and organizational, will be conducted and a definition of the grid will be proposed. A review of the various strands of environmental thought will be presented to highlight the similarities and differences between the types.

The next part of the dissertation will provide the background of how the electric power grid developed in southern New England, looking at the technological, environmental, and political forces acting on the system. Chapter Two will provide the

historical background to the subsequent analysis. The initial construction of the electric power grid in southern New England will be described as well as the technological and social challenges to its operation. The objective is to describe how this advanced technology system reached maturity and eventual culmination during the mid 1960s due to a number of economic, technical, and political factors.

In Chapter Three the development of the nascent environmental movement, nationally and locally, will be considered, and how the concerns for the environment led to a developing environmental ethic that led to regulatory and political actions. The operating doctrine of the technological system of the electric power grid and the developing environmental concerns initially acted out of synchronization with one another, but the events of the early 1970s would force the two into alignment. The numerous environmental laws passed during the first Nixon Administration, the shock of the oil embargo in 1973, and the general economic malaise of the decade coincided with real technical limits limiting the operation of the electric power grid.¹¹ The interaction of these events was not necessarily a smooth one, but it set the initial conditions for a number of other conflicts which will be examined in the subsequent chapters.

Chapter Four discusses the Rhode Island state government and its method of regulating the companies operating the electric power grid. The state allowed the electric utility companies to exercise a natural monopoly over its consumers in designated areas in return for governmental supervision of their activities and pricing. The evolution of the

11. Richard F. Hirsh and Adam H. Serchuk. "Momentum Shifts in the American Utility System: Catastrophic Change-Or No Change at All?" *Technology and Culture* 37, no. 2 (April 1996): 286-293.

state's interaction with the owners and operators of these electric utility companies is unique as the leadership of the state government and the electric utilities were often the same people. The resultant momentum generated by this confluence of personnel was an important factor in the rapid maturation of the grid in southeastern New England. This was not always beneficial for the citizens of the state, however, and the intervention of the federal government and the new political forces in Rhode Island worked to disrupt this unity. The convergence of interests of the electric utilities and the government tended to bring these elements back together, even as the new environmental movement was coming of age and working to do just the opposite.

Having examined how the electric power grid matured in the southeastern New England area, the second part of the dissertation will analyze how the emerging national environmental ethic acted to stimulate humans to effect change in the grid's construction, operation, and maintenance. Chapters Five through Seven are examinations of specific events over the subsequent decades where ethical concerns for the environment affected the electric power grid in southeastern New England. These effects often rose from the principled concerns of citizens and resulted in political or legal actions that prevented the construction of a particular component of the electric power grid, advocated for a new manner of energy conversion and transmission, or promoted an entirely new makeup of the system. Some of these efforts were more successful than others; some are still ongoing. The reaction to the advanced technology system was not one that would have been foreseen even a few years before environmental ethics became an important concern. To some extent this is the story of the trials and tribulations of the New England Electric System (NEES, now National Grid) as it struggled to adapt in a very complex

situation.¹² In each of these chapters, the effects of national trends in the operation and regulation of the electric power grid are considered as is the continuing evolution of environmental beliefs. The interaction of the Rhode Island political arena to these technological, legal and ethical influences is also examined.

The first period, discussed in Chapter Five, involves the planned construction of two nuclear power plants in Charlestown, Rhode Island, during the 1970s. Proposed during the height of the energy crisis of that decade, this plant created more negative popular reaction than any regional electric power plant previously had. These plants were not built, in large part due to the citizen response against nuclear power and its environmental impact, though the economic concerns of the New England Electric System were also evident.¹³

Chapter Six will discuss the subsequent state and federal government, electric utility company and environmental group actions during the 1980s and 1990s, including the growing reaction against the coal-fired plants in Providence, Rhode Island and Fall River, Massachusetts. Several of these plants are still in existence, but the public reaction against them is due in no small part from the pollution they generate, demonstrating the tension rising from the interplay of the reliable and economic operation of the electric power grid and the public concerns of the environmental cost of its operation. The construction of gas turbine power plants in the area seemed to simultaneously meet the

12. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 199-245.

13. *Ibid.*, 222-224.

requirements of a more efficient electric power grid that was also less detrimental to the environment.

Chapter Seven will examine these same actors in the new century when increasing concerns regarding climate change caused by human activity, including that from the operation of the electric power grid, became predominant. The accomplishments of the state and federal government, electric utility companies and environmental groups to create a more sustainable electric power grid will be surveyed. Numerous wind turbines were constructed to provide power to the grid as well as mitigate the production of exhaust gases associated with anthropomorphic global warming. While the abortive Cape Wind project is the most well known of these projects, numerous wind turbines populate the Ocean State. Their construction and operation was often supported by governmental subsidies that were created from the taxation of the consumer's electric bills, a levy supported by the population in order to attain a more sustainable society. As this effort reached equilibrium, the efforts to reduce greenhouse gas production by shutting down the coal burning Brayton Point power plant reached fruition after a generation long struggle.

Chapter Nine serves as the conclusion and proposes recommendations for further inquiry. It includes an assessment of the validity of the models of the development of advanced technology systems. The conclusion will suggest that human agency does affect the momentum of advanced technology, though perhaps in methods and magnitude not envisioned when a technology is first considered.

Relevance to the PhD Program at Salve Regina University

The question of how a new ethical vista, that of environmental ethics, affected the operation and development of the electric power grid, arguably one of modern society's most important technological systems, is in phase with the program's emphasis of what it means to be human in an age of advanced technology. The research question includes many aspects and themes associated with the core courses of the humanities syllabus. Certainly the electric power grid is an important component of the modern technological society, providing the musculature for that current civilization to achieve its physical objectives. The theme of technological determinism is discussed in several of the courses with Ellul and Mumford being important observers of technology. Hughes, as a commentator on technological momentum and as well as the interaction of complex technological systems in modern society, is also a good fit for the themes of the curriculum. His proposal on how such advanced technologies might be altered by popular will forms the basis for the research question. Environmental ethics was arguably a byproduct of the reaction to advanced technology system waste streams. How this ethos provided negative feedback to the system in a specific region in a particular time period may provide additional insight in support of the concept of technological momentum. The interaction of these elements, technology, philosophy and ethics requires an interdisciplinary approach as it is not apparent that a single proximate cause exists to explain the changes in the electric power grid over this period of time. It is hoped that this dissertation will lead to a greater discussion of the merits of technological momentum for advanced technology systems and how the citizenry might act to shift the technique that underpins modern existence.

CHAPTER 1

THEORY AND PRACTICE

Technique worships nothing, respects nothing. It has a single role: to strip off externals, to bring everything to light, and by rational use to transform everything into means.

- Jacques Ellul, *The Technological Society*

In sum, it is difficult to change the direction of large electric power systems - and perhaps that of large sociotechnical systems in general - but such systems are not autonomous. Those who seek to control and direct them must acknowledge the fact that systems are evolving cultural artifacts rather than isolated technologies. As cultural artifacts, they reflect the past as well as the present.

- Thomas P. Hughes, *Networks of Power*

Advanced technology systems require significant human activity over long periods of time to reach maturity and ubiquity. The electric power grid in southeastern New England took decades to achieve this condition. In the beginning electric power for lighting appeared more as the latest technological fad as well as a possible competitor to gas lighting in households. Decades later electricity had replaced practically every other power source in the region. One could connect into the electric power grid almost anywhere and either supply or receive reliable and consistent power. The question arises of how this transpired, and more generally, how any advanced technology system evolves. The lore of some “heroic” era of invention and technological development

leading to social progress might appear satisfying, but could be more myth than reality.¹ Since the electric power grid did not spring miraculously out of the earth after Benjamin Franklin had smote the ground with his lightning rod and Thomas Edison had electrified it with his dynamos, one is still left with the question of how and why this advanced technology system flourished in the manner that it did in southeastern New England. Was this evolution inevitable based on the technical requirements of electric power generation, or were other forces at play that influenced the growth and development of the system? Were there particular instances where decisions were made affecting the construction, operation, and maintenance of the electric power grid that were based on concerns other than what engineering economic analysis might have demanded? Different observers of technological development have proposed contending theories to explain why advanced technology systems progress in the particular manner that they do. Theories of technological determinism as promoted by Lewis Mumford and Jacques Ellul suggest that technology is acting autonomously, “independent of social constraints.”² Other scholars, such as Thomas P. Hughes, proposed that social concerns can provide negative feedback into the developing technological system, often providing forces as powerful as the technological ones.³ Examining how and why the electric power grid developed in southeastern New England may suggest that a particular model better

1. L. Sprague de Camp, *Heroes of American Invention*, 1961. Reprint. (New York: Barnes & Nobles Press, 1993), 259.

2. Merrit Roe Smith, and Leo Marx, eds. *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, MA: The MIT Press, 1994), 2.

3. Ibid.

explains how advanced technology systems develop and allow predictions for future responses.

Technological Determinism and Technological Momentum

While there is no single definition of technological determinism, several common elements are shared among most descriptions. In technological determinism, technology acts as an independent variable. Changes in technology result in changes in society. Depending upon the perspective, technology is the most important factor in the causal analysis. Analysis of this dynamic tends to fall into one of two categories. A “hard” version of technological determinism indicates “that technological change determines social change,” and is “autonomous or independent of social influences.”⁴ The “soft” account posits that “technological change drives social change but at the same time responds discriminatingly to social pressures.”⁵ Different philosophers of technology placed different weights on either of these versions based on what they were attempting to prove or their method of analysis. Theories of technological determinism as postulated by Jacques Ellul and Lewis Mumford fall into the harder versions of this theory while concepts suggested by historians of technology such as Thomas P. Hughes are more

4. Thomas J. Misa, “How Machines Make History, and How Historians (And Others) Help Them to Do So,” *Science, Technology, & Human Values* 13, no. 3/4 (Summer – Autumn 1988): 308-309.

5. Merrit Roe Smith, and Leo Marx, eds. *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, MA: The MIT Press, 1994), 2.

aligned with the softer proposition.⁶ Each outlook added insight to how advanced technology systems developed and how this development might affect society.

It is notable that the philosophers of technology most associated with the concept of technological determinism typically did not use this phrase. Their large body of work has been extensively examined by other writers with resulting schools of thought and critique embracing their overarching themes. The emphasis and inflections within the grand narratives proposed by Lewis Mumford and Jacques Ellul varied over time as they considered the criticism of their proposals. These interpretations fall within numerous views of “hard” and “soft” technological determinism, but Mumford and Ellul generally saw technological forces as being the prime mover in modern society.⁷

Mumford’s theoretical development was perhaps the longest of the theorists. Commencing his analysis in the 1930s, Mumford spent much the next forty years writing about the role of technology in the development of human civilization.⁸ His early work, *Technics and Civilization* (1934) attempted to fashion a clockwork flow of human development through successive forms of energy transformation and mechanical construction, from wind and water, through coal and iron, and climaxing in electricity and alloys. Technology affected human society as much as society affected the growth

6. Thomas J. Misa, “How Machines Make History, and How Historians (And Others) Help Them to Do So,” *Science, Technology, & Human Values* 13, no. 3/4 (Summer – Autumn 1988): 310-312, 317-319.

7. Merrit Roe Smith, and Leo Marx, eds. *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, MA: The MIT Press, 1994), 34.

8. Thomas P. Hughes and Agatha C. Hughes, eds., *Lewis Mumford, Public Intellectual* (New York: Oxford University Press, 1990), 4-10.

and spread of technology. While examining the effects of such mechanical devices, Mumford also considered the qualitative influences of human culture and psychology on these eras.⁹ Mumford stated that, “*In projecting one side of the human personality into the concrete forms of the machine, we have created an independent environment that has reacted upon every side of the personality (italics in original).*”¹⁰ By “machine,” Mumford envisioned the whole interaction of an entire technological system, including the science and art of its use as much as the physical components.¹¹ By the time Mumford completed the two volumes of *The Myth of the Machine* (1967 and 1970), his earlier optimism on the benefits of advanced technology had decayed and his more nuanced assessment of technology’s effects emerged. Technological systems were affected by human agency over the millennium, and vice versa, but now the interaction was not as balanced. At the dawn of history, the use of technology was focused on providing sustainment for survival, “broadly life-centered, not work-centered or power-centered.”¹² When human survival became less tenuous, “technics supported and

9. Carl Mitcham, *Thinking Through Technology: The Path between Engineering and Philosophy* (Chicago, IL: The University of Chicago Press, 1994), 41-42.

10. Lewis Mumford, *Technics and Civilization*, (New York: Harcourt, Brace & World, 1934, 1963), 324.

11. Mumford used Oswald Spengler’s definition of “technique” to denote the industrial arts of a civilization, as opposed to mere technology. See Donald L. Miller, *Lewis Mumford, A Life* (New York: Grove Press, 1999), 326, and Lewis Mumford, *Technics and Civilization* (New York: Harcourt, Brace & World, 1934, 1963), 12.

12. Lewis Mumford, *Technics and Human Development, The Myth of the Machine Volume One* (New York: Harcourt Brace Jovanovich, 1966, 1967), 9.

enlarged the capacities for human expression.”¹³ As human knowledge and its corresponding “technological pool” expanded, a more demanding technology also evolved. This technology was less focused on physical and mental sustenance, but more on “economic expansion, material repletion, and military superiority.”¹⁴ The exploitation of subsequent technological advances to amass power (“monotechnics” in Mumford’s theoretical construct) was certainly emboldened by the profusion of knowledge during the Industrial Revolution. To Mumford the desire of authoritarian organizations to use political, military and economic power to achieve domination over human society (the “megamachine”) and the natural environment went back to the beginning of civilization itself. What was new was the concept that the advantages from such technology were seemingly irresistible.¹⁵ This interaction was not always in the population’s interests as previous technical crafts were displaced by the pervasive production of monotechnics.¹⁶ Additionally, the megamachine, while providing for human physical requirements, also necessitated the population’s compliant reverence of authority.¹⁷ Mumford was not optimistic on the ability of the population to resist the temptations of the megamachine.

13. Ibid.

14. Lewis Mumford, *The Pentagon of Power, The Myth of the Machine Volume Two* (New York: Harcourt Brace Jovanovich, 1964, 1970), 155.

15. See Carl Mitcham, *Thinking Through Technology: The Path between Engineering and Philosophy* (Chicago, IL: The University of Chicago Press, 1994), 43-44, and Donald L. Miller, *Lewis Mumford, A Life* (New York: Grove Press, 1999), 509.

16. Lewis Mumford, *The Pentagon of Power, The Myth of the Machine Volume Two* (New York: Harcourt Brace Jovanovich, 1964, 1970), 155.

17. Lewis Mumford, *Technics and Human Development, The Myth of the Machine Volume One* (New York: Harcourt Brace Jovanovich, 1966, 1967), 12.

Though Mumford exhibited some faith that humans would ultimately escape from the rising technological tide, he did not propose any strategy of resistance.¹⁸

Jacques Ellul demonstrated much less optimism in his concept of Technique. If technology was becoming the most important factor in human society for Mumford, to Ellul it had already subsumed human activity. Humans were along for the ride in the new milieu of “technique.” “*Technique is the totality of methods rationally arrived at and having absolute efficiency (for a given stage of development) in every field of human activity (italics in original).*”¹⁹ Technique had replaced the *ancien régime* based on nature with a closed system independent of human interaction or alteration. Artificial, self focused and divorced from earlier human values and ethics, technique developed in a manner not related to any ultimate objective, and its components formed an ill-defined, complex system.²⁰ Technique did not just modify all human thoughts and actions, whether political, economic or moral; instead all of these functions required realignment to satisfy technique’s demands. Technique had created such a dominant environment that humans could not formulate other courses of action outside the boundaries of technique. Persons adapted to the new environment of technique, becoming just one element in a human capital strategy that technique coopted to achieve its ends of greater effectiveness and efficiency across all domains. Ethical concerns, moral dilemmas, and core beliefs

18. Donald L. Miller, “The Myth of the Machine: I. Technics and Human Development,” in *Lewis Mumford, Public Intellectual*, ed. Thomas P. Hughes and Agatha C. Hughes (New York: Oxford University Press, 1990), 162.

19. Jacques Ellul, *The Technological Society*, Translated by John Wilkinson (New York: Vintage Books, 1964), xxv.

20. *Ibid.*, 394-395.

became dominated by the utilitarian demands of the new master. Technique even endeavored to displace religion and other spiritual concerns while attempting to attain some asymptotic rationality.²¹ The increasing acceleration of technological development subsumed previous human thoughts and desires. Technical civilization, no longer human centered, made human agency and freedom irrelevant even as basic human needs and wants were handily provided for by the ever increasing productive means. Humans were now no longer masters of technology but merely the objects of technique.²² Since technique could not be disposed of, humans would need to transcend it, though Ellul could not propose the manner in which to accomplish this task.²³

Critical reaction to Ellul and Mumford was mixed. While both authors' ideas were seen as pessimistic, Ellul generated more disapproval of his deterministic assessment.²⁴ Even Mumford found Ellul's ideas too fatalistic.²⁵ Yet the assessment

21. Ibid., 395-397.

22. Ibid., 398-401.

23. Ibid., xxxiii.

24. Howard P. Segal, "Mumford's Alternatives to the Megamachine: Critical Utopianism, Regionalism, and Decentralization," in *Lewis Mumford, Public Intellectual*, ed. Thomas P. Hughes and Agatha C. Hughes (New York: Oxford University Press, 1990), 100-101.

25. Lewis Mumford, *The Pentagon of Power, The Myth of the Machine Volume Two* (New York: Harcourt Brace Jovanovich, 1964, 1970), 291.

that technological concerns had achieved primacy gained traction and generated great acclaim.²⁶

One of the responses to such notions of technological determinism came from Thomas P. Hughes. While both Mumford and Ellul looked at Western society or civilization as a whole, Hughes focused his attention on specific advanced technology systems to form his theory of technological momentum. Hughes first postulated his ideas based on an analysis of the German chemical industry from just prior to the First World War through the interwar period. Here, a “technology stimulated by war gathering a momentum carrying over into peacetime. The commitment of engineers, chemists, and managers experienced in the process, and of the corporation heavily invested in it, contributed to this momentum.”²⁷ The talent and creativity of the personnel operating this technology adapted the chemical plants from producing nitrogen fertilizer for agricultural purpose to munitions for the war and then later to synthetic gasoline to support the expanding German automobile industry and meet the demands of domestic consumption. At each junction the ability of this group to identify problems and propose innovative solutions for this system is instructive. Hughes observed that, “The creative potential of the chemists and the engineers, the vested interests in the plant, and the proprietary attitude toward hydrogenation of the technical men in managerial positions all contributed to the momentum. This momentum had two major components, the drive to

26. Victor Ferkiss, “Man’s Tools and Man’s Choices: The Confrontation of Technology and Political Science,” *The American Political Science Review* 67, no. 3 (Sept. 1973): 973.

27. Thomas Parke Hughes, “Technological Momentum in History: Hydrogenation in Germany, 1898-1933.” *Past and Present* no. 44 (Aug 1969): 131-132.

produce and the drive to create.”²⁸ Coupled to the dominant political party in Germany, this creativity would result in severely negative results for the company, industry, and the country as the synthetic gasoline plants helped refine the fuel for the panzers to overrun most of Europe in the Second World War.²⁹ Deflecting the trajectory of the German petro-chemical industry that took decades to create and achieve maturity required immense forces. The momentum of the system was only curtailed by the damaging of the plants by Allied bombers and their eventual capture by the resurgent Red Army of the Soviet Union.

Hughes’ examination of the invention, expansion and maturation of the electric power grids in the United States, Germany and Great Britain in his book, *Networks of Power* (1983) expanded these concepts. For Hughes, technological systems were not merely composed of those physical parts that might make up a complex machine, however large. They might also include portions of the environment that while not strictly a component of the technical structure, interact with and influence the course of its development. For the electric power grid the system might be composed of the electrical generators, the transmission lines, various switching stations, and transformers as well as the electric utility regulating organizations, the corporate business organizations and the universities that educated new cohorts of operators. This expansive

28. Ibid., 112.

29. Thomas Parke Hughes, “Technological Momentum in History: Hydrogenation in Germany, 1898-1933.” *Past and Present* no. 44 (Aug 1969): 127-131.

definition resists precise boundaries desired by the technician or scientist.³⁰ As an advanced technology system grew beyond the initial technical issues challenging the system creators, a host of administrative, economic, organizational and legal connections were built in parallel, in the process creating a symbiotic relationship between the technology itself and the human organizations devoted to its production and maintenance.³¹ When critical problems restricted the growth of the system, managers and engineers acted to define and then solve the problem, allowing further growth. Greater numbers of people become involved with the mature system and larger amounts of capital and more numerous and complex system component interrelationships were formed, all tending to resist any alteration in course of the system. This process creates momentum for the system, a concept not dissimilar to the Newtonian definition. To Hughes, advanced technological systems “have a characteristic analogous to the inertia of motion in the physical world. Their mass of technical, organizational, and attitudinal components tends to maintain their steady growth and direction.”³² The mass of the system includes the machines and physical components that required considerable capital investment to create, as well as the human component of its operators. The system velocity is attained through quantifiable rates of growth, either accelerating or

30. Thomas P. Hughes, *Networks of Power* (1983; repr., Baltimore, MD: The Johns Hopkins University Press, 1993), 5-7.

31. Richard F. Hirsh and Benjamin K. Sovacool. “Technological Systems and Momentum Change: American Utilities, Restructuring, and Distributed Generation Technologies.” *The Journal of Technology Studies* 32, no. 2: 72.

32. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Penguin Books, 1989), 460.

decelerating. The direction comes from the goals of the system managers, with additional momentum provided by the commercial entities, political bodies, professional societies and others that interact with the actual technical core of the system.³³

Once an advanced technology system acquires momentum, it can be as difficult to alter its trajectory as any massive physical body in motion. Successful advanced technology systems act to reduce disruptive threats to the system as managers of the technical core organization and subordinate support groups desire maintenance of the status quo.³⁴ Those organizations with vested interests in maintaining the normal direction of the overall system, such as the financial backers, the political groups that receive resources from it, or the government agencies that regulate it, are likely to be conservative, desiring to protect the capital and intellectual investments that they have already provided to the system. Governmental influence, organizational resistance and doctrinal adherence are all used to protect the system from undesired influences. Having built the technological system, individuals and organizations are loathe to let it be transformed, regardless of the requirements to adapt to new contingent forces or ideas.³⁵

Yet systems exhibiting technological momentum are not unalterable or autonomous, though the summation of contingent forces required to alter their course can be considerable. A shift in economic forces, system catastrophes or even a change in the

33. Thomas P. Hughes, *Networks of Power*, (1983; repr., Baltimore, MD: The Johns Hopkins University Press, 1993), 14-15.

34. *Ibid.*, 140.

35. Richard F. Hirsh and Adam H. Serchuk. "Momentum Shifts in the American Utility System: Catastrophic Change - Or No Change at All?" *Technology and Culture* 37, no. 2 (April 1996): 284.

belief system of the population using the technology may all act to change the course of the development of an advanced technology system.³⁶ Economic forces entailed a wide number of market issues that change the desire or the ability of the consumers to buy the product. In the electric power grid, the cost of fuel to run the power generating plants, the interest rates charged for capital or an overall financial downturn might result in a different market dynamic directly affecting the amount of electricity that was needed and hence the profitability of the electric utility.³⁷

Catastrophic system failures might also induce the population to avoid the consumption of a particular product or overall rejection of the technological system. The sinking of RMS *Titanic* in 1912, the space shuttle *Challenger* disaster in 1986, or the multiple nuclear reactor meltdowns at Fukushima, Japan in 2011 might all be considered system disasters that challenged the perceptions of the reliability and safety of their respective systems. These events should not be considered as merely an unfortunate turn of events for an individual component of the various technological systems. Rather, multiple minor failures and/or natural events had to occur to cause the avalanche of overall system collapse. These casualties are suggestive of “tightly coupled systems with a high degree of interconnectedness.”³⁸ In these examples, the complexity of the advanced technology system had increased at a rate faster than the ability of the system operators and managers to comprehend, let alone control. The actual disaster should thus

36. Ibid., 285.

37. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Penguin Books, 1989), 462-466.

38. Ibid., 463.

be seen not as an isolated event but as an indictment of the system and the societal values underpinning the system's momentum.³⁹

Finally, the overall beliefs of the population using the technological system might diverge from the ones that had initially supported its birth and growth. Writing in the late 1980s, Hughes postulated that the emergence of a popular counterculture in the late 1960s and 1970s might turn the population of the United States away from technological systems that emphasized the concentration of electric power production and centralization of its control.⁴⁰ Since the initial publication of *Networks of Power* in 1983 a large segment of the population of the United States has converted to embrace portions of this developing ideology, with effects that Hughes was not able to examine.

All three elements, shifting economic force, systemic technological failure, and changes in the population's beliefs may be seen in the course change in the development of the electric power grid in southeastern New England. How the effects of "a confluence of contingency, catastrophe and conversion" acted on the electric power grid in the past few decades is a key question to be addressed in this study.⁴¹

The Electric Power Grid

When considering the technological advances since the Industrial Revolution, one could easily point to several areas that have had lasting effects. The advent of the combustion engine and subsequent advances in the automobile radically altered the

39. Ibid., 465-466.

40. Ibid., 466-468.

41. Ibid., 470-471.

distances that the population would consider travelling in the normal course of their day. The development of chemistry and metallurgy permitted the creation of advanced fertilizers and stronger materials, ensuring a consequent population boom from greater supplies of food and the structures to house the people. Improved communications from the telephone, television, and computer permitted the spread of these technologies at a faster rate than ever before. Yet these developments might have been no more than luxuries for a select few without widespread access to electric power. Instead, by creating a flexible and relatively inexpensive form of power, humans vaulted from the “Age of Synergy” into the twentieth century with the fruits of all of these advances.⁴² Today it is nearly unfathomable to consider a modern society without electricity. A technological society could survive and perhaps even flourish without personal motor vehicles, stretching tracts of suburban sprawl or even chemically enhanced lifestyles. Cutting off the electric power in any advanced society, though, would rapidly lead to excessive social friction and economic dislocation. The blackout in the northeastern portion of the United States in November 1965, caused by failing to reset the power level of a single circuit breaker in the Niagara Falls power station, affected over 30 million people in the northeast, stranding thousands in subways and elevators.⁴³ Just recently, severe storms that struck New England caused hundreds of thousands to lose electric

42. Smil suggests this period occurred over the period from the end of the 1860s to the beginning of the World War One. See Vaclav Smil, *Creating the Twentieth Century* (New York: Oxford University Press, 2005), 18-28.

43. James Burke, *Connections* (New York: Little, Brown and Company, 1978), 1-3.

power, some for over a week.⁴⁴ A long term loss of electric power in the nation would have more significant economic and social impact. The population can no longer subsist without the reassuring glow of the incandescent lamp and its successors or the other comforts and necessities that electric power provides. Millions of urban dwellers would be unable to leave their apartments, walk to the countryside and become subsistence farmers, assuming this was even an option without the use of electrically produced fertilizers or fuel.⁴⁵

The American electrically driven society was not built overnight. It took generations to develop the technological and scientific comprehension of electricity and create the infrastructure to power the nation.⁴⁶ Some of the decisions made in the creation of this network were based on the pursuit of efficiency and profits while others were made for political considerations.⁴⁷ The net result has been an amalgam of systems that provide electricity to practically the entire population at an affordable price, but require the expenditure of significant environmental capital.

44. Msnbc.com, "Thousands In Dark Week After Nor'easter," Weather on msnbc.com, 5 November 2011, <http://www.msnbc.msn.com/id/45177254/ns/weather/t/thousands-dark-week-after-noreaster/> (accessed November 29, 2011).

45. James Burke, *Connections* (New York: Little, Brown and Company, 1978), 3-10.

46. Vaclav Smil, *Creating the Twentieth Century* (New York: Oxford University Press, 2005), 35-36.

47. Harold L. Platt. *The Electric City: Energy and the Growth of the Chicago Area, 1880-1930* (Chicago, IL: The University of Chicago Press, 1991), 270-271.

In an advanced technology system as pervasive as the electric power grid, it is somewhat surprising that the definitions for it are not particularly clear or well explained. Many descriptions focus on the physical components of the system, particularly the power generation plants, the transmission lines and the transformers.⁴⁸ In these descriptions the electric power grid is composed of three distinct subsystems; generation, transmission and distribution (see figure 1). The generation section consists of those facilities that convert energy, usually in the form of mechanical energy, to electrical

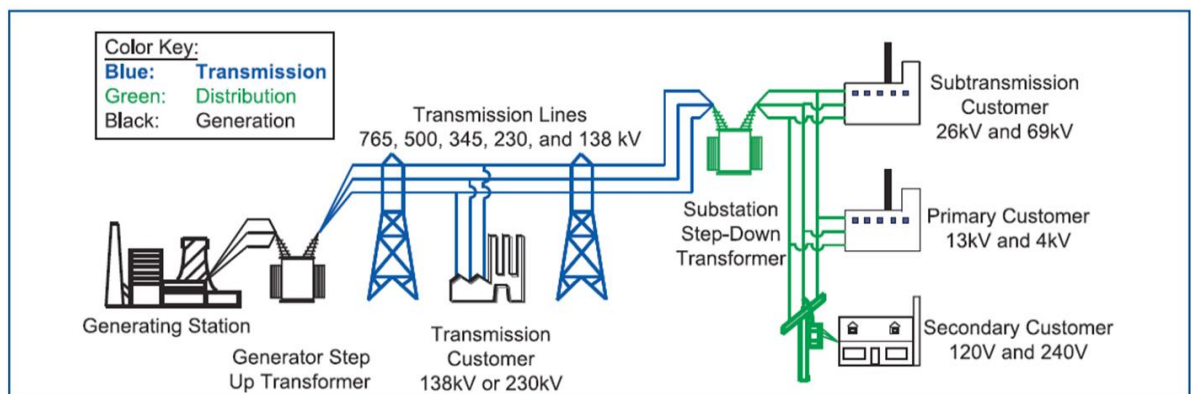


Figure 1. Basic Structure of the Electric System. U.S.-Canada Power System Outage Task Force, *Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations*, U.S. Department of Energy, Energy.gov, <http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/BlackoutFinal-Web.pdf> (accessed July 21, 2015).

energy. This may be accomplished in a variety of ways, such as burning a fossil fuel to generate thermal energy and through heat transfer boil steam to run a turbine generator

48. The website states “The “grid” amounts to the networks that carry electricity from the plants where it is generated to consumers. The grid includes wires, substations, transformers, switches and much more.” The site and suggested links concentrate on the physical components of the system and its control elements. See U.S. Department of Energy, “Smart Grid,” Energy.gov, Office of Electricity Delivery & Energy Reliability, <http://energy.gov/oe/technology-development/smart-grid> (accessed July 30, 2012).

that produces the electrical energy. Other methods to generate electricity include the use of falling water at dams to drive turbine generators or wind as a motive force to turn the blades of wind turbines.⁴⁹ The output of any one source of electric power varies greatly on the plant operating parameters though typically U.S. power plants generate alternating current (AC) power at 60 cycles per second or hertz (Hz).

While power generation may provide the greatest visual image of the electric power grid, the transmission subsystem is equally important. As the electric power generation plant is usually not in the same location as the final user of the electric power, the electricity must be transmitted on circuit lines. At the electric power generation plants, the output voltage is typically stepped up to over 69 thousand volts (kV) in order to minimize the energy losses as the electricity is transmitted to the end users. Building the transmission poles and stringing the lines can be as challenging as building the power generation plant due to costs, terrain, acquiring land right-of-way access and meshing different generations of technology.⁵⁰ Once the electric power has been transmitted to the location where it will be used, its voltage then must be stepped down and spread out to the various users with the distribution subsystem. The voltage is lowered at local substation step-down transformers and then transferred using low voltage lines to the end

49. Mark Babula, "New England's Bulk Electric Power Grid," NorthEast Disaster Recovery Information X-Change, http://www.nedrix.com/PDF/Power_Grids_Across_New_England.pdf. (accessed December 3, 2013).

50. Matthew H. Brown and Richard P. Sedano, *Electricity Transmission, A Primer* (N.p.: National Council on Electric Policy, June 2004), 6-7.

users. While some industries use higher voltages, the vast majority of the population uses electricity at 240 and 120 Volts (V).⁵¹

With the large scale use of electricity in modern society, no individual power plant can provide all of the electricity consumed by the population and industry. The construction of the electric power grid permits various electric power generation plants to be connected to the network and all provide their output to the transmission subsystem. Through continuous monitoring of the power plants output and the demand of the grid's electrical consumers, the grid operators at regional operational control centers are able to maintain a stable system voltage and frequency. In the event of a system disruption due to an electric power plant shutting down caused by equipment failure or a downed transmission line, the operators can attempt to reroute electric power from other sources to maintain the continuity and reliability of the system.⁵²

Hughes proposed a more expansive definition of the advanced technology system such as the electric power grid beyond the basic technical components. For Hughes, a technological system includes the “interacting components of different kinds, such as the technical and institutional, as well as different values . . .”⁵³ Constructors of advanced technology systems such as the electric power grid realized that their creations extended into other spheres of interest and acted to insulate the system from possible orthogonal

51. Ibid.

52. Massoud Amin and John Stringer, “The Electric Power Grid: Today and Tomorrow,” *MRS Bulletin* 33, no. 4 (April 2008): 400-401.

53. Thomas P. Hughes, *Networks of Power* (1983; repr., Baltimore, MD: The Johns Hopkins University Press, 1993), 6.

concerns. If successful, the system grew and prospered, overcoming the initial threats to growth.⁵⁴ Even this description seems limited, particularly for a system such as the electric power grid. It tends to ignore the actual users of the system who might act as more than mere consumers for the electric power being produced and provide negative feedback to the operation of the system itself. The effects of the technical components on the physical world that contain them are also neglected, positing that the system operates in a space devoid of other biological or inorganic systems. A better description would pay greater heed to these actors as they provide input to the electric power grid's construction and operation, above and beyond any transmission loss or voltage drop.

Putting these ideas together, a more inclusive concept of the electric power grid includes the physical components of the system (the power plants, transmission lines and distribution stations) as well as the organizations and people that directly affect the production and consumption of electric power. These groups contain businesses such as the ones that operate the electric power plants and transmit the electricity (such as the New England Electric System), but also those that consume electric power (for example the city of Providence to run its electric street cars). Other establishments that directly affect the production of electricity include the governmental supervisory bodies (such as the Rhode Island Public Utility Commission) whose decisions often limited the operations and maintenance of the electric power grid. Additionally, the colleges and universities that educate the engineers and the technical societies that set the standards for

54. Richard F. Hirsh and Benjamin K. Sovacool, "Technological Systems and Momentum Change: American Utilities, Restructuring, and Distributed Generation Technologies." *The Journal of Technology Studies* 32, no. 2: 72.

efficient and ethical operation of the electric power grid must be incorporated in any definition.⁵⁵ While the general population as direct consumers of electric power is a component of the electric power grid, the citizen groups that indirectly affected the system are not. These groups (such as the Conservation Law Foundation) certainly did have a strong influence on how the electric power grid was operated and maintained, but only by their ability to influence the voting public and their elected representatives.

Both Mumford and Ellul noted the creation and operation of the electric power grid in their assessment of modern technological systems, though neither devoted specific analysis to this particular system. Mumford's early views saw the expansion of electric power supplies as a means to free the population from the "basest forms of drudgery."⁵⁶ Linking the various electric generating sources would allow the diffusion of economic activity throughout the nation and not merely concentrated on those locations nearest the power sources. Advances in automation and shifting the work force out of menial jobs would lead to the transformation of the working class.⁵⁷ The combination of the various types of electric power generation and transmission would provide efficiency and reliability to all of its users, preventing the accumulation of excessive population or power in denser urban centers.⁵⁸ Over time Mumford's optimism appeared to diminish

55. Thomas J. Misa, "How Machines Make History, and How Historians (And Others) Help Them to Do So," *Science, Technology, & Human Values* 13, no. 3/4 (Summer – Autumn 1988): 318.

56. Lewis Mumford, *Technics and Civilization* (New York: Harcourt, Brace & World, 1934, 1963), 381.

57. *Ibid.*, 222-229.

58. Lewis Mumford, *The City in History* (New York: Harcourt, 1961), 565-567.

and the electric power grid was reconceived as just another portion of the “megamachine,” dispensing ambiguous gifts at the cost of human integrity and freedom.⁵⁹ Ellul had fewer positive notes regarding the electric power grid. The interconnectedness of the various means of electric power generation demanded technical solutions to the issues of operation and maintenance, solutions that could only be provided by trained technicians with the support of the state. Once again technological problems could only be solved with additional applications of technique, a palliative method that only furthered technique’s domination of mankind.⁶⁰

Environmental Ethics

Similar to the electric power grid taking over seventy years to attain maturity, the development of an environmental ethic took generations to achieve a widespread place in the public consciousness. On the surface this appears surprising, as not long after Edison was building the Pearl Street electric power system in New York City, John Muir was establishing the first national conservation movement, the Sierra Club, in California. In time, organizations such as Muir’s would have a significant effect on American society and the operation one aspect of its technological back bone, the electric power grid. The parallel evolution of American conservationist and then environmental thinking had similar features to the initial growth of the electric power grid. It had a strong element of practical problem solving in its approach to protect human life and the environment. The

59. Lewis Mumford, *The Pentagon of Power, The Myth of the Machine Volume Two* (New York: Harcourt Brace Jovanovich, 1964, 1970), 300-301.

60. Jacques Ellul, *The Technological Society*, trans. by John Wilkinson (New York: Vintage Books, 1964), 237.

premier theorists for conservation and then environmental protection were more self-taught than educated at prestigious universities. Finally, government assistance was seen as essential to meeting the goals of the various individuals and groups that wanted to maintain and protect the environment. Over time the character of these similarities would change. A professional cadre of committed individuals with an ethic for protecting the environment as strong as any electric grid operator's emphasis on efficiency came to the forefront of the environmental movement. Their actions would affect the manner in which the electric power grid was perceived, regulated and operated.

The modern environmental movement might well consider John Muir's exertions as important as anything Edison accomplished. Muir's walking expeditions through some of the most pristine areas remaining in North America convinced him of the necessity to safeguard all types of biologic forms, not just those advantageous to the spread of human civilization. To Muir, nature's existential rights were not based on human necessity but were self-evident. For that matter, an untouched wilderness was a requisite for the population's acquaintance to prevent the hectic pace of modernity from cracking the essence of humanity. An accomplished writer and organizer, Muir popularized his biocentric views through magazine articles and books and used the Sierra Club, which he helped found in 1892, to create to generate the popular support required to preserve the forests and wilderness areas of the Sierra Nevada Mountains.⁶¹

61. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 63-65.

In contrast to Muir's views, his contemporary, Gifford Pinchot, saw the country's forests and natural resources as assets for human use to fuel the nation's development. While Muir wanted to preserve areas of the nation untouched by human growth, Pinchot wanted to manage the consumption of natural resources so that they would not run out and be unavailable for future generations. The appeal of the wilderness as some sort of aesthetic reserve seems to have appealed to Pinchot less than the possibility of its long term use for human progress. Both Pinchot and Muir were able to gain access to the national leadership in what was initially a mutually reinforcing effort, leading to legislation that established the national park system and made conservation an issue for the republic. Over time, however, the goals of the two men diverged, leading to a public disagreement regarding the damming of the Hetch Hetchy Valley in California to provide water and electricity for the nearby city of San Francisco. A portent of current environmental and developmental imbroglios, this Gordian knot was cut only when President Woodrow Wilson sided with the developers in 1913 following a seven year struggle in Congress.⁶²

If the proponents to dam the Hetch Hetchy Valley won the battle, Muir's followers won the war of ideas, though this was not immediately evident. In the first decades of the twentieth century, conservation was the greater motivational force behind national organizations such as the National Wildlife Foundation and the Audubon Society. State and local organizations might be concerned with maintaining a particular parcel of land clear from human development or providing a link to human interaction

62. Ibid., 61-67.

with nature, but these efforts were typically small compared to the development of industry in the nation, particularly that of the electric power grid. Certainly the New England Electric System, which was busy building its own hydroelectric power dams on the Connecticut and Deerfield Rivers, did not appear to have been limited by the population's desires to conserve portions of the wilderness. The thrill and excitement of the useful new electric powered technology was more compelling than any concerns of the environmental damage it might be causing.⁶³

Environmental concerns tended to be sublimated by the greater problems of the Great Depression, the Second World War, and then the postwar afterglow even as the electric power grid was achieving maturation. Conservation issues had not evaporated, but the concerns had not reached any critical mass that would affect public policy. Conservation of open spaces and scenic vistas still appeared as the more important problems to be addressed.⁶⁴

A more sophisticated environmental perspective was provided during this period by Aldo Leopold's "Land Ethic." Leopold saw the relationships between humanity and the environment as incredibly complex interactions that required great humility when attempting to comprehend, let alone control. A new manner of thinking was required to deal with this relationship, one that "changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow

63. David B. Sicilia, Electric Power and Electrification. In *The Encyclopedia of New England*, ed. Burt Feintuch and David H. Watters, 851 (New Haven, CT: Yale University Press, 2005).

64. Samuel P. Hays, *Beauty, Health and Permanence: Environmental Politics in the United States, 1955-1985* (New York: Cambridge University Press, 1987), 27.

members, and also respect for the community as such.”⁶⁵ Leopold examined these relationships in terms of energy exchange between the participants, but the actors were not simply elements that could be plugged into or removed from the circuit. The members had expansive functions whose limits could not be easily determined. In any case the environment was not a reservoir for purely economic endeavors. The protection of the environment required a personal commitment towards conservation, as economic and political motivations were not sufficient.⁶⁶ Leopold’s oft-quoted adage that “A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise,” should not be understood to presume the total inviolability of nature.⁶⁷ Such an ethical proposal did not propose equal rights for animals and plants, but desired responsible and prudent interaction with the environment by mankind. Leopold saw conservation as an important human activity and emphasized personal responsibility for this change in emphasis.

In the 1960s, the problems of environmental degradation caused by increased population growth, industrial production and modern technology edged their way into the national discourse.⁶⁸ This was a period of unprecedented interest in ecological actions

65. Aldo Leopold, *A Sand County Almanac* (New York: Oxford University Press, Inc., 1949; repr., New York: Ballantine Books, 1970), 240 (page references are to the reprint edition).

66. Aldo Leopold, *A Sand County Almanac* (New York: Oxford University Press, Inc., 1949; repr., New York: Ballantine Books, 1970), 250-251 (page references are to the reprint edition).

67. *Ibid.*, 262.

68. *Ibid.*, 15-21.

that affected many aspects of American technological society, especially the electric power grid. The decade's early years had seen business as usual for the electric power utilities. The larger companies experimented with different types of energy sources, even as the business model that formed the backbone of their concept of operations was becoming less dynamic.⁶⁹ The promise of practically free electric power provided by civilian operated commercial nuclear reactors proved illusionary, the costs of carbon-based fuel continued to rise and the increased regulation of the utilities by national and state organizations tended to lower the companies' profits.⁷⁰ Business was not booming, but it was safe and profitable. The 1960s were to turn this complacency on its head during a number of interconnected phases. The stalling out of the further expansion of the electric power grid, an increasing realization of the ecological stresses that this vital technology created, and external political, economic and social problems created a powerful combination affecting continued development. More importantly, the environmental concerns that had been dormant during the Depression and the World Wars came roaring back into the national consciousness. The system received its first major shock in 1965 when a minor electrical fault cascaded into a major power outage throughout the northeastern United States, eventually blacking out the homes and

69. David B. Sicilia. Electric Power and Electrification. In *The Encyclopedia of New England*, ed. Burt Feintuch and David H. Watters, 851. (New Haven, CT: Yale University Press, 2005).

70. Richard F. Hirsh. *Technology and Transformation in the American Electric Utility Industry*. (1989. Reprint, Cambridge, UK: Cambridge University Press, 2002), 82-86.

businesses of over thirty million people.⁷¹ This catastrophic failure of the electric power grid foreshadowed what was to come, although few would have predicted it based on economic or technological factors.

The 1960s also saw numerous changes in the cultural course of American society, not the least of which was the explosion in the importance of the environmental consciousness of the population. The publishing of *Silent Spring* by Rachel Carson in 1962 was the spark that rekindled the fire Muir had set earlier. Carson's warning of the unseen, though not undetectable, effects of manmade chemicals on the environment created national notoriety for *Silent Spring*. Her description of the use of the pesticide Dichloro-Diphenyl-Trichloro-ethane (DDT) suggested that it affected life forms far beyond the initial intent of insect eradication. The byproducts of such poisons could be identified in the water supplies of the areas they were used and often caused deleterious effects on other life. At the same time, DDT use failed to keep the insect population at bay as the rapidly reproducing target species quickly developed resistance to it and the other toxic substances. Carson considered other methods of proposed insect control had greater promise with less collateral damage to the biological landscape in man's attempts to mold the environment to his preferences.⁷² While reaction against Carson's clarion calls were swift and often vehement, her ideas penetrated the psyche of the national

71. Phillip F. Scheew, *The Grid* (Washington, DC: Joseph Henry Press, 2007), 115-131.

72. J.E. de Steiguer, *The Origins of Modern Environmental Thought* (Tucson, AZ: The University of Arizona Press, 2006), 38-39.

consciousness and caused a new burst of environmental awareness.⁷³ Despite Carson's death in 1964, governmental agencies and non-governmental groups began to take greater notice of environmental concerns.

The late 1960s and 1970s saw an explosion in environmental thinking that considered human responsibilities to the environment from many viewpoints. The sum of these often divergent perspectives on how to consider environmental concerns did not result in a single environmental ethic but a catalog of perspectives that granted greater equality to all members of the earth's biological community. Over time, this eruption of new viewpoints and diverse modes of analysis would result in concepts that would motivate large segments of the population. This newfound enthusiasm for protecting the environment would affect the operation of many advanced technological systems, including the electric power grid.

Some of this discussion built off of the previous work of Leopold and Carson and was pragmatic in its appreciation of the environmental issues. Scientists such as Barry Commoner proposed a set of environmental postulates in 1971 to help harmonize the challenge of human activity in the world with the demands of the environment.⁷⁴ Commoner also opposed the prevalent Western view that nature was simply a resource to be efficiently expended or used up. The view that the earth was some infinite sink where the waste heat and combustion products from energy production could be blithely

73. Rachel Carson, *Silent Spring* (New York: Houghton Mifflin Company, 1962), xvii.

74. Barry Commoner, *The Closing Circle, Nature Man, and Technology* (New York: Alfred A. Knopf, 1971): 33-45.

disposed of was rejected. The earth had a finite capacity to absorb polluting residue, and if this capacity was exceeded, irreparable harm might result.⁷⁵ At the same time Paul Ehrlich in *The Population Bomb*, published in 1968, and then the Club of Rome's *Limits to Growth* in 1972, emphasized the finite nature of the planet and suggested that new designs had to be considered to deal with the expansion of the world population to levels previously unimaginable.

These environmental perspectives were secular in origin with the religion relegated to a marginal component of the discussion. This was not an inadvertent omission. For some environmentalists, the very foundations of Western Civilization buttressed the root causes that led to these abuses of the environment. The distinctive nature of western Christianity was particularly responsible for the condescending view of the environment. "Especially in its Western form, Christianity is the most anthropocentric religion the world has seen," argued Lynn White in 1967 in his seminal paper "The Historical Roots of Our Ecological Crisis."⁷⁶ This human-centric religion diminished the status of the environment when it called for man to go forth and subdue the earth, placing the land as merely another resource to placate human desires. Additionally, the western proclivity for action made it not only permissible but almost ordained behavior for humans to go and achieve some worthy goal, with little regard to the consequences. White argued that this Western attitude was instrumental in the

75. William J. Coad, "Energy Conservation is an Ethic," *ASHRAE Journal* 42, no. 7 (July 2000): 19.

76. Lynn White, Jr., "The Historical Roots of Our Ecological Crisis," *Science* 155, no. 3767 (March 10, 1967): 1203-1207.

scientific and technological discoveries that led to the Industrial Revolution. As long as this common Christian mindset prevailed, the tendency for man to exploit and damage the environment would predominate. From White's perspective, "we shall continue to have a worsening ecologic crisis until we reject the Christian axiom that nature has no reason for existence save to serve man."⁷⁷ White proposed that the vision of Saint Francis of Assisi, where man has equality with nature and not mastery of it, should be the ideal.⁷⁸

White's missive created a storm of response across academia and religious institutions. Some Christian denominations viewed the ecological concerns arising from the production and consumption of energy more stridently. Within these organizations a desire for the creation of a Christian Environmental Ethic was espoused. Such a tenet would acknowledge the value of God's creation of the earth and include the environment as a characteristic for the common good of mankind. This ethic viewed the health of the environment as an international goal that required the good works of the entire world, but especially those nations creating the most pollution, to solve the problems.⁷⁹

Other ethicists looked at the environment as having its own inherent value. This stream of thought flows from the initial source of "deep ecology" postulated by Norwegian Arne Naess in the early 1970s. Naess rejected balancing human affluence in

77. Ibid., 1207.

78. Ibid., 1207.

79. Global Warming Working Group of the JPIC Promoters, *Integrity of Creation: An Issue for Religious Today, Global Warming and Climate Change* (Rome, Italy: JPIC Promoters, 2002).

the developed world against the degradation of the environment across the globe, proposing a new ‘ecophilosophical’ perspective to supplant such rationalized tradeoffs. A value system embracing biological diversity, anti-class posture, the fight against pollution and resource depletion and a belief in the complexity of ecological systems beyond normal human comprehension formed the basis of Naess’ new ‘ecosophy.’ Attaining Naess’ principles would lead to a human polity of smaller organizations with a flatter decision making process more in tune with his proposed value system. The political opportunities suggested by this normative value system would replace the previous ones based purely on scientific reductionism.⁸⁰

These ethical concerns regarding the environment are not all inclusive, but represent major secular outlooks. They are usually not diametrically opposed to the operation of the electric power grid, but electric energy production and consumption requires evaluation before making decisions that may affect the environment. In engineering matters, one cannot violate the physical laws describing the application of electricity and electromagnetism. Natural restrictions may be tempting to flaunt, but designers know that nature will always side with the hidden flaw. Environmental precepts are not as obvious, but they may be as unkind if flouted.

Such prudence often became the basis for political action protesting the normal operating procedures of the electric power grid. The undercurrents of social unrest from the stresses of participation in the Vietnam War, concerns regarding finite resources

80. Arne Naess, “The Shallow and the Deep, Long Range Ecology Movement. A Summary.” *Inquiry* 16, no. 1: 95-100.

compared to an exponentially increasing population, and greater research on the effects of industrial pollution led to the transformation of public interest in environmental issues. The environmental organizations rising from these tensions and apprehensions resulted in a number of legislative actions which tended to cement the initial gains of the movement as well as provide legitimacy for their philosophical underpinnings.⁸¹ In the United States, the creation of the Environmental Protection Agency in 1970 provided the executive branch the authority to deal with conservation and then later ecological concerns.⁸²

The environmental movement in America became more apparent and effective following the watershed events of the 1960s and 1970s as Mideast oil crises, unpopular Asian wars and the establishment of environmental regulatory bodies resulted in an environmental consciousness that echoed the spirit of the times.⁸³ This sea change was not initially noted by the operators of the electric power grid. Environmentalists viewed the tensions from electric power generation in a different light than engineers and businessmen. Those concerns were not some fantasy mixture of “desire for Elysian Fields, a conservation ethic and a vision of American energy independence that requires a

81. Jon Agar, “What Happened in the Sixties?” *British Society for the History of Science* 41, no. 4: 577-584.

82. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 121-124.

83. David E. Nye, *Consuming Power: A Social History of American Energies* (Cambridge, MA: The MIT Press, 1998), 217-237.

technological revolution in the way we make and use energy.”⁸⁴ Instead, they were consistent, deeply felt ethical narratives that permitted the critical examination of the production and consumption of energy, but used different paradigms than the ones preferred by engineers and economists.

Multiple strands of environmental thought and philosophical concerns motivated the population of the United States. Regardless of whether these new values were some sort of replacement for the atrophying faith traditions of the West or the expansion of a non-secular, non-exclusive humanism, people were inspired by these environmental postulates and corollaries.⁸⁵ This enthusiasm led them to create local organizations that often acquired influence in the local political processes, at times leading to friction between the contending desires for safe and reliable electric power and the values of environmentalism. The manner in which this interaction occurred and the results of the collision is the central research question to be explored in the dissertation.

Review of the Literature

The literature covering the electric power grid in the United States, the nation’s environmental movement and foundational ethical concerns and the concepts of technological determinism and technological momentum is extensive and varied. However, most books or articles typically covers one or perhaps two of these topics; rare is the account that tries to place all three strands of thought in the same conversation.

84. Stephanie Cohen, "Energy Dreams and Energy Realities," *The New Atlantis*, no. 5 (Spring 2004): 12-15.

85. Charles Taylor, *A Secular Age* (Cambridge, MA: The Belknap Press of Harvard University Press, 2007), 19.

Thus technological determinism or momentum may be combined with the development of the electric power grid, but the effect of environmental ethics on the subsequent operation of the system is given short shrift. Additionally, many histories of the development of the electric power grid focus on the “heroic” period of its creation and growth, and less on its maturation and inertia in the latter half of the twentieth century. Thus, the past and current literature only tangentially covers the proposed research question, leaving an appreciable area for new analysis to explore. The sparse coverage is particularly noticeable when these elements are applied to the southeastern New England area. Incidents in Massachusetts might attract national attention, but the area of Narragansett Bay lacks significant analysis.

The discourse on technological determinism and momentum has its own library. Ellul’s *The Technological Society* (1954), while not the first volume written in this collection, is perhaps the most important. Here Ellul begins his account of how technique has engulfed all human endeavors in a drive for maximum efficiency. While Ellul does not explicitly define his hypothesis as technological determinism, his writings focused the discussion on this idea for subsequent analysis. Ellul wrote extensively over the years expanding his initial concepts and ideas but *The Technological Society* is the starting point for this concept. Little time or energy on the electric power grid itself, but his works provided a general theory of how technology had affected human development and humanity itself. Later works by Ellul devoted more time to how ecological concerns were influencing human interactions with technique.

Langdon Winner’s books *Autonomous Technology* (1977) and *The Reactor and the Whale* (1986) picks up on Ellul’s postulate that technique gives rise to a technological

politics focused on efficiency. Yet Winner takes offense to the notion that “the movement of advanced technology is universally centralizing and that this centralizing tendency eventually culminates in control by an extremely powerful technologically oriented state.”⁸⁶ Instead, a diffusion of power from the advanced technological systems, such as transportation or the electric power grid, to the organs of the state seems the norm. *Autonomous Technology* examines Ellul’s theories but provides less insight on the effects of the new ethical standard of environmentalism on the technocracy. In *The Whale and the Reactor*, Winner considers this in greater depth, as well as some aspects of the electric power grid. Winner is more interested in the intersection of politics and technology, particularly the manner in which technological systems may create political side effects. Technology may be used to solve a political problem, but may also result in unplanned and unexpected political effects.⁸⁷ The Rhode Island example of political institutions using the new technology of the electric power grid to advance their control of the political levers of the state almost appears to suggest the converse of Winner’s ideas.

Lewis Mumford’s works bracket Ellul’s in time and scope. His multiple volumes on human civilization and the encroachment of technological systems into the human sphere spanned his life and provided different perspectives how this trend affected

86. Langdon Winner, *Autonomous Technology, Technics-out-of-Control as a Theme in Political Thought* (Cambridge, MA: The MIT Press, 1977): 252.

87. Carl Mitcham, *Thinking Through Technology: The Path between Engineering and Philosophy* (Chicago, IL: The University of Chicago Press, 1994), 197-188.

modern society. His early work in *Technics and Civilization* (1934) suggested greater human agency than his later thoughts in *The Myth of the Machine* (Volume One, 1966, and Volume Two, 1970) where technological excess diverging from human nature held a superior position. Mumford did spend greater time in discussing the effects of the electric power grid on human civilization, allowing how it might prevent excessive centralization of political and economic power. His concepts of regionalization would be later cited as supportive of environmental concepts, though Mumford's work was more of the conservationist mentality.

Noted scholar and Society for the History of Technology co-founder Thomas P. Hughes' extensive work provides both the starting point for a discussion of technological momentum, as well as ground breaking work on the creation and development of the electric power grid in Europe and North America. His 1969 article "Technological Momentum in History: Hydrogenation in Germany, 1898-1933" was his first step in exploring the concept of technological momentum, which was expanded upon in later works such as *Networks of Power* in 1983 and then in *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* in 1989. By observing a number of advanced technological systems in different nations (the chemical hydrogenation industry in Germany from the early twentieth century to the interwar period and the electrical utility industry in Germany, Great Britain and the United States from the 1880s to the 1930s), Hughes concluded that these systems, far from having a life of their own, grew, matured and even occasionally transformed themselves as they penetrated the societies where they were developed. Hughes' use of a systems approach to examine these advanced technology systems was also important as he viewed them as not merely

technical artifacts interacting with the population, but also forming other organizations that assisted or hindered their growth. *Networks of Power* is perhaps the most important of Hughes' works as it looks extensively at the growth and development of the electric power grid. Ending his study in the mid 1930s, Hughes did not examine the changes that occurred to this system in the later part of the century.

Other authors have examined the electric power grid during this later stage. Richard Hirsh in his works *Technology and Transformation in the American Electric Utility Industry* (1989) and *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (1999), as well as other journal articles, surveyed the electric utility industry in the past few decades. The latter study is more inclusive of Hughes' concept of technological momentum. Both books focus more on the technical and economic aspects affecting the electric power grid and less on how the environmental movement provided negative feedback to the system. Hirsh's studies cover the entire country and end prior to the current stress of anthropomorphic global warming reenergized the environmental consciousness of the nation.

John T. Landry and Jeffrey L. Cruikshank's book, *From the Rivers, The Origins and Growth of the New England Electric System* (1996) provides a general overview of the electric power grid's development in the southeastern New England area. While conceived as an in-house history of the New England Electric System Company, the authors cover the story of the numerous businesses and technologies that provided electric power to the New England area. This is particularly valuable as while most other studies focus on particular time periods, this volume's longer time line permits greater reflection on the advantages and disadvantages of some of the company's decisions. The

study is focused more on the technological and business side of the electric power grid and less on the resistance provided in the past few decades by expanding environmental concerns.

Other works look at particular aspects of the electric power grid's operations, social impacts, interactions with government and industry, or marketing. Robert F. Falb's 1964 Honor's thesis from Brown University on "Marsden Perry, the Man Who Owned Rhode Island" is both instructive and amusing. He details how Perry, a cunning businessman, established an electric power monopoly in the state of Rhode Island, cornering the state government along the way. David B. Sicilia, in his PhD dissertation (1991) and articles, examined how marketing of the nascent electric power industry assisted its expansion and interacted with other facets of the culture in the Boston area. David Roe's *Dynamos and Virgins* (1984) discussed how the state of California regulated the electric utilities in the 1970s based on environmental concerns. This book is of note as the author is well versed in the technical aspects of power generation and transmission as well as the environmental concerns of his focus group. Wendy Williams' and Robert Whitcomb's *Cape Wind: Money, Celebrity, Class, Politics, and the Battle for Our Energy Future on Nantucket Sound* (2007) provides the most recent example of how divergent forces affect the electric power grid's operation.

The Electric City (1991) by Harold L. Platt describes the growth of the electric power grid in the Chicago area from 1880 to 1930. This period paralleled the early evolution of the New England Electric System in southeastern New England, a company that used many of Samuel Insull's methods to achieve dominance. The New England Electric System management team also took numerous actions to fend off Insull's drive

for continental control of the utility industry. Insull's system was widely copied across the country for better and worse. That the New England Electric System managed to survive the Great Depression and the new federal regulation of the 1930s while Insull's business empire did not provides an interesting contrast to examine.

Vaslov Smil's numerous books and articles on the development of the electric power grid and other advanced technology systems gives historical context to the immensity of these projects and the time required to change them. Both *Creating the Twentieth Century* (2005) and *Transforming the Twentieth Century* (2005) provide global perspectives on how the seminal technological inventions of the late 1880s changed the world and led to the current modern technological society. Smil's work also considers any number of possible calamities and suggests that the current system arrived at after generations of toil, will take an equal lengthy time to alter.

While the literature associated with the evolution of environmental ethics and the environmental movement in America is extensive, most of the literature is focused at the national or global levels either philosophically or technologically. With the adage to "Think globally but act locally," many authors attempt to promote or discuss a unifying theory of environmental values, allowing the regional chapters to deduce the necessary actions to achieve fulfillment. The readings emphasize political action taken at the national level, or global concerns to be addressed, but typically fail to address how specific actions affect the operation of the electric power grid.

Roderick Nash's ground breaking work *Wilderness and the American Mind* (1973) followed by *The Rights of Nature, A History of Environmental Ethics* (1989) are important in discerning the development of the American concepts of environmental

thought. The first book is particularly insightful on the struggle between John Muir's and Gifford Pinchot's ideas as one can see the strands of their discourse extending into the modern day. Pinchot was the more politically connected of the two and chalked up a number of early victories though Muir is arguably the touchstone of modern environmental thought. *The Rights of Nature, A History of Environmental Ethics* extends Nash's analysis into the late 1980s and analyzes some of the contemporary ideas on the concept of environmental ethics.

The numerous works by John Muir set the initial baseline for ethical concerns for the environment in the United States. In his strident defense of the wilderness, Muir sounds much like an Old Testament prophet haranguing the population to atone for their sins. *A Sand County Almanac* by Aldo Leopold (published in 1949 not long after his death) is the next step in the process of assigning value to the environment above and beyond that of a standing reserve of natural resources.

Rachel Carson's *Silent Spring* (1962) is the entry point to the modern environmental movement's beliefs. This work is perhaps the dividing point between the previous conservationist mindset and a new value system that transcended the more anthropocentric concept of the environment. Carson's book emphasized the long term effects of man made chemicals on biological life cycles and sparked the subsequent interest in averting such problems. *Silent Spring* was less a philosophical treatise than a well constructed argument against the use of pesticides. In many ways this work is a quintessential American document, written not by some "expert" or "intellectual," but a well informed citizen suggesting practical responses to observed problems. Subsequent authors in the late 1960s and 1970s made the case that the old conservationist paradigm

was no longer operative, such as Lynn White in "The Historical Roots of Our Ecological Crisis" (1967) or Paul Ehrlich in *The Population Bomb* (1968) and the Club of Rome's *Limits to Growth* (1972) which emphasized the finite nature of the planet. With the expansion of the world population to levels previously unimaginable, new designs had to be considered.

Barry Commoner was in many ways a successor to Rachael Carson. Like Carson, Commoner explored the effects of various complex chemicals on the environment, though unlike Carson he did not propose a new ethic per se to deal with the ecological crisis. As an advocate of the Nuclear Test Ban Treaty, Commoner examined the effects of nuclear fallout on not only the human population, but the rest of the biologic realm after he discovered that the organs of the federal government were underplaying the risks. During the 1960s and 1970s Commoner published a wide array of books and articles on the ecological crisis though *Closing the Circle* (1971) is perhaps his best known work. Later in the decade he authored *The Poverty of Power* (1976) and *The Politics of Energy* (1979) which more closely examined the role of the electric power grid on the environmental crisis. Commoner was a scientist but his effective writing and energetic action in the political realm established him as a leading prophet of the environmental movement.

In contrast, Arne Naess' *The Shallow and the Deep, Long Range Ecology Movement, A Summary* (1973) offers no less than a complete new value system to replace the past. Naess wanted to by pass the previous values of conservation and pollution mitigation and proceed directly to an entirely new value system. This new philosophical philosophy of Deep Ecology would provide a new final vocabulary as a basis to make

responsible political decisions regarding the protection of the biosphere as well as the promoting biological diversity, preventing the exploitation of humans by one another while emphasizing local autonomy.⁸⁸

Samuel P. Hays offered a number of commentaries on American Environmental Politics in both *Beauty, Health and Permanence: Environmental Politics in the United States, 1955-1985* (1987) and *Environmental Politics since 1945* (2000). Both books examine the larger national perspective of the issues and value systems proposed by environmental ethics, and less on the specific regions that deep ecologists are enamored with, or the specific energy concerns associated with the electric power grid.

Amory B. Lovins' 1976 article, "Energy Strategy: The Road Not Taken," is of interest as it straddles the intersection of power, politics and environmental ethics. His proposal to shift electric power generation to wind based sources appeared radical at the time of its publishing in the height of the 1970's energy crisis. While aimed at a national audience, one can trace the progression of many of Lovins' ideas into the 21st century in the Cape Wind project that is currently under review. Lovins wrote many other books during the subsequent decades focused on practical suggestions on how the electric power grid could be successfully operated while minimizing its effect on the environment.

Ralph Nader and John Abbot's *The Menace of Atomic Energy* (1979) is of note for a number of reasons. It describes in great detail many of the strengths and

88. Arne Naess, "The Shallow and the Deep, Long Range Ecology Movement. A Summary," *Inquiry* 16, no. 1: 95-100.

weaknesses of the standard nuclear power plant, particularly the entire life cycle environmental costs of its construction, operation and maintenance. It is also helpful for a list of possible activities that citizens might do to prevent the construction of any of these facilities in their areas. Ironically, many of the nuclear power plant projects the authors inveighed against were constructed and brought on line. Meanwhile, they completely neglected the protests in Rhode Island that were successful using many of their proposed techniques and tactics.

Written works on the historical analysis of southeastern New England, with an emphasis on the state of Rhode Island, are often thin volumes. Snippets of specific incidents, biographies of important political figures, or dusty governmental records are available, but need to be critically considered when evaluating the complete picture of politics in the Ocean State. Both William G. McLoughlin's *Rhode Island: A History* (1970), and Patrick T. Conley's *Rhode Island in Rhetoric and Reflection* (2002) provide important vignettes on the course of Rhode Island history, particularly some of the larger than life characters of the late 19th and early 20th century. Both note the intersection of government and utility leadership during this era but do not describe how this juncture was split apart by the political forces of the New Deal and later environmental movement in the state. Particularly lacking is any analysis of the growth of the many environmental groups in the state. While the environmental groups' web sites do suggest their own historical background and environmental mission, the actual historical record is sparse. Duane Lockard's *New England State Politics* (1959) examines some of the more seemly portions of Rhode Island government, but does not cover the stresses of the later decades. Biographies and autobiographies of some of the major political leaders of the period

should also be read with some level of skepticism. Erwin L. Levine's *Theodore Francis Green, The Rhode Island Years* (1963) and *Theodore Francis Green, The Washington Years* (1971), Ruth Morgenthau's *Pride Without Prejudice, The Life of John O. Pastore* (1989) and David McKean's *Tommy the Cork* (2004) all provide insights on seminal political leaders on the Ocean State. Arlene Violet's *Convictions* (1988), Claiborne Pell's *An Uncommon Man* (2011) and even Vincent "Buddy" Cianci, Jr.'s *Politics and Pasta* (2011) serve more as background to the manner of which state politics was conducted and the intellectual background of some of the key leaders than a historical record.

The records of the Public Utilities Commission of the state of Rhode Island serve as a means to second check some of the claims of the secondary sources. These must also be examined critically as the regulatory body's actions were frequently linked to the political motivations of the state government. Additionally the Commission was often more interested in the other public utilities than the electric ones, diluting the strength of this source. The state's annual reports from the Department of Agriculture and Conservation and its successors also provides respected insight on how the state viewed environmental problems. The Federal Trade Commission's reports of the electric utility companies are also valuable as they provide a great wealth of material to confirm or deny statements from secondary sources, as well as indicate the thought processes of the actual leadership of the holding companies in the 1930s. While the amount of data that these state and federal regulatory bodies provided increased with the decades, the intent of the regulatory bodies' leadership and their insight on the problems they were dealing with became more opaque

CHAPTER 2

BUILDING MOMENTUM: THE ROAD TO CHARLESTOWN

We cannot measure the limits of future developments. We have seen much, but we have produced only a sample of what is to be. The central station men of this country do not realize the possibilities that lay before them.

- Marsden Perry

An independent observer contemplating the status of the electric power grid in southeastern New England in the spring of 1970 would have noted the pervasive reach of this technological system. The product of this advanced technology system was available to the vast majority of the population in the region. It powered the sinews of the economy as well as providing energy to improve the quality of life of the people through any number of electric appliances, heat to their residences, and lights to keep the darkness at bay. The system was professionally run by the public utility companies. The structure was well maintained and updated with new, more efficient means of power generation, transmission and distribution, and the sustained growth of the system seemed inevitable. Society and government were stable with biannual elections that helped reflect the population's desires and regulatory organs to monitor the public utilities' actions. The population seemed relatively content with the safety and reliability of the system as well as the cost required to tap into this energy source. The companies and organizations

running the electric power grid gave the impression of relative stability with a future path clearly envisioned by their leaders and managers.¹

This overlapping consensus was not to last locally or nationally. The turbulent 1970s was a period when the electric power grid under the control of the public utility companies came under great stress. Some of this strain was due to technological problems, some was due to poor management of the system and some was due to economic pressures outside the control of any of the people ostensibly controlling the electric power grid. An additional component of those forces was the rise of an environmental ethic in the population and the manner in which the political process in the nation would respond to this emerging concern. The net effect of all of these forces affected the electric power grid in different ways in different areas of the country based on the characteristics of the population, the ability of companies operating the grid to anticipate and to adapt to change, and the history of the grid's operation in the region. Each region was affected differently; all of them were altered in the process.²

While the history of the men and organizations that conceived of, built and operated the electric power grid is demonstrably not the same as the technical components that made up the grid itself, there is a strong correlation between the system and its human operators. Concurrently, there were numerous organizations that contributed to some segment of the electric power grid, but the most important actor in

1. Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999): 49.

2. Richard F. Hirsh and Adam H. Serchuk. "Momentum Shifts in the American Utility System: Catastrophic Change - Or No Change at All?" *Technology and Culture* 37, no. 2 (April 1996): 286-287.

this process was the organization that eventually evolved into the New England Electric System (NEES). The growth of this company and the parallel development of the electric power grid in southeastern New England provide ample data for the discourse between the competing theories of technological determinism and technological momentum.

Marsden Perry in Rhode Island

Following Thomas Edison's construction of the Pearl Street electric power station in New York City in 1882, this system of electric power generation, transmission and distribution rapidly spread to southeastern New England.³ Edison's seminal invention generated electric power using six coal-fired dynamos and transmitted DC electricity using copper wires to the nearby buildings in Manhattan to power their electric light bulbs.⁴ In April 1882, the first electric power system was sold to a business group in Fall River, Massachusetts where it powered the lights of several small businesses and facilities.⁵ A month later an electric power demonstration in Providence, RI, piqued the interest of experienced entrepreneur Marsden Perry. Perry, with familiarity in the manufacturing and banking industries, was sufficiently impressed by the exhibition to buy a controlling interest in the Fall River Electric Company. There he learned about the different issues affecting this new means of industry, the financing of the large capital

3. Vaclav Smil, *Creating the Twentieth Century* (New York: Oxford University Press, 2005), 35-36.

4. *Ibid.*, 53-60.

5. Samuel Insull, then an employee of Thomas Edison was behind the sale. See Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 8.

expenditures required for business growth, the technical requirements of plant operation and the necessary local political connections to speed the process.⁶

Other businesses were erected in Providence to compete in the wide open new market for electric power generation for mainly lighting applications. The Rhode Island Electric Company was established in 1882 under the direction of local business leadership while the Narragansett Electric Light Company was formed in 1883 from a merger of business interests from Maine and Massachusetts with a subsidiary of American Electric, a Boston, Massachusetts firm. The Narragansett Electric Lighting Company of Rhode Island, created under the leadership of Edward Goff, strung up new incandescent electric lights in the hallways and entrance of his Providence office building to attract public attention for this new technology. By April of 1884 Goff was able to edge out the Rhode Island Electric Company for the lucrative street lighting contract for the city of Providence and use the capital he had amassed to build a multi-generator power station. Following this Goff was willing to profit from his activity and sold the company to Perry and his backers.⁷

6. Not all of the lessons were positive ones. At one time the Fall River Electric Company was seized by the local authorities for the non-payment of debts. See Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 8-9.

7. Goff was a sales agent of the Thomson-Houston Company of Lynn, MA. This company built lighting facilities in New England using arc-lights technology. Goff was responsible for the company's expansion in Massachusetts and Rhode Island. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 14-16.

Perry's stewardship of Narragansett Electric Light Company in the 1880s was illustrative of the types of problems that all electric power companies were experiencing.⁸ Operators of the new technology were often ignorant of the methods to best run their plants or string the wires to the houses. Learning how to do it safely and efficiently required trial and sometimes costly errors even as the electrical companies were selling the product to compete with the older, more accepted technology of coal gas for home lighting.⁹ The utilities' generators created Direct Current (DC) electric power which limited the distance it could be transmitted to customers. Since much of the power requirement for Perry's generators only existed at night when the street lights were lighted, the electric power company's production was not matched by any need during the rest of the day. This resulted in the company having to overspend for generator capacity that was often unused.¹⁰ Capital requirements for the new generating capacity were significant, which required a close relationship between financiers and utility managers. As the company expanded and gained traction by providing a desired product

8. Boston Edison, a Massachusetts electric firm had similar problems involving the right of way for stringing power lines, matching load for large and small customers, determining how to charge the same, and the issues of turning off the power for delinquent accounts. See David B. Sicilia, "Selling Power: Marketing and Monopoly at Boston Edison, 1886-1929" (PhD dissertation, Brandeis University, 1991): 103-185.

9. David E. Nye, *Consuming Power: A Social History of American Energies* (Cambridge, MA: The MIT Press, 1998), 5-6.

10. Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 10.

to the city's population, political assistance to gain the necessary exclusive franchises to permit long term capital spending became more important.¹¹

Perry was assisted in the expansion of the Narragansett Electric Light Company in a number of ways. He acquired control of the company and rode the technological wave sweeping through the western world at the time, of which the technology of electric power generation, transmission and distribution was only one of many. Perry had excellent financial and political connections in the Rhode Island area. As one of the directors of the then minor Bank of America in Providence, Perry had access to the necessary capital for his new business. With this job Perry also gained important political connections in the Rhode Island government. Men like Rhode Island Senator Nelson "Boss" Aldrich, the head of the United States Senate's Finance Committee and the acknowledged "General Manager of the United States," Charles R. "Boss" Brayton, a former Union General from the Civil War and now head of the dominant Republican Party and patronage in the state, and Zechariah Chafee the ethically challenged president of Bank of America, were all helpful to Perry in navigating the political shoals of the state.¹² With such connections Perry was better poised to gain the additional financial backing and the political permits required to grow his business.

11. McLoughlin's work depends heavily on Falb's research for the business and technical items but incorporates some of the larger issues in Rhode Island political currents of the time. See William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970): 178.

12. Aldrich replaced former Union General Ambrose Burnside as the state's junior senator after Burnside's death in 1881. Brayton, a former Union Officer in the Civil War, had attained the rank of Brigadier General based on superior performance as the Commanding Officer of the 3rd Rhode Island Heavy Artillery and Chief of Artillery in

Competition in the early days of the Narragansett Electric Company against its Providence rival, the Rhode Island Electric Company, was severe. Perry's success against his competition was the result of several factors. He was an effective salesman, convincing more of the local businesses to install the new electric lights over the familiar gas lighting. As inventors began to tap the potential of the new energy source, other consumer electrical loads became feasible. Electric fans and traction motors to run the local trolley system were among the first new customers for Narragansett's output. This resulted in Narragansett Electric's sales doubling in the first few years of its existence. Perry installed greater numbers of electrical generators to cover this load growth, though the rapidly improving efficiency of the electrical technology allowed him to invest more money back into the company and still run a profit.¹³ Perry expanded the generating capacity at his first plant on Aborn Street in Providence repeatedly in the late 1880's only to build a new station at the junction of Elm and South Street in 1890. The latter coal-fired plant had the capacity of 10 megawatts (MW) of power generation, more than 20 times the previous total capacity of the entire company.¹⁴ As Narragansett Electric's

the Department of the South. Brayton's units were involved in the Union siege of Charleston, SC in 1863. See William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970): 148-168, and Frederic Denison, *Shot and Shell: The Third Rhode Island Heavy Artillery Regiment in the Rebellion, 1861-1865* (Providence, RI: J. A. & R. A. Reed, 1879).

13. Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 13-15.

14. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 17.

generating capacity expanded, Perry could use the economies of scale to offer discounts to the rates charged to his customers.¹⁵

Electricity use rapidly expanded into the Providence industrial areas, particularly the jewelry and textile manufacturing firms. These firms often had their own water mills or steam engines and turbines to generate electricity. This electricity was used to power the looms to make material or the machine tools that punched out and shaped the metal for buttons and or silverware.¹⁶ The generators also powered the foundries for melting the base metal for these products.¹⁷ Initially the cost of installing a new power source for lighting or machine motive force prevented the shift to electric lighting and power, but as more companies realized the benefits of the new technology, numerous independent electric generators were installed in the factories and mills. Incandescent electric lighting proved superior to both the electric arc lights and gas lighting in illumination and aroma and decreased the chance of fires as well. Electric motors were a more efficient way to power the individual machine tools and looms as the companies no longer had to install large water mills or steam turbines to drive the shafts and belts of the machines.¹⁸ Each

15. Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 15-16.

16. For example, the Rockland textile mill in Scituate, RI had a power capacity of approximately 100 kW. See Heritage Room Committee, *Scituate, Rhode Island* (London: Arcadia Publishing, 1998): 31-32.

17. Gary Kulik and Julia Bonham, *Rhode Island, An Inventory of Historic Engineering and Industrial Sites* (Washington, DC: Government Printing Office, 1978), 186.

18. Lisa Fink, *Providence Industrial Sites* (Providence, RI: Herald Press, 1981): 19.

of these plants had self-contained electrical systems and was powered by either water turbines or coal-fired steam plants. The dynamos generating the electricity were often run by Corliss Steam engines, themselves manufactured in Providence.¹⁹

The population viewed the new technology in a positive light. The *zeitgeist* was one of encouragement of the technological advances seemingly coming at breakneck speed. The electrical lighting of the streets followed by homes and then the electrification of various aspects of industry and transportation were seen first as exciting novelties but evolved into common day happenings.²⁰ The previous technologies of gas lighting, water power for industrial purposes or horse power for transportation had disadvantages that were disparaged by the new electric power's proponents to gain popular approval. The new electric power enabled a higher quality of living in a time where industrial activity was drawing a greater portion of the population into urban areas at a higher population density. Burning gas left an unpleasant smell and risked fire. Linking industry to geographic water fall locations constrained the locations of possible commercial activity as well as limited the water flow. Eliminating extensive equine wastes in the crowded cities could only have been seen as an aid to public health and sanity.²¹

19. Gary Kulik and Julia Bonham, *Rhode Island, An Inventory of Historic Engineering and Industrial Sites* (Washington, DC: Government Printing Office, 1978), 183-185.

20. David E. Nye, *Consuming Power: A Social History of American Energies* (Cambridge, MA: The MIT Press, 1998), 5, 57.

21. *Ibid.*, 86.

Narragansett Electric's expansion caused much of its competition to wither. In 1889 Perry was able to buy out the Rhode Island Electric Company and achieve a monopoly over electric generation, transmission and distribution in the city of Providence and rapidly throughout most of the state of Rhode Island. Perry followed this up by purchasing other utility companies with electric franchise rights across the area, making the Narragansett Electric Company the dominant player in the electric power business.²² With strong support of the new technology from industry and individual consumers, and with Perry's high level political and financial contacts, local Rhode Island governments were reticent to disrupt Perry's expanding monopolies. The local electric companies created natural monopolies as they built their generating plants, strung the transmission lines and even wired homes and businesses for lighting. The presence of one company tended to diminish the efforts of others to compete in the same area as the initial capital investments for generating plants and transmission lines were so large as to discourage encroachment. Municipalities would often sell the exclusive rights for electricity sales to particular businesses and organizations.²³ The length of these exclusive rights allowed the new electricity companies to amortize the cost of expensive equipment and regressively plan in order to make a profit. Shorter leases induced additional uncertainty

22. Perry's utility monopolies in electricity and water as well as the Providence streetcar lines served over 70% of the population of the state by the turn of the century. See William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970): 178.

23. Perry's acquisition of the East Greenwich Electric Light Company and the Bristol County Gas and Electric Company in 1895, and then the East Providence Water Company in 1896 earned him the franchise to sell electricity in those areas of the state. See Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 14.

in the management of the companies, increasing the perceived risk and thus reducing desires to expand. Buying up the local companies and more importantly their exclusive franchises allowed Perry's firm to achieve domination over larger areas of the state.²⁴

Given the technical problems with the initial electric power grids, the possibility of any one business gaining too large a share of the overall market in a given area was still low, minimizing the potential danger of an all powerful monopoly for electric power. The initial transmission range of the DC electricity was limited to a few miles from the generating plant as transmission losses became exorbitant. The different power plants had a wide range of output voltages that were usually incompatible with one another. The generators themselves were small and inefficient. The Edison electrical system worked well for shorter ranged loads but could not offer coverage over a wider area.²⁵

These limitations were transcended by a number of technological innovations in the late 1890s. George Westinghouse demonstrated the superiority of Alternating Current (AC) as a more efficient means to transmit electric power over longer distances. Westinghouse's research also led to the development of vastly improved electric transformers which permitted the output voltage of AC generators to be greatly increased at the power plants. The higher output voltage dramatically reduced the transmission losses in the lines between the generators and the customers, where another transformer

24. In other states, the government was the leading force in the electrification of the area, with the local electrical generation and transmission directed by elected officials and town bureaucracy, often more efficiently than private entrepreneurs. See Richard Rudolph and Scott Ridley, *Power Struggle, The Hundred-Year War over Electricity* (New York: Harper & Row, Publishers, 1986): 31-32.

25. Vaclav Smil, *Creating the Twentieth Century* (New York: Oxford University Press, 2005), 61-62.

would reduce the voltage to the lower levels used by the consumer. Concurrently, using new steam turbine technology to power the electric generators demonstrated a significant increase in efficiency, allowing more electric energy to be produced from a smaller amount of coal fuel.²⁶ The increased standardization of the industry also led to agreed upon technical requirements for the components being built. The common frequency of 60 Hz that is the standard today in the United States is the result of Westinghouse's work.²⁷

These features created the conditions for the electric power companies to expand their range of service, but they were not inexpensive. Investors were not keen to loan the fledgling electric companies the capital required for expansion and increased efficiency unless the companies could procure long term exclusive franchises. Perry attempted to procure these in Providence but was stymied by the resistance of the Providence City Council in 1890. Enlisting the assistance of the Providence Gas Company and the Union Railroad, Perry induced the Rhode Island General Assembly to pass legislature permitting state municipalities to grant companies franchises for terms up to twenty five years. Unfortunately for Perry, the Providence City Council failed to take advantage of this new ordinance with either the electric company or the railroad. Rebuffed, the state legislature went over the heads of the local government and passed a new law in 1892 granting twenty year franchises to both the railroad and Perry's electric company, though

26. Ibid., 62-74.

27. The 120 Volt standard was a function of Edison's initial plant in New York City. See Vaclav Smil, *Creating the Twentieth Century* (New York: Oxford University Press, 2005), 97, and Thomas P. Hughes, *Networks of Power* (Baltimore, MD: The Johns Hopkins University Press, 1983), 127-128.

taxing Perry's business at three percent of his net income.²⁸ Perry later bought the Union Railroad to acquire its franchise as well as other local railroad franchises to establish complete control of the Providence horse-propelled trolley cart transportation network. As Perry gained control of the trolley companies, he accelerated their purchases of electric motor traction cars that required electric power to run, ensuring an increased demand for his electric power plants. Producing greater amounts of electric power to meet this demand required even larger electric generators which were very expensive. Senator Aldrich, a leader of the U.S. Senate's Finance Committee, had numerous acquaintances that were willing to loan Perry the required capital. Meanwhile "Boss" Brayton greased the skids for the trolley companies by promoting favorable legislation that prevented local governments from resisting Perry's acquisitions. Perry's holdings and wealth increased dramatically, Aldrich profited from his association with Perry and the power of Brayton over the legislature was strengthened.²⁹

28. While a twenty year franchise may seem excessive, a similar franchise provided to the Newport and Providence Ry. Company, established in 1902, allowed the company to "do electric lighting in Newport" under a "perpetual" charter. Bond agencies would often trumpet the returns of 6-7% for Narragansett Electric a decade later, so a 3% tax seems reasonable. See Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 17, *Poor's Manual of Public Utilities: Street Railway, Gas, Electric, Water, Power, Telephone and Telegraph Companies* (New York: Poor's Manual Company, 1918): 148, and "Public Utilities Summary," *United States Investor*, XXVII, no. 9 (February 26, 1916): 367.

29. Falb's account would make an excellent moral tale of wealth, greed and power, all the more amazing as it was true. Aldrich received "stock options, loans and other business opportunities" from his political allies. See Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 16-32, and Patrick T. Conley, "Nelson W. Aldrich" in *Rhode Island in Rhetoric and Reflection* (East Providence, RI: Rhode Island Publications Society, 2002): 411-412.

Other Rhode Island electric companies followed similar lines of effort in establishing their own local monopolies. In Pawtucket, the Bridge Mill Power Company obtained franchises from the City Council and state legislature to run power lines. The company also supplied electric power to the railroad running between Pawtucket and Attleboro, Massachusetts. In May 1893, the Bridge Mill Power Company merged with the local gas company to ensure that any competition was internal to the company. The Bridge Mill Power Company's main generation plant in Pawtucket, built in 1893, used both water and steam power to generate electricity for its customers. The plant generated a full 750 kilowatts (kW), a fairly large capacity for the time, and included six of the new generators made by the General Electric Corporation.³⁰

Business interactions with Narragansett Electric expanded beyond those with its immediate customers. Other organizations noted the opportunities the electric power company presented and took advantage of them. Local businesses altered their production to provide the materials Narragansett Electric required. The American Electric Company, a Providence-based company that made wire and conductors for the equally cutting edge telephone technology, also made insulated cables for Narragansett Electric and the other electric power companies. The company was established in 1870 when the owner, Eugene F. Phillips, began making wire for the telegraph companies. By 1880, Phillips had built a factory in Providence but the demand for wire exceeded production, so in 1893 he built a larger one on the Seekonk River. The expanding

30. "The Bridge Mill Power Plant of the Pawtucket, R.I., Electric Co.," *The Electrical Engineer*, December 23, 1896: 637-641.

company provided jobs for so many of the local inhabitants of the area that they named the new neighborhood Phillipdale after the company's owner.³¹

Overall the Providence region appeared particularly well suited for rapid electrification. The efforts were spearheaded by Perry who continued to leverage his business acumen and insight on the possibilities of the new technology with his strong ties to the financial communities and political powers of the state.³² Northern Rhode Island was fairly compact and within reach of the limited electric power transmission range of the day. The industries of the area were receptive to the new energy source and relatively easy to power with the new electric motors.³³ Many of the industries already had a source of motive power, whether water mill or steam engine, to turn a new electric dynamo and electrify their own buildings. Electrification of the trolley system for the short runs to and from Providence was achievable given the technical limits of both trolley motors and transmission lines. Having the largest monopoly for electric power transmission in the area, Perry could set technical standards that permitted easier installation and repair of the new energy source for industry and household use. With the Elm Street plant in operation, the coal to run the steam engines could be easily brought to

31. "Obituary, Eugene F. Phillips," *Western Electrician*, March 4, 1905, 173.

32. Lisa Fink, *Providence Industrial Sites* (Providence, RI: Herald Press, 1981): 19.

33. Mumford estimated that introducing electric motors to factory production increased the efficiency of the site performance by fifty percent. See Lewis Mumford, *Technics and Civilization*, (New York: Harcourt, Brace & World, 1934, 1963), 224-225.

the plant from the Providence waterfront.³⁴ Technological, business, financial and political systems were all synchronized to propel the area into the twentieth century.³⁵

Yet Perry's expanding electrical empire also generated resistance in the community. Rhode Island residents were justifiably apprehensive about the monopolies that his companies had been awarded, even if they were doing a good job at providing the power, water and transportation required for an increasing urban population. In an effort to rationalize the Providence trolley routes and stations, Perry shut down some of the older stops that had few customers even while building a new central station at Westminster and Dorrance Streets. The resulting friction over issuing transfer tickets to displaced commuters required the intervention by the Rhode Island General Assembly in 1902.³⁶ A bitter strike by unionized railroad workers for higher wages broke out later in the year requiring the governor to call out the state militia to restore order and service

34. In some ways the increased electrification of lighting in Providence slowed this progress. The city's lights made it more difficult for the coal ships to approach Providence at night as the background lighting obscured other navigation aids. To mitigate this problem new lighthouses were built, though curiously enough they were not powered by electricity. In fact Conimicut lighthouse in Warwick used a kerosene lit illumination until 1960. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 250, and Lisa C. Fink, *Providence Industrial Sites* (Providence, RI: Herald Press, 1981): 244.

35. It is often difficult to make a distinction between the state government, the financial levers of power, and the electrical utility companies as the people occupying the leadership positions of many of the organizations were the same ones.

36. Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 26.

after the police were unable to quell the disorder.³⁷ Perry helped break the strike but won no friends amongst the Providence patrician class or the workers and middle class of the capital city who had supported the strikers.

Further actions by Perry to buttress his firms' monopoly led to internecine political strife within the Rhode Island Republican Party. The Democrats had used the popularity of the railroad strike to win the governorship in the fall of 1902 and the new governor attacked "Boss" Brayton's machine and control of the state government. Even worse, the newspapers began to examine how Brayton exercised the levers of power in the state, including the so called "Brayton's Law," which allowed the state Senate to substitute their own nominee for a patronage position if they found the governor's appointment lacking. With the Senate under Brayton's control, this was often the case.³⁸ Under constant attack in the *Providence Journal*, Brayton's machine, buttressed by the cash advances from Perry and Senator Aldrich, was insufficient to stave off another Democratic victory in 1903.³⁹ Somewhat apprehensive that Brayton had lost control of his political machine, Perry set up his own political structure by buying up the loyalty of the ward committees in Providence and Pawtucket with a generous application of charm

37. Six companies of infantry, two of cavalry, Naval Reserves and a machine gun battery from Newport were ordered to establish martial law in Pawtucket to stop the rioting. They failed. Luckily saner minds prevailed and the violence slowly subsided. See Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 39-43.

38. Duane Lockard, *New England State Politics* (Princeton, NJ: Princeton University Press, 1959): 175.

39. Terms for the Rhode Island Governor lasted only one year until 1912 when they went to two years. See Duane Lockard, *New England State Politics* (Princeton, NJ: Princeton University Press, 1959): 175.

and money. Under Perry's guidance, the Republicans swept to victory in the 1904 and 1905 elections.⁴⁰

Brayton, though ill, recovered sufficiently to mortally wound Perry's political plan. Brayton's southern Rhode Island organization allied with the reform minded "Lincoln" Republicans in Providence and Democrats to swing the governorship back to the Democrats in 1906. This faction was less interested in protecting the utility monopolies that Perry desired, but more in regaining the power they had lost previously to the upstart Perry. The Democratic governor James E. Higgins won reelection in 1907 even as Perry's business regime was crumbling. As part of the financial panic of 1907, banking giant J. P. Morgan spread rumors that Perry's numerous railroad and banking businesses were undercapitalized. Subsequent runs on Perry's banks forced him to sell off most of his holdings, including the Narragansett Electric Company, to Morgan.⁴¹ While hardly penurious, Perry's influence as a political deal maker in Rhode Island, as well as the guiding force for the new electric power technology, was finished.⁴²

40. Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 45-47.

41. Robert F. Falb, "Marsden Perry, The Man Who Owned Rhode Island" (Honors thesis, Brown University, 1964), 55-58 and 66-69 as well as William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970), 181.

42. Both Falb and McLoughlin describe Perry's fall as one of financial overreach as well as political reaction from the patrician class in Providence with a strong assist from political treachery from Brayton. Perry had to content himself with collecting manuscripts and his considerable philanthropy, segments which can still be seen throughout the state. The extensive book collection in the U.S. Naval War College's Mahan Reading Room is from a donation of the Marsden Perry Library.

Harriman and Chase in the Connecticut River Valley

Other electric power generation firms noted the opportunity that arose from Perry's downfall. In 1906, Malcolm G. Chase, the progeny of a Providence, RI family that owned a textile mill, and Henry I. Harriman, a textile mill manager and machinery inventor from Taunton, Massachusetts, formed Chace & Harriman, Inc. of Maine to develop hydroelectric power plants. Abandoning their first area of interest in North Carolina, the developers shifted back to New England, where they found a suitable site to build a hydroelectric station at Vernon, Vermont, on the Connecticut River. The local business ventures had failed to find the financial backing to build the electric generation station, resources that Harriman and Chase had greater access to. By promising to provide a portion of the generated electric power to the local industry, Harriman and Chase received the vital state licenses to build the plant.⁴³ The two men had larger designs than just the local industry, however. They believed that the site was strategic for transmitting electric power to the central Massachusetts factories in faraway Worcester and Marlborough, a goal that the technical experts of the day had advised against.⁴⁴

43. The machinations of Harriman and Chase to find the most lucrative permutation of state licensing for the company headquarters, local geography to build the hydroelectric station, and local easement agreements to run transmission lines defies simplification. Deerfield was to receive a maximum of 12,000,000 kw-hrs as part of the agreement, a not inconsiderable amount for the first decade of the century. See Senate, *Utility Corporations, Letter from the Chairman of the Federal Trade Commission Transmitting, in Response to Senate Resolution no. 83, a Monthly Report on the Electric Power and Gas Utilities Inquiry, Nos. 31 and 32, New England Power Association, 70th Cong., 1st sess., 1931, S. Doc 92, pt. 31 and 32: 72.*

44. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 27-31.

Forming the Connecticut River Power Company in 1907, Harriman and Chase had to overcome technological, business, financial and political hurdles that covered the breadth from the local actors to those at national level to bring their vision to fruition. Financially, the bankers backing their efforts had to be cajoled with numerous advantageous bond issues that promised a higher return on the investment if the firm prospered. These bond issues required the creation of subordinate holding companies in order to attract the required venture capital. As the New Hampshire state regulations were too restrictive, the two shopped around New England and formed a new corporation in Maine, the “Connecticut River Power Company of Maine,” to take advantage of that state’s more lax financial regimes. A Massachusetts holding company was also created as that state prohibited corporations from owning domestic utilities.⁴⁵ The new company envisioned the transmission of electric power across state lines to Massachusetts so the politicians of that state had to be persuaded to amend the current laws protecting in-state electric generating companies. Finally the farmland surrounding the proposed dam site in

45. In this era, a holding company was “A corporation formed for the express purpose of controlling other corporations by the ownership of a majority of their voting capital stock. In common usage, the term is applied to any corporation which does in fact control other corporations commonly referred as subsidiaries.” The often byzantine structure of these subordinate holding companies is described as “complex” by its successor, National Grid USA. Attempting to follow the myriad mergers, business buyouts and stock sales conducted in the early years of the firm is a challenge. See William E. Mosher and Finla G. Crawford, *Public Utilities Regulation*, (New York: Harper and Brothers, 1933): 322, National Grid “National Grid History,” National Grid, <http://www.fundinguniverse.com/company-histories/national-grid-usa-history> (accessed January 6, 2014), and Senate, *Utility Corporations, Letter from the Chairman of the Federal Trade Commission Transmitting, in Response to Senate Resolution no. 83, a Monthly Report on the Electric Power and Gas Utilities Inquiry, Nos. 31 and 32, New England Power Association, 70th Cong., 1st sess., 1931, S. Doc 92, pt. 31 and 32: 67-130.*

Vernon, Vermont had to be purchased before construction could begin.⁴⁶ The dam and water turbines were designed to produce 16 MW, larger than most of the era's hydroelectric plants.⁴⁷ Using the maturing transformer technology, the plant was able to step up its output voltage to 66,000 Volts (V) and transmit the energy to a distance of 66 miles.⁴⁸ It is a measure of the people involved that this project, conceived of in 1907, was completed in slightly over two years.⁴⁹ Prowess in any single element of this problem would not have been sufficient to achieve success. Harriman and Chace had to excel in all of them to achieve their goals.

While the initial startup of the new power station had some problems, within a year industry requirements within range of the plant as well as residential lighting demands were outstripping the station's capacity. The strain on the system became more pronounced during the summer months when the river flow rate decreased, lowering the available energy production. Harriman identified a number of suitable locations on the nearby Deerfield River to build new hydroelectric stations, but desired a better method to control the water flow on the river to manage the output of any new plants. The solution

46. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 31-34.

47. John L. Ragonese, "Hydro Hall of Fame: Upgrading Vernon for Another Century," Renewable Energy World.com, last modified November 13, 2009, <http://www.renewableenergyworld.com/rea/news/article/2009/11/hydro-hall-of-fame-upgrading-vernon-for-another-century>.

48. Robert Duncan Coombs, *Pole and Tower Lines for Electric Power Transmission* (New York: McGraw-Hill, 1916), 134.

49. Chas. R. Cummings, "Power Development in Windham County," *The Vermonter*, August-September 1912, 621.

to this problem was to build a large reservoir on the Deerfield River upstream of the possible sites. Varying the flow rate from the reservoir would permit a constant electric power output from the downstream power plants as well as mitigating the risk of flooding to the towns along the river banks.⁵⁰

Construction of the next series of four hydroelectric power plants and reservoir dam on the Deerfield River was conducted in parallel. Harriman and Chace leveraged the experience they had gained from the Vernon construction at the Deerfield sites to standardize equipment and assembly procedures. Buying the land took some time. This location, however, did not require the displacement of any human inhabitants when filling the dam's reservoir, an area that covered two thousand acres. The dislocation of other activities was not an issue either:

No farms are despoiled. It is a good fishing and hunting region. . . Logging has been going on extensively for years along the streams and spurs of the railway. Spruce logs are now being taken from the waters of the newly formed lake, down the railway to great mills at Wilmington that can handle them. The company will log the valley for hard wood for the next twenty five years.⁵¹

As well as building the new stations, Harriman and Chace extended the high voltage transmission lines network from Vernon, VT to Worcester, MA using a new route

50. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 38-39.

51. Chas. R. Cummings, "Power Development in Windham County," *The Vermonter*, August-September 1912, 624-625.

through Shelburne, MA. This supplementary pathway provided a backup power supply to ensure “continuity of service” in the event of any transmission lines failure.⁵²

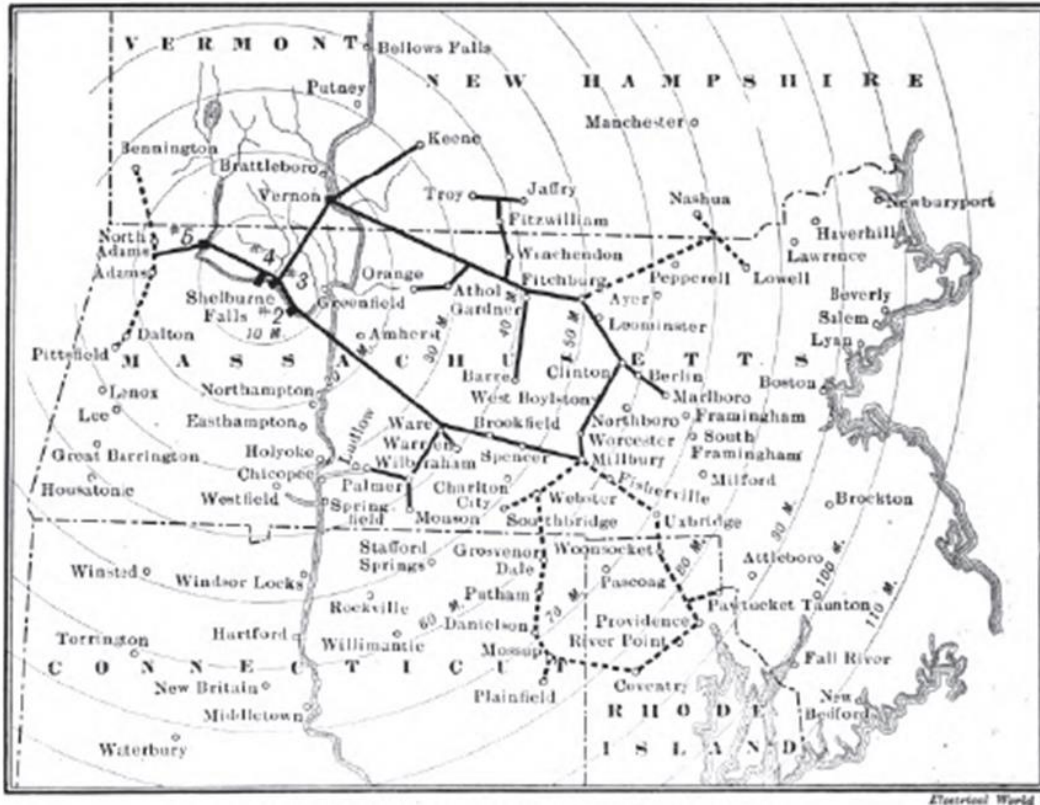


Figure 2. The Extension Of The Connecticut River Power Company’s Transmission Lines Throughout The State Of Massachusetts And Rhode Island. “An Important New England Transmission System,” *Electrical World*, 28 December 1912, 1366.

These new power lines extended the range of Harriman and Chace’s electrical transmission as well as their appetite for further expansion. Increasing the line voltage to 120,000 V allowed them to further lengthen their transmission and connect into the

52. “An Important New England Transmission System,” *Electrical World*, 28 December 1912, 1365.

Rhode Island electric power network.⁵³ The two developers eyed the expanding markets of Rhode Island and attempted to move into the territory that the Narragansett Electric Lighting Company operated with an exclusive franchise. While the Narragansett Electric Lighting had received a twenty year exclusive franchise to deliver electric power to the Providence area in 1892, the forthcoming expiration of this franchise was noted. Harriman and Chace created a new local utility company in 1912, the “Rhode Island Power Transmission Company” to compete with Narragansett Electric in the Rhode Island capital, promising less expensive power to future customers. Narragansett Electric opposed this encroachment, suggesting that the interlopers would be unable to meet their promises due to uneven river flow rates. Both companies suggested that their adversary’s proposed method to acquire financial backing for future projects would result in higher future costs to the customers.⁵⁴ The competition ended up in the Providence city government, where the city’s Common Council voted to extend Narragansett Electric’s franchise, but for only five years for lighting, heating and power supply, and ten years for street lighting.⁵⁵ On the other hand, the Rhode Island Power Transmission Company was permitted to trade wholesale electric power in the state. Narragansett Electric would buy power from the Rhode Island Power Transmission company during large load periods when the company’s steam plants could not meet the demand, and sell power back when

53. Ibid.

54. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 48-49.

55. “Construction,” *Electrical World*, 17 August 1912, 382.

the other company had similar excessive demands. The new Rhode Island Public Utility Commission, established in 1912, would monitor the transactions.⁵⁶

This confluence of the two companies marks an important event in the establishment of the electric power grid in southeastern New England. Each firm could benefit from the other's strengths in providing electric power to their customers. Both companies were pressing to take advantage of the opportunities that new advances in electric power generation and transmission allowed. The Connecticut River Power Company was proficient in the use of hydropower to generate electricity and had gained experience in the long range transmission of power. Narragansett Electric had a more stable supply of electricity in its steam powered plants powered by coal delivered by sea. Both companies were expansion-minded, willing to absorb smaller entities in their quest for market share and higher profits. For example, Narragansett Electric acquired a majority share of the Westerly Light & Power Company in 1916, making it the monopoly holder for electric lighting from Providence to the southeastern corner of Connecticut.⁵⁷ Similarly, Harriman and Chace had acquired a canal company on the Connecticut River and reorganized it as the Bellows Falls Power Company. This company almost immediately became involved in a lawsuit with the Fall Mountain Paper Mill, a subsidiary of the International Paper Company, over water rights on the canal. An armistice was achieved in 1918 between the two companies under the condition that the

56. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 49.

57. "Public Utilities Summary," *United States Investor*, XXVII, no. 25 (June 16, 1916): 55.

Bellows Falls Power Company would expand the disputed canal size to increase the total water flow to both parties. This the electric company did, eventually increasing the canal flow rate by a factor of four and building a 45 MW hydroelectric station to take advantage of this.⁵⁸ Finally, both Narragansett Electric and the Connecticut Power Company were willing and able to use creative financial streams in order to attain the capital required for their large scale projects.⁵⁹

While the competing firms were not electrically connected until 1916, both companies' methods and values continued to operate in synchronization as America entered the First World War the next year.⁶⁰ The onset of the war forced industries to shift to production to assist the expanding American military. Since American involvement in the war was for only a short duration, industry had to react rapidly to meet the new requirements. During the war the price of coal rose rapidly, straining the electrical generating companies as they provided electric power for wartime production. The electric companies did achieve greater interconnectivity during this period as they

58. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 59-60.

59. Both companies also benefited from close ties with the banking industry. Both Perry and Chace served as directors of banking firms, relationships that proved profitable in more ways than one. See William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970), 148-168, and Senate, *Utility Corporations, Letter from the Chairman of the Federal Trade Commission Transmitting, in Response to Senate Resolution no. 83, a Monthly Report on the Electric Power and Gas Utilities Inquiry, Nos. 31 and 32, New England Power Association, 70th Cong., 1st sess., 1931, S. Doc 92, pt. 31 and 32: 67-130.*

60. "Load Dispatching by New England Power Company," *Electrical World*, 14 October 1916, 754-757.

attempted to match power requirements with available capacity.⁶¹ The Rhode Island Power Transmission Company arranged to connect its transmission lines with the Fall River Electric Light Company and the Blackstone Valley Gas and Electric Company to match its arrangements with the Providence firm.⁶²

Narragansett Electric performed well in the years after the war despite the increasing decline of Providence industry in the first decades of the twentieth century. The textile industry in the area had been affected by increased competition from the Southern states with their cheaper labor costs, smaller distances from the cotton field to the newer factories, and fast flowing capital from the North.⁶³ Electric power for lighting and household use, by no means universal in the city let alone the rest of the state, was considered a highly desirable item and the local utility and retailers worked to meet the demand. The Rhode Island Electrical League was established in 1921 to promote the general welfare of its members, make the electrical industry available to the public and provide for the common improvement of the industry.⁶⁴ Composed of both

61. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 54-56.

62. *Ibid.*, 49.

63. While uniform orders for the Great War did help the textile businesses, postwar contraction wiped out any gains. The jewelry industry did better as the industry responded more rapidly to the changing environment, producing products desired by population. Cigarette lighter production increased as cigarette smoking doubled in the country. See Lisa C. Fink, *Providence Industrial Sites* (Providence, RI: Herald Press, 1981): 28-29.

64. "Rhode Island League States its Purpose," *Electrical Merchandising* 25, no. (6 June 1921): 336-337.

manufacturers and retailers of electrical goods and services, the Electrical League conducted Providence's first electrical show in 1922, demonstrating the latest appliances and radio communications equipment.⁶⁵ Narragansett Electric leveraged this and other groups to sell greater numbers of electric appliances and electric services, improving their profit and electrical load balance.⁶⁶ The company was active in increasing its customer base, standardizing service to homes, and erecting utility poles in the city.⁶⁷

Narragansett Electric appeared to follow the strategy of "Grow and Build" as postulated by Samuel Insull, a former employee of Thomas Edison and now an electrical business empire builder of his own right. In Chicago, Insull had demonstrated that the electric utilities could spend immense amounts of money to build new generating stations yet still be able to lower the resultant cost of power to the customers. This balancing act required gaining a wide array of customers that used power at different times during the day. Since most of the electricity usage occurred at night when people turned their lights on, Insull sought manufacturing firms with large power requirements that operated during the day to balance the overall load in any daily schedule. Spreading out the total electric load over a twenty four hour period negated the necessity for the utilities to buy

65. *Electrical Merchandising* 27, no. 4 (April 1922): 101.

66. Narragansett's direct marketing of electric appliances to its customers and assistance to retailers resulted in sales of \$ 569,000 in 1922, including 4,284 irons, 4,768 lamps, 2,214 vacuum cleaners, 464 washers and 52 electric stoves. In November the company offered a \$3 discount on any new vacuum cleaner if the prospective customer brought in a broom or carpet sweeper to sweeten the deal, leading to \$66,572 in new sales. See Arthur S. Lisle, "Merchandising Policies and Results in Providence," *Electrical World* 82, no 19 (10 November 1923): 975-976.

67. "What Other Companies are Doing," *Electrical World* 82, no. 24 (15 December 1932): 1230.

expensive generating equipment that could meet the peak loads at any one time of the day, but would remain essentially idle at other times. Since the machinery was producing power and profit throughout the day, the utility could actually provide power at a lower rate than before.⁶⁸

In Chicago, Insull had benefited from the advancing technology in electric power generation as manufacturers could build newer turbine generators that were larger in capacity, more efficient, required less space to operate, and produced less pollution.⁶⁹ Such growth could also be used to strangle any competition from manufacturers with their own electric generating capacity. Insull proposed that expanding efficiencies and capacity would force such competitors to shut down their own power plants and take advantage of the electric utilities' lower power costs. This would then lead to greater profits for the utility, allowing them to expend greater amounts of capital for more powerful and efficient equipment, but still driving down the marginal cost of power for customers who would then increase their demand, thus completing the virtuous circle.

68. The balanced load between manufacturing and household demands over the day was known as the “diversity factor.” Attaining such quantifiable measure of effectiveness became an early goal of the electrical power industry. See Richard F. Hirsh, *Technology and Transformation in the American Electric Utility Industry* (1989. Reprint, Cambridge, UK: Cambridge University Press, 2002), 17-19.

69. Harold L. Pratt, *The Electric City, Energy and the Growth of the Chicago Area, 1880-1930* (Chicago, IL and London: The University of Chicago Press, 1991), 113-115.

This positive feedback to the system would allow the system to persistently grow, generating momentum for the electric power grid.⁷⁰

Still, Insull recognized that the monopolistic tendencies of such a system had some drawbacks, at least in the court of popular opinion. As early as 1898 Insull had proposed that the electric utility companies negotiate with the state governments. The utilities would trade off public oversight of their business by local regulatory bodies for the natural monopoly of electric power generation, transmission and distribution that was already being constructed.⁷¹ Electric utility regulation had already started in Rhode Island as the city and town governments had granted exclusive franchises to local electric power companies. State regulation did not begin in Rhode Island until 1912, though Massachusetts had established a state regulatory body for all public utilities back in 1887. Many states looked at this new supervisory activity as similar to that of railroad regulation. Since it was common for the local city traction companies to be electrically powered, this may have not been a bad idea of applying one regulatory methodology for a new technology.⁷² Rhode Island's Public Utilities Commission followed this model and occupied the same facilities as the previous Railroad Commission. The body focused on

70. Richard F. Hirsh, *Technology and Transformation in the American Electric Utility Industry* (1989. Reprint, Cambridge, UK: Cambridge University Press, 2002), 19-21.

71. *Ibid.*, 22.

72. Werner Troesken, "Regime Change and Corruption, A History of Public Utility Regulation," in *Corruption and Reform: Lessons from America's Economic History*, ed. Edward L. Glaeser and Claudia Goldin (Chicago, IL and London: University of Chicago Press, 2006), 260-262.

railroad regulation with only peripheral interest in the new electric utilities.⁷³

Narragansett Electric, like the other state electric utilities, worked well with the Rhode Island Public Utility Commission which was supportive of the utility's desires.⁷⁴

Nationally, the government had also begun to assert its authority over the regulation of the electric utility companies. In 1920, Congress passed the Federal Power Act to regulate the development of hydroelectric power on navigable waters of the United States. Conservationists such as Gifford Pinchot had promoted such legislation, reasoning that the government should not give away valuable hydroelectric sites to the electric utilities.⁷⁵ The act created a Federal Power Commission under the authorities of the Secretaries of War, the Interior and Agriculture. The Commission had the authority to investigate and collect information regarding the use of water resources in an area and whether suitable sites could be exploited for the generation of electric power. The Commission could issue licenses for up to fifty years to organizations desirous of exploiting these locations in return for royalties.⁷⁶ While the statute initially allowed the

73. State of Rhode Island and Providence Plantation, *Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1912* (Providence, RI: E. L. Freeman Company, 1913): 5-8.

74. The state's Public Utilities Commission approved most of the electric companies' requests with little apparent scrutiny. The railroads and gas companies garnered much closer examination. See State of Rhode Island and Providence Plantation, *Tenth Annual Report of the Public Utilities Commission of the State of Rhode Island* (Providence, RI: The Oxford Press, 1922).

75. Betsy Vencill, "The Federal Power Act and Western Water Law-Can States Maintain Their Own Water Use Priorities?" *Natural Resources Journal* 27 (Winter 1987): 214.

76. *Federal Water Power Act*, Public Law 280, 66th Cong., 2d sess. (June 10, 1920), 262-269.

construction of dams in the National Parks, this authority was rescinded in 1921.⁷⁷ The commission, with staff members seconded from other departments which had divergent opinions on the importance of the organization and its objectives, was often overwhelmed with requests that were processed slowly. In the first decade of existence, the commission met infrequently for short periods.⁷⁸ The Commission also did not have the authority to regulate interstate electric power commerce, even if it had been more proactive.⁷⁹ In 1928, Congress provided the Commission its own staff with the ability to conduct formal hearings. The Commission was further altered by the Federal Power Act of 1930, which created a five member body with commissioners appointed by the President and confirmed by the Senate, however the initial commissioners were more interested in promoting the interests of the utilities than monitoring their operations.⁸⁰

At the end of the First World War, both the Narragansett Electric Lighting Company and the Connecticut River Power Company undertook projects to create large water reservoirs to assist with their power generation. Chace and Harriman had

77. Ibid., 266.

78. The average meeting lasted about a half an hour during the approximately eleven meetings per year. Even in the 1920s Federal interagency cooperation was a challenge. See Philip L. Cantelon, "The Regulatory Dilemma of the Federal Power Commission, 1920-1977," *Federal History* 4 (January 2012): 62-64.

79. Criticism of the Federal Power Commission may be harsh. They did assist in the construction of the Conowingo Dam on the Susquehanna River in Maryland in accordance with their authorities. Expecting this body to do more than what the organization had been designed to accomplish by Congress might be unrealistic. See Thomas P. Hughes, *Networks of Power* (1983. Reprint, Baltimore, MD: The Johns Hopkins University Press, 1993), 325-329.

80. Philip L. Cantelon, "The Regulatory Dilemma of the Federal Power Commission, 1920-1977," *Federal History* 4 (January 2012): 65.

investigated the creation of a larger reservoir on the Deerfield River at Somerset, VT to power a new hydroelectric station. They had started buying the land associated with this project in 1910 though actual construction of the dam to hold back the water did not begin until 1921.⁸¹ This flood area required the displacement of people living on four hundred farms.⁸² The reservoir filled the area of 2200 acres; Lake Harriman, as it came to be known, became the state's largest lake. When completed in 1924, the ten million dollar hydroelectric station coupled with the dam would produce 140 MW of power, more than the total generated by all of the other stations on the Deerfield River. Connected to the rest of the company's transmission lines with newer 110 thousand volts (kV) lines to Millbury, MA, the new power supply was barely sufficient to keep up with demand.⁸³ The dam also limited the damage caused by flooding on the Deerfield River in 1926 and 1933, which killed hundreds of people in other parts of Vermont.⁸⁴

In Rhode Island, the Narragansett Electric Company became involved in a similar project. In 1915 the Rhode Island legislature approved funding to create a new Water Supply Board. This body was authorized to construct a large reservoir to provide fresh water for the expanding Providence population. It took almost six years to acquire the

81. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 54-56.

82. Catherine Reid, River of Change, *Historic Deerfield*, Spring 2003.

83. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 59.

84. Catherine Reid, River of Change, *Historic Deerfield*, Spring 2003.

necessary land near the town of Scituate, let the construction contracts and actually begin construction of the dams and associated systems. The completed reservoir became Rhode Island's largest freshwater body; at approximately 3400 acres it was larger than Lake Harriman. This flood area also resulted in the condemnation of numerous populated areas. Five villages (Ashland, Kent, Richmond, Rockland and South Situate) were completely submerged by the reservoir's waters. Portions of five other villages around the new lake were affected.⁸⁵

The Narragansett Electric Company supplied electric power during the construction of the reservoir for lighting, sawmills, and pumping stations.⁸⁶ When the reservoir was completed, the Gate House Hydroelectric Station at the dam powered the pumps and purification plant for the fresh water being supplied to Providence. Excess energy was sold to the Narragansett Electric adding to the net power on Narragansett's transmission lines.⁸⁷

It is interesting to note just how little popular reaction there was against the construction of these reservoirs. In California, the proposal to use the land in the Hetch Hetchy valley on the Tuolumne River to build a water reservoir and hydroelectric power for the city of San Francisco resulted in a decade long conflict between the city's

85. Rhode Island Historic Preservation Commission, *Historic and Architectural resources of Scituate, Rhode Island: A Preliminary Report* (Providence, RI: Rhode Island Historical Preservation Commission, 1980): 17.

86. "What Other Companies are Doing," *Electrical World*, 20 October 1923, 821.

87. Rhode Island Historic Preservation Commission, *Historic and Architectural Resources of Scituate, Rhode Island: A Preliminary Report* (Providence, RI: Rhode Island Historical Preservation Commission, 1980): 60.

leadership and the nascent Sierra Club led by conservationist John Muir. That struggle pitted the desires of the local political leaders and the electric utility, Pacific Gas and Electric, for electric power against the desires of Muir to preserve the pristine wilderness and not submerge it for power and water. The cast of conservationists on both sides of the issue raised it to national prominence. It eventually took an act of Congress in 1913 to permit construction of the dam, the lobbyists for the city of San Francisco being more effective than the national outpouring to conserve the wilderness.⁸⁸ The resistance to either reservoir in New England was much more muted. Both New England projects required the displacement of hundreds of families, the cutting down of thousands of trees and even the destruction of entire villages.⁸⁹ Admittedly, having a nationally known and connected figure such as John Muir to advocate leaving Hetch Hetchy as wilderness was a benefit, but both Somerset and Scituate reservoirs were larger than the Californian counterpart. Aside from a long running lawsuit by the Joslin family, the majority of the

88. Roderick Nash's chapter in his seminal work, *Wilderness and the American Mind*, is particularly insightful of how the lobbyists in Washington were more persuasive than Muir's acolytes in convincing the Senators, many of whom had conservationist credentials, to permit the construction of the project. The Rhode Island Senators split their votes, with Senator Lebaron Colt (R) voting against giving the land to create the reservoir while Senator Henry Lippert (R) voted to do so. Others suggest that this project, as well as being poorly conceived by the San Francisco and California political leadership, was not well managed resulting in numerous cost and time overruns. Perhaps Hetch Hetchy was a bad idea poorly presented. See Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 161-181, Govtrack.us "Senate Votes #156 in 1913," Govtrack.us, <http://govtrack.us/congress/63-2/s156> (accessed January 13, 2014), and James Cogan, "Lessons From an Earlier California Boondoggle," *Wall Street Journal*, January 11-12, 2014.

89. Raymond A. Wolf, *The Lost Villages of Scituate* (Charlestown, SC: Arcadia Publishing, 2009), 86.

displaced people left with little resistance.⁹⁰ The population was satisfied that the “greater good” of the community had been achieved.⁹¹

Integration of the Systems

Even as Narragansett Electric Company and the Connecticut River Power Company were involved in their large scale reservoir projects, Harriman and Chase were exploiting their success to make further inroads into the Rhode Island area. The 1920s was a period of almost reflexive acquisition by their company, motivated by a need to diversify its electric power sources, expand its market share in the region, shore up its financial resources, and to prevent acquisition by other equally voracious firms. Not all of this action was to the company’s benefit, but the net result was a central unifying organization that would direct the electric power grid’s future direction in southeastern New England.

The sequence of events began shortly after the hydroelectric station at Lake Harriman came on line. Harriman and Chase had reorganized their company as the New England Company, now under state of Massachusetts licensing. The subsidiary companies, such as the Connecticut River Company, retained their operational

90. Others suggest that at least one family burned down their residence rather than meekly turn it over to the state while two other farmers committed suicide. See Rhode Island Historic Preservation Commission, *Historic and Architectural Resources of Scituate, Rhode Island: A Preliminary Report* (Providence, RI: Rhode Island Historical Preservation Commission, 1980), 17, and Robert L. Smith, “Scituate Reservoir: A Story of Sacrifice,” *Providence Journal*, March 29, 1999.

91. Catherine Reid, River of Change, *Historic Deerfield*, Spring 2003.

independence, but the New England Company controlled all of the voting stock.⁹² In the early 1920s while the International Paper Company was leveraging the Bellows Falls Power Company, a New England Company subsidiary, to expand the canal at Fall Mountain, the New England Company returned the favor, leveraging the greater assets of International Paper to fend off a potential hostile takeover by the brilliant electric power entrepreneur, Samuel Insull. Harriman and Chace became concerned that Insull could exploit a critical vulnerability in their business model. If Insull bought up the retail electric utility organizations that the New England Company sold power to, or at least attempted to, Harriman and Chace would be forced into a bidding war to retain their customers. With its own financial resources stretched, the New England Company would be vulnerable to a direct attack on its own independence and a competitor would be able to buy up its stock at bargain prices. With this threat in mind, Harriman and Chace negotiated with Archibald Graustein, the leader of International Paper, to stave off any aggression. Graustein was interested in a deal as both companies had similar interests in exploiting the energy from river flow and because the profitable hydroelectric industry could reduce the losses in the more variable paper industry.⁹³ The resultant deal in 1926 provided twenty million dollars to the New England Company, though International Paper became the majority owner of the merged assets of the company. The New

92. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 42-43.

93. Thomas Heinrich, "Product Diversification in the U.S. Pulp and Paper Industry: The Case of International Paper," *The Business History Review* 75, no. 3 (Autumn 2003): 481-483.

England company, having absorbed several other electric utility companies from the previous holdings of International Paper in the merger, was renamed the New England Power Association (NEPA) in 1926.⁹⁴

Meanwhile, flush with the twenty million dollars from the merger with International Paper, Harriman and Chace set out to protect NEPA's financial vulnerabilities. Still dreading that Insull would buy out their retail electric utility customers, they forestalled any hostile acquisitions by buying them out first. This would also allow NEPA to supplant its hydroelectric power stations with steam powered ones, providing greater reliability to the system as well as keeping out competitors.⁹⁵ NEPA first acquired the Grafton County Electric Light & Power Company in in Lebanon, NH. Since there were not any electric transmission lines connecting the utilities, the company was probably bought to gain entry into that state's electric power market.⁹⁶

Harriman and Chace were much more interested in the Narragansett Electric Lighting Company in Rhode Island, but this company was a more challenging acquisition. It was a more lucrative one as well, with a new 140 MW steam powered electric station in Providence. The Narragansett Electric Lighting Company had little debt and few bondholders. Already connected to NEPA's transmission lines,

94. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 66-67.

95. *Ibid.*, 62-63.

96. *Ibid.*, 73.

Narragansett Electric would provide a larger additional power supply and business income to support NEPA.⁹⁷

The acquisition of Narragansett Electric did have some disadvantages, not the least of which was the legal battles the firm was enmeshed in over the interstate sale of electricity. In 1917, the company had contracted with Attleboro Steam & Electric Company in Attleboro, MA to sell electric power over the next twenty years. In return for a constant cost for all of the electric power it required, the Attleboro company dismantled its own generating station. This contract was reviewed by the Rhode Island Public Utility Commission which authorized the special rate that Narragansett Electric was charging Attleboro. By 1924 this rate was no longer considered advantageous to Narragansett Electric, though Attleboro unsurprisingly thwarted any attempts to renegotiate the contract. Narragansett then petitioned the Rhode Island Public Utility Commission for a new cost schedule to be charged to Attleboro. The commission, after hearing arguments from both companies, sided with Narragansett, stating that the Rhode Island company could not make a fair return on its investments under the previous

97. *Ibid.*, 73-74.

contract.⁹⁸ The aforementioned agreement was “detrimental to the general public welfare” and the proposed rate increase was therefore reasonable.⁹⁹

The directors of the Attleboro Steam & Electric Company disagreed and appealed the decision, reaching the U.S. Supreme Court in 1926. The Attleboro Company proposed that the Rhode Island Commission held no authority to regulate the transmission of electricity across the state border as this was interstate commerce which fell under the purview of Federal regulation. Since there were no federal statutes on such commercial activity, the Rhode Island interference on this issue was in violation of the commerce clause of the United States Constitution. The Rhode Island Public Utility Commission objected, stating that such electricity sales were local in nature and should thus be subject to local regulation. The Supreme Court sided with the Attleboro Steam & Electric Company, stating that this sale was “not local to either state, but is essentially national in character. The rate is therefore not subject to regulation by either of the two states in the guise of protection to their respective local interests; but, if such regulation is

98. See State of Rhode Island and Providence Plantation, *Thirteenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1924* (Providence, RI: The Auto Press, 1925): 116-117, 127-128, 152, and State of Rhode Island and Providence Plantation, *Fourteenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1925* (Providence, RI: The Oxford Press, 1926): 71-94.

99. *Public Utilities Commission of Rhode Island et al. v. Attleboro Steam & Electric Co.*, 273 U.S. 83 (1927).

required it can only be attained by the exercise of the power vested in Congress.”¹⁰⁰ Left unresolved was whether Congress was willing to deal with this issue or when it would.¹⁰¹

Meanwhile NEPA was in the pursuit of Narragansett’s assets. A merger of the two companies appeared to be a sensible from the technological perspective. Both companies had strengths that moderated the weaknesses of the other. Electric power from NEPA was mostly generated by water flow, while Narragansett’s electric power was from coal-fired steam plants. When the river flow was low in the winter, the electric power from Providence could be sent to the hills of Massachusetts and Vermont. When the river flow was greater, the cheaper power could be sent south to Rhode Island. Connecting the two transmission systems would allow the merged organization to operate more efficiently and profitably. Providence’s industry and population would also act as an attractive revenue stream for the combined companies.

The leadership of the Narragansett Electric did not share NEPA’s views and desired to maintain control of the company within the state. Another Providence company was more intrigued by the possibilities; the United Electric Railways (UER) had excess capacity and was willing to deal. UER had been established in 1920 to take over the previous bankrupt Providence electric trolley company. Business had not been profitable so the leadership of the company began to look for outside sources of money. The company’s charter was not permissive in this respect; it prevented the company from

100. Ibid.

101. Even Gifford Pinchot thought this was an unfair exploitation of the monopoly power of the Narragansett Company that had to be paid for by the Rhode Island consumers. See Gifford Pinchot, *Power Monopoly, Its Makeup and Menace* (Milford, PA: 1928), 12-13.

increasing capital or selling excess electricity to outside entities. In March 1926, the Rhode Island Republican Party leader, Frederick S. Peck, convinced other state legislators to charter a new company, United Electric Power (UEP) that was not constrained in these venues.¹⁰² UEP was also allowed to buy and sell assets, a feature that might permit acquisition of Rhode Island's utility companies. Popular reaction and the leadership of Narragansett Electric were opposed to this new charter; however, the legislature passed it under the proviso that UEP would fall under the state's Public Utilities Commission. Control of UEP was also promised to stay within the state.¹⁰³

Mistrust of the UEP's motives was warranted. By midsummer assumptions of a merger between UER and Narragansett Electric under the auspices of UEP fueled stock sales of the two utility companies. NEPA leadership disclaimed any involvement in the stock sales or interest in the utilities, but International Paper's legal syndicate threw gasoline on the flames by setting up a new holding company, the Rhode Island Public Service (RIPS) company to acquire as much stock of Narragansett Electric as possible. The resultant struggle for control of the state's utility companies took most of the next six

102. UER's board of directors included both of Rhode Island's U.S. Senators, Peter G. Gerry (D) and Jesse H. Metcalf (R) which provided bipartisan cover. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 74.

103. The leader of the Republican Party, Frederick S. Peck, was also the sponsor of the 1922 Peck Act that required all instruction in RI private schools to be conducted in English, alienating the growing French Canadian immigrant population in Providence. Public mistrust of Peck may have arisen from this earlier transgression. See Patrick T. Conley, "Ethnic Politics in Rhode Island: The Case of Franco-Americans" in *Rhode Island in Rhetoric and Reflection* (East Providence, RI: Rhode Island Publications Society, 2002), 290-291, and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 74-75.

months to resolve, including influencing a gubernatorial election. Offers and counteroffers for UER's stock from both Narragansett Electric and RIPS resulted in UER falling in with RIPS. Both companies used the *Providence Journal* to proclaim their virtues and deprecate their adversary's vices. The deep pockets of International Paper were eventually decisive in convincing Narragansett Electric stockholders that a quick profit now was more important than maintaining state control and Narragansett's leadership submitted to International Paper's buyout terms in October 1926. By January of the next year, NEPA took a guiding position of RIPS, abrogating earlier promises of local electric utility autonomy.¹⁰⁴ All that was left was the post-unification activity of cleaning up the residue from the merger. UEP was rechristened as The Narragansett Electric Company to maintain brand continuity while acquiring the old Narragansett Electric Lighting Company's assets.¹⁰⁵ UER's Manchester Street power plant was sold to the newly minted company. Debts of the old companies were paid off through the issuance of stock in the new company. Everyone was happy, except the leadership of the old Narragansett Electric company.¹⁰⁶

104. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 75-78.

105. State of Rhode Island and Providence Plantation, *Sixteenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1927* (Providence, RI: Snow & Farnham Co, Inc., 1928): 218-228.

106. Not everyone was happy. Within months the Narragansett Electric management team had been sidelined. The Democrats did lose the gubernatorial election to the popular Republican Adam Pothier, though although they maintained the mayoralty in Providence. On the other hand, the Democrats did help set the necessary preconditions for future political success by highlighting the Republican's perfidy in dealing with the utility takeover. See Patrick T. Conley, "Ethnic Politics in Rhode Island: The Case of

Subsequent acquisitions cemented NEPA's position as the dominant electric utility in central New England. With International Paper & Power's assistance, NEPA established other holding companies that purchased the Lawrence Gas & Electric Company in Massachusetts as well as the Webster & Southbridge Gas & Electric in eastern Connecticut. Smaller Massachusetts electric companies in Seekonk, Lowell, New Salem, Fall River, Gardner, Attleboro fell under the NEPA orbit by the end of the 1920's while Rhode Island's East Greenwich Electric and South County Public Service joined Connecticut's Mystic Power as NEPA purchases.¹⁰⁷ Worcester Electric Light was one of NEPA's final objectives as the decade ended, but this objective was a contested one as Insull was willing to compete. The deeper pockets of International Paper & Power again won out and Worcester joined the NEPA family of firms.¹⁰⁸ Other retail electric utility

Franco-Americans” in *Rhode Island in Rhetoric and Reflection* (East Providence, RI: Rhode Island Publications Society, 2002), 290-291, John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 75-78, State of Rhode Island and Providence Plantation, *Sixteenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1927* (Providence, RI: Snow & Farnham Co, Inc., 1928): 218-228, and State of Rhode Island and Providence Plantation, *Seventeenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1928* (Providence, RI: The Oxford Press, 1929): 223-225, 248-252.

107. This presumably resolved the rate dispute between Narragansett Electric and Attleboro Steam & Electric as federal regulation had not yet been instituted and would not be until 1935. See Jeffrey C. Dennis, “Federalism, Electric Industry Restructuring, and the Dormant Commerce Clause: Tamps Electric Co. v. Garcia and State Restrictions on the Development of Merchant Power Plants,” *Natural Resources Journal* 43 (Spring 2003): 624-625.

108. Senate, *Utility Corporations, Letter from the Chairman of the Federal Trade Commission Transmitting, in Response to Senate Resolution no. 83, a Monthly Report on the Electric Power and Gas Utilities Inquiry, Nos. 31 and 32, New England Power Association*, 70th Cong., 1st sess., 1931, S. Doc 92, pt. 31 and 32: 183-186.

companies in Boston and central Massachusetts were bought out by NEPA as the 1930's began.¹⁰⁹ Boston Edison resisted NEPA's advances, but the two firms worked together to build the hydroelectric station at Fifteen Mile Falls in the upper Connecticut River in New Hampshire. The turbines at this location brought 170 MW of electric power to the enlarged grid following the construction of 126 miles of transmission lines to the NEPA's switching station in Tewkesbury, MA.¹¹⁰ Even NEPA's subordinate companies were not immune to the desire for growth. Narragansett Electric acquired all of the assets of the Bristol County Gas and Electric Company, the Tiverton Electric Light Company, the East Greenwich Electric Company, portions of the South County Public Service Company, and the West Gloucester Power and Light Company in 1936.¹¹¹

Acquiring control of these companies provided numerous advantages for NEPA and hence International Paper & Power. Firstly, by keeping Insull and his financial backers at bay, NEPA gained a controlling share of much of the area's electric power generating, transmission, and distribution companies. Most of the companies possessed either electric power generation capabilities that could contribute to the networked system, or at least established customers that the more efficient NEPA could sell power

109. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 78-84.

110. *Ibid.*, 84-91.

111. The Mystic Power Company retained its independence with the absorption of the rest of the South County Public Service Company. See State of Rhode Island and Providence Plantation, *Twenty-Fifth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1936* (Providence, RI: Visitor Printing Company, 1937):166-167, 170-176, 272-274.

to. The local ordinances providing local monopolies to these smaller firms made NEPA not only the electric utility of choice, but the only electric utility. There were disadvantages as well. Many of the smaller companies used obsolescent technology for electric generation that would require replacement. The sheer size of the area and scope of supervision of the expanded number of facilities required a change in NEPA's internal organization. The area under NEPA was subdivided into six areas of operation, with Rhode Island and Fall River companies falling under the Southern Group.¹¹² The town of Millbury, MA, housed NEPA's central dispatching station, where operators could balance the power being generated by the various hydroelectric or steam generating stations to match the load required by the network's customers. Monitoring the electric power grid's voltage and frequency, the human dispatchers would transmit orders to the numerous stations using a private telephone system.¹¹³

By this time both Harriman and Chace had been eased aside from the leadership of NEPA. Soon after the takeover threat from Insull had been deflected, Graustein began a campaign to acquire the rest of the NEPA stock that Harriman and Chace still retained. Here he was helped by Chace, who had joined the board of International Paper. Over the next few years, Graustein bought more and more of NEPA's stock until by 1928 he had gained full control of the company.¹¹⁴ With command of both International Paper and

112. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 84.

113. *Ibid.*,88.

114. Senate, *Utility Corporations, Letter from the Chairman of the Federal Trade Commission Transmitting, in Response to Senate Resolution no. 83, a Monthly Report on*

NEPA's properties, Graustein reorganized the companies into an expanding structure of holding companies and subsidiaries to provide the maximum flexibility for his control with the minimum actual capital required. The resultant organization within the newly named International Paper & Power Company allowed Graustein to circumvent state restrictions for utility ownership.¹¹⁵ By setting up a number of subordinate holding companies, Graustein could use his preferred stock to direct the operation of subordinate organizations requiring large capital influx from bond and stock holders without necessarily risking his own money. This organization was going to be tested and found wanting in the Great Depression, but in the roaring '20s it provided a means to attract the money necessary to buy the expensive electrical components and fund the immense engineering structures to power them.¹¹⁶

While successful in expanding its power generating capacity and control of the market during the 1920's, the next decade brought a number of difficult business and financial challenges to NEPA. Technologically, the firm had been successful at producing large amounts of electric power for both industry and household consumers. It generated its electric power from a wide variety of sources, was using increasingly advanced technology to provide its product at a reasonable cost, and had determined ways to get that power to consumers often hundreds of miles away from the power

the Electric Power and Gas Utilities Inquiry, Nos. 31 and 32, New England Power Association, 70th Cong., 1st sess., 1931, S. Doc 92, pt. 31 and 32: 303-309, 312-314.

115. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 67-70.

116. *Ibid.*, 69-71.

generation sites. Organizationally, the company, under the guiding light of International Paper & Power, had expanded in such a manner that the pyramid of holding companies created in Graustein's quest for business empire was going to be found unstable under the economic shock of the Great Depression.¹¹⁷

Zenith of the Holding Company: International Paper & Power

The directors of International Paper & Power and the New England Power Association continued with their acquisition plan even following the stock market crash of 1929, though in some ways this concept was poorly conceived. Numerous bonds that had been floated to fund previous takeovers would come due in the early 1930s, and the capital to finance these was difficult to obtain. Additionally, the stock losses and bankruptcies across the nation resulting from the stock market crash in 1929 led to state and federal investigations of NEPA's business operations and structure. The Massachusetts Legislature's Power and Light Commission and the Federal Trade Commission both investigated the company's business ventures and holding company structure.¹¹⁸ The Massachusetts investigation sought to compare and contrast the efficiency and effectiveness of the public vs. private electric utilities in the state as a means to denigrate the private companies. Analysis concluded that the differences in price or service were not dramatic:

117. Thomas Heinrich, "Product Diversification in the U.S. Pulp and Paper Industry: The Case of International Paper," *The Business History Review* 75, no. 3 (Autumn 2003): 492-496.

118. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 94-96.

At their *best* the private companies are quicker to develop improved methods, the resulting gains being divided between the stockholders and the consumers. At their *best* the municipal plants are less aggressive in demonstrating to their customers the advantages of an increased use of electricity, but pass along to them all gain resulting from the adoption of improved methods. At their *worst* the difference between the two is the difference between graft at the top and graft at the bottom.¹¹⁹

NEPA was able to deflect the criticism from the Massachusetts direction, claiming that its holding company structure was fundamentally different from that of its parent, International Paper & Power. NEPA's subordinate companies were all actually connected in the area's electric power grid and thus more responsive to local demands, unlike those of Samuel Insull's whose extensive holdings spanned the nation.¹²⁰ The Rhode Island Public Utilities Commission (RIPUC) did not conduct any investigations of the electric utilities during this period.¹²¹

119. Porter quotes a customer as suggesting that the best argument in favor of public ownership of one of the Boston utility companies (Boston Edison Company) was the company's rates; the best argument in favor of private ownership was the quality of the Boston City Council. See Charles H. Porter, "A Comparison of Public and Private Electric Utilities in Massachusetts," *The Journal of Land & Public Utility Economics* 7, no. 4 (Nov. 1931): 394, 437-438.

120. Insull's fall was all the more news-worthy as it transpired across the continent, much like his utility holdings, demonstrating that leverage works both ways. See Energy Information Administration, "*Public Utility Holding Company Act of 1935: 1935-1992*," Energy Information Administration, <http://www.eia.gov/electricity/archive/0563.pdf> (accessed January 27, 2014) and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 94-96.

121. The Annual Reports of the Rhode Island Public Utilities Commission in the 1920s and 1930s are filled information regarding the regulation of the state's transportation systems such as the railways, jitney lines and bus companies. Information on the electric companies appears cursory compared to the others, particularly the jitney licensing. As late as 1933 less than 10% of all monitored utilities in Rhode Island were electric ones. See State of Rhode Island and Providence Plantation, *Twenty-Second*

Federal investigations were less easily repelled than the state ones in no small part due to the failures of other public utility pyramid holding company structures across the country. The local utility companies at the bottom of these structures were hard at work generating, transmitting and distributing electric power. A local utility might be owned by a superior holding company for the primary purpose of controlling it. This business might be purchased by another holding company in turn, adding additional levels to the overall structure of the organization. Pyramiding was appealing to investors such as Graustein as it permitted the reduction in the amount of money required to achieve command of an operating utility at the low end of the pyramid. It also permitted the exceptional increase of income received by the company at the top of the heap through a process known as leveraging.¹²²

When the holding company was expanding, this method of controlling the nascent electric power business was probably advantageous overall to both the owners and the consumers. It did permit the attainment of great sources of capital to finance the large scale projects required to generate the power demanded by industry and households. The pyramid structure allowed businesses to comply with the state and local ordinances which

Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1933 (Providence, RI: The Oxford Press, 1934): 5-6.

122. In such a manner the expenditure of a small amount of money at the upper end of the organization allowed the control of numerous subsidiary companies. When the profits of any subordinate level increased, the amount received at each successive level was amplified. The FTC noted one five level organization earned profits of 295 percent off of profits at the lowest level of only 5 percent. See Energy Information Administration, “*Public Utility Holding Company Act of 1935: 1935-1992*,” 2-4, Energy Information Administration, <http://www.eia.gov/electricity/archive/0563.pdf> (accessed January 27, 2014).

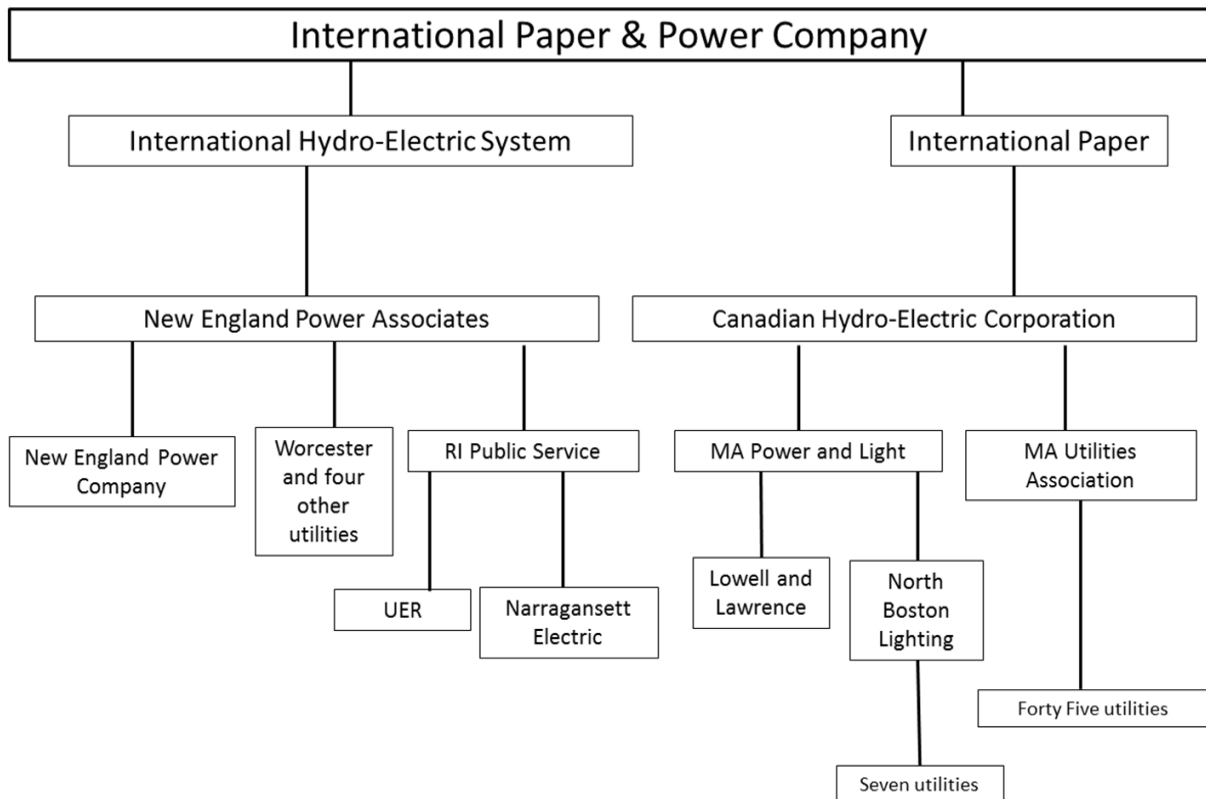


Figure 3. International Paper & Power Organizational Chart Emphasizing The Electric Utility Portion Of The Holding Company. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 70, and Thomas Heinrich, “Product Diversification in the U.S. Pulp and Paper Industry: The Case of International Paper,” *The Business History Review* 75, no. 3 (Autumn 2003): 491.

often prohibited direct out of state ownership of the utility, but was more lenient to the indirect control of the holding company. It permitted the standardization of methods, procedures and equipment over a wider area, increased the purchasing power of the local operating companies, centralized insurance claims, and overall provided a greater quality service to the customer. An important feature of this structure is that it allowed the engineering, construction, and management functions of the organization to be centralized. The professional nature of this staff ensured compliance with regulations

and technical specifications throughout the area of control of the overall company. Subject matter experts in advertising products and services, legal services and operation of the electric power grid could be dispatched to problem areas to act as trouble shooters, assuring a standard response to complications.¹²³ The centralized management of the company could carefully apportion its talented work force to solve the difficult technical and financial problems they encountered. Since the private sector was less apt to underutilize its personnel, it could provide better service at lower costs.¹²⁴ As a greater number of problems were experienced and successfully solved, this staff also built up a standard, though often unwritten, doctrine to address issues.

The other side of the holding company structure was less compelling. The multiple layers of holding companies reduced transparency, often preventing regulatory bodies from assessing the nature of the business deals the parent companies were making. Leadership at the top of the pyramid became divorced from local problems and concerns, seeing the operating utilities as cash cows to be milked to expand profits at the higher levels of the organization. Service charges for transactions between the layered holding companies were padded, property was sold at a loss from one company to another in the same organization, depreciation of equipment was put off, and financial devices created to make the overall company look profitable were all done, bleeding the operating company out of the money needed to maintain service while passing excessive costs on to

123. Energy Information Administration, “*Public Utility Holding Company Act of 1935: 1935-1992*,” 2-4, 3-5, Energy Information Administration, <http://www.eia.gov/electricity/archive/0563.pdf>. (accessed January 27, 2014).

124. “Federal Regulation of Holding Companies: The Public Utility Act of 1935,” *The Yale Law Review* 45, no. 3 (Jan. 1936): 473.

the consumer.¹²⁵ The consecutive mergers required to maintain the façade of ever greater profits allowed creative financing in the issuing of public bonds to finance the utilities' projects.¹²⁶

International Paper & Power, and its subsidiary NEPA, fell somewhere between these two extremes. While NEPA's quest for regional dominance in establishing a reliable and diverse electric power grid was an impressive feat of technological mastery, its growth was certainly well motivated by financial gain. The differences between the financial end and the operating end of the business were slight, particularly in the origins of the company. There seems to be little difference between Marsden Perry the main developer of a new technology and Marsden Perry the chief financier of the process (as the President of the Union Trust Bank Perry was essentially bankrolling his own company as well as the Brayton political machine). Harriman and Chase were also well connected to the financial powerhouses of their era. Certainly Graustein at International Paper & Power appears as the archetypical New York lawyer pulling the strings of an immense business empire. While much of the vitriol heaped on the holding companies arose from the political sphere, the corresponding accolades from the business realm

125. While the practices noted were certainly deleterious to the overall health of the stockholders at the lower end of the pyramid, the operating companies and the national economy, the positive results of electrification must also be considered. It is perhaps too far to consider these practices as "evil." See "Federal Regulation of Holding Companies: The Public Utility Act of 1935," *The Yale Law Review* 45, no. 3 (Jan. 1936): 472-478.

126. Gifford Pinchot, "Utility Regulation, Federal and State," *Annals of the American Academy of Political and Social Science* 159, Part 1 (Jan. 1932): 71-72.

were less telling, particularly for voters who had lost large sums of money after the market crash.¹²⁷

Disintegration of the Holding Company: The Public Utility Holding Company Act of 1935

The 1929 stock market crash exposed many of the flaws in this system. Samuel Insull's Middle West Utility Company, operating in 30 states and over five thousand communities, showed that leverage works both ways. With the dramatic drop in stock prices, Middle West was saddled with fixed costs on its preferred stock and interest on its bonds. Despite creative insider dealing to drive up the price of the stock, Insull's actions could not resist market pressures and the company was placed in receivership in 1932. Upon inspection of the company's financial records, Middle West was shown to have a shortfall of \$177.7 million.¹²⁸

127. Hughes suggests the net gain of the holding companies of the development of the electric power grid was a positive one. The greater specialization of the firms to deal with technical issues allowed for greater efficiency and effectiveness while the financial structures spread the risk of failure between the different companies and amongst the numerous bond holders. The Great Depression exposed all of the flaws in the system in greater detail, as the excessively leveraged companies' failures generated opportunities for their political adversaries to exploit. The incoming Franklin D. Roosevelt administration could have easily seen the expanding power of the electric utilities as another facet of rival political party hostility. Certainly NEPA, with its roots well interwoven with the Republican Party in Rhode Island, was no shrinking violet in such matters. The connections to Rhode Island's Democratic governor Theodore F. Green may have assisted NEPA survival. See Thomas P. Hughes, *Networks of Power* (1983; repr., Baltimore, MD: The Johns Hopkins University Press, 1993), 393-401.

128. Insull fled the country though was later extradited back to the United States where he was prosecuted for securities fraud. Found not guilty following an impassioned self defense on the witness stand, Insull again departed the country, dying in Paris in 1938. "I lost a lot of money with Sam Insull" was a common expression among Chicago pensioners. See Energy Information Administration, "*Public Utility Holding Company*

International Paper & Power's losses in the market crash were also immense, though somewhat lessened by the diverse nature of the organization. With the collapse of the newsprint segment of the company, International Paper & Power ran up a \$19.7 million debt by the mid 1930s.¹²⁹ NEPA was also hard hit, particularly with the decrease in revenue from electricity sales while its appliance sales decreased by over 40%. Though overall labor and fuel costs also declined, the net result was not advantageous to NEPA stockholders, who went most of the next decade without receiving dividends.¹³⁰

With a failure of the magnitude of Insull's company in mind, the new Franklin D. Roosevelt administration had a strong desire to break up the numerous electric utility holding company pyramids by establishing Federal regulation of the industry. Pressed by other legislative concerns with the New Deal, the Roosevelt administration did not address the holding companies and utility regulation until 1935.¹³¹

Their eventual attack was assisted by work done by previous regulators. In the late 1920's, the Federal Trade Commission (FTC) under direction from the U.S. Senate,

Act of 1935: 1935-1992," 2-4, 6, Energy Information Administration, <http://www.eia.gov/electricity/archive/0563.pdf> (accessed January 27, 2014) and Harold L. Platt, *The Electric City: Energy and the Growth of the Chicago Area, 1880-1930* (Chicago, IL: The University of Chicago Press, 1991), 272-273.

129. Thomas Heinrich, "Product Diversification in the U.S. Pulp and Paper Industry: The Case of International Paper," *The Business History Review* 75, no. 3 (Autumn 2003): 495-496.

130. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 99-102.

131. Energy Information Administration, "*Public Utility Holding Company Act of 1935: 1935-1992*," 2-4, 8, Energy Information Administration, <http://www.eia.gov/electricity/archive/0563.pdf> (accessed January 27, 2014).

commenced a series of hearings on the large utility holding companies focusing on their financial structure.¹³² NEPA's opportunity for Congressional scrutiny did not occur until March, 1931 when the directors of the various levels of the company presented testimony and evidence. With over eleven hundred pages of evidence, the hearings detailed the business deals that permitted the growth of NEPA under International Paper & Power. While much of the records detailed energy production and infrastructure, the investigation also covered the numerous stock transactions required to purchase the subordinate operating companies. The committee also investigated whether NEPA was using the press to garner popular support and to suppress local electric power initiatives in its quest for monopoly.¹³³ NEPA President Frank D. Comerford testified on his company's efficiency, stating, "A few months ago the Providence steam plant failed early in the morning, dropping a load of 50,000 kilowatts. The automatic regulators at our Bellows Falls plant, 150 miles away, opened up their water wheels and picked up the load, so that there was no interruption."¹³⁴ While generally wary of the company's

132. Federal Trade Commission, *Annual Report of the Federal Trade Commission for the Fiscal Year Ended June 30 1931* (Washington, DC: Government Printing Office, 1931): 17.

133. The testimony of Thomas H. Carens, the publicity director of NEPA is particularly amusing. See Senate, *Utility Corporations, Letter from the Chairman of the Federal Trade Commission Transmitting, in Response to Senate Resolution no. 83, a Monthly Report on the Electric Power and Gas Utilities Inquiry, Nos. 31 and 32, New England Power Association, 70th Cong., 1st sess., 1931, S. Doc 92, pt. 31 and 32, 406-419.*

134. Since Comerford was the vice president of International Paper & Power, his testimony may not have been that convincing. Senate, *Utility Corporations, Letter from the Chairman of the Federal Trade Commission Transmitting, in Response to Senate Resolution no. 83, a Monthly Report on the Electric Power and Gas Utilities Inquiry,*

business practices, the investigation board did note the difference between NEPA and other, larger, but geographically more diffuse holding companies. Investigators noted the operating intent of NEPA to act as a unified whole, with the sum of the components being more important than any of the parts, although the inclusion of older, obsolescent plants in the electric power grid mitigated against overall system efficiency.¹³⁵

By 1935, fresh off the gains of the midterm elections, the Roosevelt administration was able to focus its attention on addressing the problems of the large electric utility holding companies. With the information provided by the FTC's investigations as well as the results of the National Power Policy Commission on Public Utility Holding Companies, there was sufficient information to determine the overall nature of the problem. At the start of the Roosevelt Administration, the thirteen largest electric utility holding companies controlled over seventy five percent of the industry; the three largest had forty percent.¹³⁶ The holding companies' actions were described in the harshest terms by the FTC, which stated "The use of the words such as fraud, deceit,

Nos. 31 and 32, New England Power Association, 70th Cong., 1st sess., 1931, S. Doc 92, pt. 31 and 32: 343.

135. Senate, *Utility Corporations, Letter from the Chairman of the Federal Trade Commission Transmitting, in Response to Senate Resolution no. 83, a Monthly Report on the Electric Power and Gas Utilities Inquiry, Nos. 31 and 32, New England Power Association, 70th Cong., 1st sess., 1931, S. Doc 92, pt. 31 and 32: 5, 39.*

136. Crystal J. Lloyd, "The Public Utility Holding Act of 1935," *Boston College Law Review* 7, no. 3 (1966): 717.

misrepresentation, dishonesty, breach of trust and oppression are the only suitable terms to apply.”¹³⁷ Roosevelt meant to change the nature of this business.

Wanting to break the hold of the holding companies, Roosevelt directed two of his trusted subordinates, Benjamin V. Cohen from Indiana, and Thomas G. Corcoran from Rhode Island to write the draft legislation. Both men were gifted lawyers with sharp, incisive minds, but Corcoran was the driving force of the duo. A native of Pawtucket, RI, Corcoran had graduated from Brown University in 1922 before earning his Doctor of Jurisprudence degree at Harvard and later serving as a law clerk for Supreme Court Justice Oliver Wendell Holmes, Jr. Following private work in the late 1920s, Corcoran became one of the “New Dealers” of the Roosevelt administration and worked on the Security Exchange Commission Act in 1933. The president took a liking to the brash Ocean State native, nicknaming him “Tommy the Cork.”¹³⁸

Cohen and Corcoran’s proposed legislation addressed the holding company problems in two ways. The first portion, Title I of what would become the Public Utility Holding Company Act, gave the Securities and Exchange Commission (SEC) the power to register and evaluate all holding companies. With such information, the SEC could evaluate the whether the company should be allowed to maintain its current structure or direct its disassembly. The rationale for the continued existence of any holding company was the maintenance of a “geographically and economically integrated system.” While

137. Arthur M. Schlesinger, *The Age of Roosevelt, The Politics of Upheaval* (Boston, MA: Houghton Mifflin Company, 1960), 308.

138. David McKean, *Tommy the Cork* (South Royalton, VT: Steerforth Press, 2004), 13-41.

initially such dissolution would be up to the holding companies themselves, after January 1, 1940 the SEC could order the breakup of the company. This part became known as the “death sentence” for the holding company.¹³⁹

If Title I sounded draconian for the holding companies, the second part, Title II, was perhaps an even more important portion of the draft legislation. The SEC was empowered to regulate the surviving licensed electric utility holding companies that spanned numerous states. The largest holding companies were to be broken up into their component parts focused on providing integrated service in a specific geographic area. Such consolidation would be based on defined areas and technical efficiency, and not on financial lucrativeness of any business arrangements. Electric utilities residing in only one state would be left to local control.¹⁴⁰ Title II also gave the Federal authorities the warrant to regulate the interstate transmission of electric power, a feature that had been an issue since the Supreme Court *Attleboro* decision in 1927.¹⁴¹

139. Choosing their own method of dissolution might have had some advantages to the stockholders of the companies. See Arthur M. Schlesinger, *The Age of Roosevelt, The Politics of Upheaval* (Boston, MA: Houghton Mifflin Company, 1960): 306, and Energy Information Administration, “*Public Utility Holding Company Act of 1935: 1935-1992*,” 8-9, Energy Information Administration, <http://www.eia.gov/electricity/archive/0563.pdf> (accessed January 27, 2014).

140. See Arthur M. Schlesinger, *The Age of Roosevelt, The Politics of Upheaval* (Boston, MA: Houghton Mifflin Company, 1960), 306, and Energy Information Administration, “*Public Utility Holding Company Act of 1935: 1935-1992*,” 8-9, Energy Information Administration, <http://www.eia.gov/electricity/archive/0563.pdf> (accessed January 27, 2014).

141. *Federal Power Act*, U.S. Code 16 §791a, 74th Cong., 1st sess. (August 26, 1935), 527-528.

The general structure of this draft legislation was proposed in the House by Representative Samuel Rayburn (D-Texas) and in the Senate by Senator Burton K. Wheeler (D-Montana), both allies of Roosevelt's New Deal policies. As might be expected, the electric utility holding companies reacted strongly against such legislation, but despite intense lobbying by the companies, the Wheeler-Rayburn Act passed the Senate in June 1935.¹⁴² Debate in the House was more antagonistic and bitter as the holding company lobbyists contested the bill's advocates from the White House to sway congressional opinion. Corcoran was a leader of the administration's efforts, but even his drive and forcefulness was not sufficient. Representative Ralph Brewster (R-Maine) even accused Corcoran of threatening to stop construction of a dam in his district if the congressman voted against the bill, a charge Corcoran vehemently denied. The bill was amended in the House to delete the "death sentence," a grievous blow to Roosevelt's intent. Attempts to reconcile the work of the two legislative bodies only increased the tension, but now, Congress began to publically investigate the efforts of the holding companies' lobbyists, who were said to outnumber the members of Congress. Under the

142. The Rhode Island Senators, Senator Peter G. Gerry (D) (1879-1957) and Jesse H. Metcalf (R) (1860-1942), voted against the bill while supporting an unsuccessful amendment to remove the "death penalty." Both Senators were former directors of Rhode Island electric utility companies (Gerry with United Electric Railways and Metcalf with Narragansett Electric) which may have assisted generating their bipartisan resistance. See Govtrack.us, "Roll Call Votes, 1935 Jan-Aug (74th Congress)," <https://www.govtrack.us/congress/votes#session=217&chamber=1> (accessed February 5, 2014), Arthur M. Schlesinger, *The Age of Roosevelt, The Politics of Upheaval* (Boston, MA: Houghton Mifflin Company, 1960): 313, *Poor's Manual of Public Utilities: Street Railway, Gas, Electric, Water, Power, Telephone and Telegraph Companies* (New York: Poor's Manual Company, 1913): 916 and *Poor's Manual of Public Utilities: Street Railway, Gas, Electric, Water, Power, Telephone and Telegraph Companies* (New York: Poor's Manual Company, 1915): 1226.

inquisition of Senator Hugo Black (D-Alabama), the petitioning schemes of the holding companies were uncovered, including the use of telegrams sent to Congressman by the local electric utility but signed with names of the representative's constituents, and the large sums of money spent to influence wavering legislators.¹⁴³ These actions to influence Congress were exposed publically, helping Corcoran sway the House to accept the Senate version of the bill, complete with the "death sentence." In mid-August, a compromise, proposed by Roosevelt's confidante and loyal advisor Felix Frankfurter bridged the divide. Frankfurter's proposal allowed the SEC to permit holding companies to control more than one electric utility system, if the independent system would not be economically viable alone and if it was not too large or diffuse over a geographic area as to prevent efficient operation or local control.¹⁴⁴ Thus mollified, the House passed the compromise bill and on 26 August 1935 the Public Utility Holding Company Act of 1935 was signed into law.¹⁴⁵ This law also directed the amendment of the Federal Water

143. See Kenneth S. Davis, *FDR, The New Deal Years, 1933-1937* (New York: Random House, 1986), 535-536, and Arthur M. Schlesinger, *The Age of Roosevelt, The Politics of Upheaval* (Boston, MA: Houghton Mifflin Company, 1960): 318-323.

144. The rough edges of this political drama are well sanded down in Schlesinger's account. Other versions make Black's investigation a more cold-blooded affair. Given Corcoran's subsequent dealings in business and government (assisting the Nationalist Chinese government in setting up a mercenary air force, the American Volunteer Group, better known as the Flying Tigers, supporting the overthrow of the left leaning government in Guatemala, and lobbying Supreme Court Justices) it seems quite conceivable that Brewster's accusations were on target. See Arthur M. Schlesinger, *The Age of Roosevelt, The Politics of Upheaval* (Boston, MA: Houghton Mifflin Company, 1960): 323-324, Kenneth S. Davis, *FDR, The New Deal Years, 1933-1937* (New York: Random House, 1986): 535-537, and David McKean, *Tommy the Cork* (South Royalton, VT: Steerforth Press, 2004).

145. The Rhode Island Representatives voted along party lines in this instance with Representative Charles Risk (R-RI) voting against and Representative John

Power Act of 1920, hence known as the Federal Power Act, to permit the SEC to monitor the electric utility holding companies.¹⁴⁶ Unsurprisingly, the holding companies were not willing to meekly acquiesce to the passage of the legislation. Subsequent challenges to the law reached the U.S. Supreme Court which eventually upheld the legality of all of the portions of the Act, though it would take over a decade to do so.¹⁴⁷

While the full ramifications of the Public Utility Holding Company of 1935 and the amendments to the Federal Power Act would take a generation to fully implement, NEPA acted proactively.¹⁴⁸ In December 1935 NEPA registered with the SEC as a holding company in anticipation of the breakup of its parent holding company, International Paper & Power. International Paper & Power attempted to obtain a waiver from the SEC but the regulators rejected the parent company's claims. The SEC determined that with electric power generating plants in Canada and New England, International Paper & Power was both too large and spread out over a dispersed geographic area to efficiently operate the electric power grid. The New England electric power grid controlled by NEPA and its sister subsidiaries was not well interconnected

O'Connel (D-RI) voting for the bill. See Govtrack.us, "Roll Call Votes, 1935 Jan-Aug (74th Congress)," <https://www.govtrack.us/congress/votes#session=217&chamber=2> (accessed February 5, 2014).

146. *Federal Power Act*, U.S. Code 16 §791a, 74th Cong., 1st sess. (August 26, 1935), 527-528.

147. Energy Information Administration, "*Public Utility Holding Company Act of 1935: 1935-1992*," 11-12, Energy Information Administration, <http://www.eia.gov/electricity/archive/0563.pdf> (accessed January 27, 2014).

148. NEPA was skirmishing with the SEC as late as 1968 over the dissolution of the company's holdings. See *S.E.C v. New England Electric System*, 390 U.S. 207 (1968).

with the Canadian power stations owned by International Paper & Power. NEPA fell under the International Hydro-Electric System holding company in International Paper & Power's pyramidal structure yet had not paid a dividend to the parent organization in years. The SEC reviewed the status of NEPA and the other utilities powering the Boston area and ordered International Paper & Power to divest itself of these holdings. The president of International Paper & Power dissolved the company in 1939 and disseminated the shares of the subordinate companies to the preferred stockholders and bondholders, sparking legal challenges that would last until 1947.¹⁴⁹

While NEPA had been removed from the controlling interests of International Paper & Power, it still had its own subordinate companies that aroused SEC interest. With its own subsidiary gas and electric companies such as Narragansett Electric and UER spanning southeastern New England, NEPA contained many of the features the Federal Power Act was purposely designed to eliminate.¹⁵⁰ Here the SEC Commissioners were more willing to accede to NEPA's protestations that the company was operating per the provisions of Title II of the Federal Power Act, operating as "integrated and coordinated electric facilities" in a geographic area. While NEPA was

149. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 109-110 and Thomas Heinrich, "Product Diversification in the U.S. Pulp and Paper Industry: The Case of International Paper," *The Business History Review* 75, no. 3 (Autumn 2003): 502-503.

150. Senate, *Utility Corporations, Letter from the Chairman of the Federal Trade Commission Transmitting, in Response to Senate Resolution no. 83, a Monthly Report on the Electric Power and Gas Utilities Inquiry, Nos. 31 and 32, New England Power Association*, 70th Cong., 1st sess., 1931, S. Doc 92, pt. 31 and 32: 2.

forced to shed a service company and reorganize its headquarters, the main structure of the organization was allowed to retain its shape.¹⁵¹

The Public Utility Holding Company Act of 1935 and the amendments to the Federal Power Act were thus important for two main reasons. These laws broke apart the larger holding companies that often were national in their areas of interest, with unfocused or divergent interests. Less geographically diffuse electric utilities with less convoluted financial setups and more economical organizations were allowed to survive. The others adapted or were dissolved by SEC directives. International Paper & Power was too large and unfocused in its purpose, attempting to mesh the business concerns of paper and electric power production across two countries. The company was unwilling to adapt and thus failed to survive. NEPA, which had been mainly redesigned along the lines of the new legislation, did. While some changes to the business structure of the organization was required, the company's infrastructure remained under central control.¹⁵² NEPA would probably not have achieved the priority of focus in International Paper & Power given Graustein's varied business interests. Instead, the generation, transmission and distribution of electric power from the mountains of Vermont to the tidewater of Rhode Island under the direction of one corporate headquarters endured.

151. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 113.

152. The SEC forced NEPA to sell off its retail service company. The regulators believed that utility companies used these service companies to bleed money from the retail electric power providers. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 113.

The Federal Power Act was also significant in that it signaled the growing interest of the federal government in regulating the operation of the expanding electric power system in support of the public interest of the nation. While a great deal of the legislation was directed towards curbing the perceived financial abuses of the holding company structures, the act also made the federal government the authority in determining the limits of electric utility boundaries, designated the transmission of electricity as interstate commerce, and was used later to ordain war time and emergency powers over the industry. Previously, regulation has been accomplished at the local and state level. Now, the federal government would also be an active force in determining the features of the electric power grid.

Growing Pains of NEPA

Even as International Paper & Power was giving birth to an independent NEPA, the electric utility was attempting to meet all the external stresses of the Great Depression. The expansion in the late 1920s had created excess capacity in the system that the decrease in electric load during the economic downturn rapidly exposed. No new plants were built during this time period and the smaller less efficient generators were allowed to depreciate away without replacement. Nevertheless, the company was able to maintain the backbone of the system, its larger generating stations, while still providing effective transmission and distribution to industry and consumers. In many ways, the Depression shook out some of the excess that the parent holding company had imposed on NEPA, allowing it to focus on its core specialty. This is not to say the company was without challenges in this period; far from it. Demand for its main product was reduced and subsidiary revenue streams from appliance sales plummeted. Numerous industries in

the NEPA operating area were shuttered; Providence's main industries were devastated. Unemployment in the textile, jewelry and base metal industries exceeded 35 percent at the start of the Depression.¹⁵³ The company was forced to reduce utility rates by twenty five percent due to falling consumer demand; a demand that would not be renewed until later in the decade. Labor demands and natural disasters such as floods on the Connecticut River and hurricanes on the coast all strained the system.¹⁵⁴ Even with the capital available from the federal government's new Rural Electrification Administration (REA) to electrify previously unserved areas, the company's expansion was limited.¹⁵⁵ NEPA made efforts to attract additional farmers to electrify their homes and farms, both to move into a new area for sales as well as to prevent the REA from creating local electric generating cooperatives in southeastern New England that might threaten the NEPA monopoly.¹⁵⁶ Aided by the short distances in the NEPA electric power grid, 84 percent of all farms were electrified in Rhode Island by 1939. Perhaps more importantly, at least from NEPA's point of view, no electric cooperatives as authorized by the REA

153. Lisa C. Fink, *Providence Industrial Sites* (Providence, RI: Herald Press, 1981), 30.

154. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 99-108.

155. See Arthur M. Schlesinger, *The Age of Roosevelt, The Politics of Upheaval* (Boston, MA: Houghton Mifflin Company, 1960), 379-384, and *Rural Electrification Act of 1936*, Public Law 605, 74th Cong. 2d sess. (May 20, 1936).

156. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 107-108.

were established in either Rhode Island or Massachusetts.¹⁵⁷ In this manner NEPA was able to maintain complete control of the area with little competition from federal government entities.

The start of the Second World War saw NEPA emerging as a separate commercial entity, focused on delivering electric power to its customers. As a result of the 1935 Public Utilities Holding Company Act it was free of the distracted leadership of International Paper & Power, while it was still reorganizing itself to be a leaner business with fewer subsidiaries. The Depression had eliminated some of the inefficient portions of the system but the company contained sufficient expertise and ability to expand to meet the needs of expected wartime production. One of the company's first moves following the start of hostilities in Europe was to expand the Manchester Street generating station in Providence. This project had been delayed by poor economic conditions in the 1930s, but the concerns of the expanding war prompted the system's first electric power generation construction since 1931. Completed prior to the Japanese attack on Pearl Harbor in 1941, the improvements to the power plant increased the total electric power generation capacity in the city to greater than 200 MW. Transmission lines were also upgraded and expanded, and security forces were created to guard the

157. Not all of this was due to superior performance. Utilities were not above stoking the fears of farmers suggesting that if the local electrical cooperatives failed, the farmers would be held financially accountable and the government would foreclose on their farms. A northwestern Massachusetts electrical power cooperative was suppressed when the state legislature failed to provide the necessary permits after the utility companies protested. See Richard Rudolph and Scott Ridley, *Power Struggle, The Hundred-Year War Over Electricity* (New York: Harper & Row, Publishers, 1986), 81-82 and U.S. Department of Agriculture, *1940 Yearbook*. Robert Beall, "Rural Electrification" (Washington, DC: Government Printing Office, 1940): 802.

facilities against enemy sabotage. While wartime shortages of fuel oil and rubber disrupted some supply chains, the emphasis on military production allowed the company to focus on the main effort. NEPA was able to shift to coal as a fuel supply as oil was being used for other purposes and tankers were in short supply due to wartime losses from U-Boats and supporting the Allied advances. Once again the system's multiple power sources permitted the system to adjust to various external demands beyond its original design requirements.¹⁵⁸ Providence textile industries also enjoyed a brief reprieve as they fulfilled government orders for uniforms and boots, while a shipyard was constructed to build merchant ships.¹⁵⁹

NEPA was able to provide both electric power and construction skills for the expanding war effort, both to power factories and military facilities, despite the loss of thousands of trained technicians and engineers to the armed forces. The organization was capable of assessing new personnel and training them to the same standards of performance as the senior technicians and staff. Military construction was also significant, particularly at Newport and Quonset Point. NEPA construction teams and electricians provided support for the major expansion at the Naval Station in Newport, the firm's largest military contract of the war. Other NEPA personnel worked on highly classified programs supporting the war effort such as the Manhattan Project, antisubmarine fire control systems and radar. Within the war effort, NEPA played an

158. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 121-127.

159. Lisa Fink, *Providence Industrial Sites* (Providence, RI: Herald Press, 1981), 30-31.

important role in powering industry, managing significant programs, and using their employees' problem solving experience in some of the most challenging technical difficulties.¹⁶⁰

While the end of the war caused a dramatic reduction in the size of the armed forces, NEPA anticipated continued expansion for the postwar era. Initially, a lack of funds for capital investment hampered plans for growth as the company was still working with the SEC to eliminate some of the last vestiges of its subordinate holding companies. Simplification was the order of the day in order to accrue the assets required for additional growth, but the flattening of the organization was not without some cost. In order to maintain a single organization managing the electrical grid in the area, the president of NEPA, Irwin Moore, had to reorganize the firm. NEPA would issue new stock based on depreciation of its current assets and issue new bonds and stock to provide the money for long term growth and debt servicing. A new organization, now named the New England Electrical Service (NEES), was established. NEES still contained three wholesale companies, 36 retail organizations (both gas and electric), a railway company in Providence, and four other firms. This reorganization was not initially sufficient to

160. NEPA profited in both directions. NEPA personnel served in various wartime industries and research organizations, adding to the reputation of the firm as one competent to manage technological programs. Members of these organizations joined NEPA and later filled important roles in the postwar company. John W. Lebourveau served in the U.S. Army Corps of Engineers on the Manhattan Project and later joined the New England Electric Service (NEPA's successor), eventually becoming the firm's Manager of Environmental Affairs. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 128-135 and Obituary of John W. Lebourveau, *The Needham Times*, January 20-27, 2014.

achieve financial stability in the post war stock market. Dividends were meager for several years, the United Electric Railway Company had to be sold off, and NEES had to eliminate its controlling shares of the Fall River Electric Lighting company, resulting in the loss of the Montaup generating plant. An abortive attempt to sell off the firm's gas generation companies in the anticipation of the arrival of cheaper natural gas supplies cost NEES time and money. Five million dollars were required for the conversion which eventually proved profitable, but the up front cost put another strain on the company's ledger. On the other hand, NEES did acquire the Lynn Gas & Electric company, expanding the company's hold in the northern Boston area, adding 40,000 new customers and an elderly 60 MW steam plant.¹⁶¹

The initial creation of both the Rhode Island and Connecticut River ends of the NEES area of control had been driven in large part by knowledgeable engineers and financiers, who had learned their trade as the companies and the electric power grid grew. Political action, technological limitations, and financial constraints had all influenced the company's development. By the beginning of the post war period, NEES was essentially focused on one major product, electric power. Subordinate companies were being shed under the watchful gaze of the SEC while superior holding agencies had been removed. The NEES operating area was physically self-contained, with opportunities to use geography to the advantage of the generation of power and without difficult technical salients that restricted the distribution of the product.

161. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 137-146.

Education and Ethics for the Electric Power Grid Operator

With greater specialization came a greater professionalization of the managers and operators of the grid. In the “Age of Synergy,” spanning perhaps from just before Edison’s first electric power grid was installed in New York City to the end of the First World War, the number of trained or educated individuals constructing, operating or maintaining the system was relatively low.¹⁶² There were approximately nine thousand practicing scientists and engineers in the nation in 1880. The large expansion in the technological fields in this period required a correspondingly larger number of individuals to operate them. By 1950 there were around half a million technical operators.¹⁶³ While organizations did conduct training programs for their technicians and plant operators to prevent equipment damage and the real possibility of electrocution on the job, the firm’s senior management and engineers received their education at college.¹⁶⁴ While NEES (as well as all the electrical utilities in the country) employed a large number of different types of engineers, the staff of electrical engineers was the most important in the construction, operation and maintenance of the electric power grid. Such personnel could only be accessed from the graduates of colleges and universities.

162. Vaclav Smil, *Creating the Twentieth Century* (New York: Oxford University Press, 2005), 18-28.

163. L. Sprague de Camp, *Heroes of American Invention*, 1961. Reprint. (New York: Barnes & Nobles Press, 1993): 259.

164. It was not uncommon for several linemen to lose their lives during the course of a year. This work was still substantially safer than working (or being a passenger for that matter) on the United Electric Railway during the 1920s and 1930s, but it was not without risk. See State of Rhode Island and Providence Plantation, Various *Annual Report of the Public Utilities Commission of the State of Rhode Island*.

Local education institutions became interested in and associated with the expanding electrical technology. Brown University in Providence, RI first offered engineering degrees in 1891 with electrical engineering taught as a portion of the Physics Department curriculum. As Brown's engineering programs matured over the next decades, there was considerable interaction with industry. Expansion of engineering department facilities followed and interest in the student body in the discipline grew until over half of the freshmen in the class of 1907 were aspirants for a Bachelor of Science degree.¹⁶⁵ The Mechanical, Civil and Electrical Engineering courses were merged into a single division at Brown in 1916 with William H. Kenerson as its chairman. A Brown graduate in Mechanical Engineering in 1896, Kenerson attended Harvard University where he earned a Master of Arts degree in 1906 before returning to Brown. As the division director, Kenerson instructed his students that the primary objective of an engineer was "to make things work."¹⁶⁶ A statue of the Hindu elephant god Ganesha graced the division spaces as a motivation for the students to be able to remove obstacles in their efforts, much like the Indian deity.¹⁶⁷

The University of Rhode Island lagged Brown University in several respects. The university itself was established in large part because Brown University had failed to meet its side of an agreement with the Rhode Island state government. In 1863 the state

165. Martha Mitchell, Brunonian, "Engineering," http://www.brown.edu/Administration/News_Bureau/Databases/Encyclopedia/search.php?serial=E0120 (accessed December 18, 2013).

166. Ibid.

167. Ibid.

legislature passed an ordinance designating Brown University as the recipient of funds from the recently passed Morrill Land Grant Act, as long as the institution would meet the duties and responsibilities of the law. Brown was willing to take the resources, but over the decades became less interested in providing higher level education for agricultural pursuits. This was noted in the state legislature and especially by the representatives in the more agriculturally focused southern part of the state. In 1888 the state bought land in Kingston where an Agricultural Experimental Station was established. This was later expanded into the state Agricultural School using reprogrammed federal funding.¹⁶⁸ The school's name was changed in 1892 to the Rhode Island College of Agriculture and the Mechanic Arts (RICA&M) and opened in September of that year with courses in mechanical engineering as well as agricultural science.¹⁶⁹ Serious legal wrangling between the state and Brown University occupied both parties over the next few years as Brown concluded that the burdens of the Morrill Act were more demanding than desired, but was unwilling to pay back the sums already appropriated. In 1894 a truce was established allowing the state to shift the resources to the new school in Kingston. Legislation passed the Republican controlled State Senate following Brown's offer to settle the conflicting claims.¹⁷⁰ While John H. Washburn, the

168. The legality of this funding mechanism appears to have been slightly irregular, though not perhaps abnormal for the state. See Herman F. Eschenbacher, *The University of Rhode Island* (New York: Meredith Publishing Company, 1967), 30.

169. *Ibid.*, 72.

170. This struggle eventually rose to the level of a U.S. Supreme Court appeal by Brown University. See Herman F. Eschenbacher, *The University of Rhode Island* (New York: Meredith Publishing Company, 1967), 44-69.

president of the new college, would soon run afoul of the Republican Party machine led by Charles Brayton, his initial years were influential in charting the course of the new institution. The college emphasized the practical aspects of science and technology. Students were prepared for real-world agriculture or industry, teaching their newly learned profession to others, or additional education at medical or veterinary school. An electrical engineering course combining a fusion of similar mathematics and physics classes was created in 1900.¹⁷¹ A separate Electrical Engineering Department was not established until 1938.¹⁷²

A privately financed college, the Worcester Polytechnic Institute (WPI), was another college located within the NEES boundaries. Established in Worcester, MA, in 1865 as part of that state's Morrill Act program, the college focused on an engineering curriculum from the start, with an emphasis on practical and commercial applications and interaction.¹⁷³ Higher education in engineering and science existed side by side with the more technical training of skilled workers in the school's mechanical shops. WPI initially offered diplomas in mechanical and civil engineering as well as in chemistry and physics. In the 1880s the technological advances in electricity began to receive serious study at the college, illuminated perhaps by the city building electric street lights in 1891. A graduate course in electrical engineering was first offered by the school in 1889 and by

171. Ibid., 70-73.

172. University of Rhode Island, "Electrical, Computer & Biomedical Engineering," University of Rhode Island, <http://egr.uri.edu/ele/>, (accessed January 9, 2014).

173. Mildred McClary Tymeson, *Two Towers: The Story of Worcester Tech 1865-1965* (Worcester, MA: Worcester Polytechnic Institute, 1965), 9-18.

1896 WPI had established an undergraduate electrical engineering course from the offerings of the physics department.¹⁷⁴ This course grew in popularity such that half of the students at the college were electrical engineering majors. This curriculum continued to expand over the next few decades from eleven courses in 1897 to forty one in 1915.¹⁷⁵

Along with academics, several technical related student organizations were founded, including the “Tech Elect,” an electrical engineering group founded by the Electrical Engineering department’s founder, Professor Alonzo Smith Kimball. In the new century, the Electrical Engineering Society was established in 1902 by Prof. Harold B. Smith. This popular group received support from both faculty and students, and became affiliated with the American Institute of Electrical Engineers in 1904.¹⁷⁶

Following World War I, students were allowed to take a 12 to 15 month industrial cooperative course, spending the period with an electricity focused industry after which they would return to the school to complete their degree.¹⁷⁷ While the college concentrated on technical subjects and the sciences, business course were offered as well,

174. See Herbert Foster Taylor, *Seventy Years of the Worcester Polytechnic Institute* (n.p., 1937), 148 and Mildred McClary Tymeson, *Two Towers: The Story of Worcester Tech 1865-1965* (Worcester, MA: Worcester Polytechnic Institute, 1965), 87.

175. Mildred McClary Tymeson, *Two Towers: The Story of Worcester Tech 1865-1965* (Worcester, MA: Worcester Polytechnic Institute, 1965), 87.

176. Herbert Foster Taylor, *Seventy Years of the Worcester Polytechnic Institute* (n.p., 1937), 148, 155.

177. *Ibid.*, 306.

leading to an option of concentrating in administration and business as part of the electrical engineering major.¹⁷⁸

As well as serving as the founder of the institute's Electrical Engineering Department and developing submarine detection equipment for the Navy in the First World War, H. B. Smith also went on to head the American Institute of Electrical Engineers (AIEE), the nation's premier professional electrical engineering society.¹⁷⁹ The AIEE had been formed in 1884 somewhat as a countervailing force against other international societies that were scheduled to attend the International Electrical Exposition in Philadelphia. The founders included many of the key inventors and commercial leaders in the burgeoning technology, including inventor-entrepreneurs such as Thomas Edison and Alexander Graham Bell.¹⁸⁰ The organization was to accept as members practitioners of the trade on both the engineering and commercial side as well as instructors and other interested observers. The organization was attuned to activities

178. Ibid., 323.

179. Smith appears to have been a larger than life character within the confines of WPI. "Prof. Harold B. Smith was steadily adding to his reputation in engineering circles, and was serving as consulting engineer for one of the large electrical manufacturers. He built several high-voltage transformers, one of which he was invited to exhibit at the St. Louis Exposition in 1904. Having acquired a splendid laboratory and equipment for his department, he secured a two-year leave of absence in 1911. Mrs. Smith had died by accidental drowning at their summer home in Maine early in 1910. Professor Smith remarried the following year, and with his bride embarked on a cruise around the world." By the end of his life, Smith appears to have been tired of the academic challenges and welcomed the shift of venues. See Herbert Foster Taylor, *Seventy Years of the Worcester Polytechnic Institute* (n.p., 1937), 221-222, 353.

180. The society was founded by inventors and designers who had developed into manufacturers and businessmen more than engineers as the term is understood today. See John D. Ryder and Donald G. Fink, *Electrons and Engineers, A Century of Electrical Progress* (New York: The Institute of Electrical and Electronic Engineers, 1983), 64.

that reinforced the development of technology to support industrial expansion, such as the precision measurement of electric parameters and the use of mathematics to better comprehend electrical phenomena. This knowledge assisted the capability to build, operate and maintain complex technological systems. The new society would hold meetings, elect officers, publish papers, propose standards, interact with other engineering societies, shield its members from intrusive legislation, and instill a greater professionalism in the growing ranks of electrical engineers.¹⁸¹

Education and the establishment of technical standards were some of the most pressing issues promoted by the society in its first decades of existence. The struggle between educating the new members of the profession in a broad range of science and mathematics, as well as practical laboratory work, as opposed to merely training the new worker for the upcoming job, was apparent in the early years. The emphasis on education became predominant, though with a curriculum heavily weighted towards the technical end of the spectrum. Business and economics were also valued, but the hands-on work of the student in an actual electrical company was considered more important as a means of gaining the real world experience that would be required to excel upon graduation. Not all members concurred with this assessment, but a large number of students across the nation had practical experience in an actual firm as part of their education.¹⁸²

181. A. Michael Mahon, *The Making of a Profession: A Century of Electrical Engineering in America* (New York: The Institute of Electrical and Electronic Engineers, 1984), 26-29.

182. *Ibid.*, 70-78.

Standardization was another consuming line of effort for the society. Here the organization struggled to first create common units of measurement, definitions and terminology.¹⁸³ Later efforts attempted to build consensus on applied science, engineering and manufacturing. Much like any work with many authors, gaining consensus was not an easy task, but by the mid 1940s most standards had achieved international acceptance, assisted no doubt by the destruction of competing electrical firms in Europe.¹⁸⁴

While the creation of technical standards took time to achieve accord, the consensus to create an ethical standard for the practitioner of the new engineering discipline was more contentious and required numerous revisions. In 1906, Dr. Shyuyler Skaats Wheeler had proposed a code of “Engineering Honor” to the assembled members of the AIEE in Milwaukee. Later that year, a working group composed of Wheeler, H. W. Buck, former chief electrical engineer at the Niagara Falls hydroelectric power station, and noted scientist Charles P. Steinmetz, wrote a Code of Ethics for consideration

183. Common units in the electrical lexicon came from AIEE proposal, units such as the Henry (H) for magnetic inductance. This was an international discussion, disrupted by the First World War. See A. Michael Mahon, *The Making of a Profession: A Century of Electrical Engineering in America* (New York: The Institute of Electrical and Electronic Engineers, 1984), 78-92, and John D. Ryder and Donald G. Fink, *Electrons and Engineers, A Century of Electrical Progress* (New York: The Institute of Electrical and Electronic Engineers, 1983), 64.

184. John D. Ryder and Donald G. Fink, *Electrons and Engineers, A Century of Electrical Progress* (New York: The Institute of Electrical and Electronic Engineers, 1983), 64.

by the society.¹⁸⁵ Submitted to the body in May, 1907, it drew immediate criticism, even from its authors. The first segment of the code required engineers to act with the “highest principles of honor” in mind, as well as emulate the same standards of conduct professionally that he might follow in other portions of civil society. This latter admonition failed to make the first edit of the code. While other aspects of the code’s emphasis on business concerns caused comment, the section discussing the engineer’s relation to his employer drew stern discourse. The engineer was required to bring to the attention of his employer any flaws or defects in the functioning of system he was responsible for that might be dangerous to the humans operating it. If the employer did not take corrective action, the engineer should remove himself from the activity. Criticism of this resulted in the removal of the last action, with only the requirement to notify the employer of the problem remaining.¹⁸⁶

Additional revisions caused the entire process to stall and the code languished in the society’s files until 1911 when the new President of the AIEE, Dugald Jackson, appointed a new working group to establish a broad based “moral standard or the ethics of the profession.”¹⁸⁷ The group, composed of members from all facets of the electrical industry, as well as the members of the original committee, submitted their assignment in

185. *Transactions of the American Institute of Electrical Engineers, June 25 to December 31, 1912. Volume XXXI, Part II* (New York: American Institute of Electrical Engineers, 1912): 2229-2230.

186. A. Michael Mahon, *The Making of a Profession: A Century of Electrical Engineering in America* (New York: The Institute of Electrical and Electronic Engineers, 1984), 114-115.

187. *Ibid.*, 112.

the beginning of 1912 for consideration by the society. The new revisions further diluted the requirements for action by engineers upon discovery of safety problems, but were suitable enough to pass muster with the Board of Directors, which voted to accept it in March, 1912.¹⁸⁸

While a business oriented ethic, the AIEE's Code of Professional Conduct also clarified the engineer's role in dealing with the public and other non-technical persons. The code suggested that only its well educated devotees could comprehend the subject of electrical engineering and the ramifications of any project. Engineers were to "assist the public to a fair and correct general understanding of engineering matters . . . and to discourage the appearance of untrue, unfair or exaggerated statements on engineering subjects in the press."¹⁸⁹ Members should endeavor to avoid providing "opinions on a subject without being fully informed as to all the facts relating thereto," as to do so was "unprofessional."¹⁹⁰ Finally, an engineer in charge of a project "should not permit non-technical persons to overrule his engineering judgments on purely engineering grounds."¹⁹¹ A noted omission was that the code did not discuss the effects of any operation or construction of electrical devices on their surroundings or the possible public hazards associated with their use.

188. *Transactions of the American Institute of Electrical Engineers, June 25 to December 31, 1912. Volume XXXI, Part II* (New York: American Institute of Electrical Engineers, 1912): 2227.

189. *Ibid.*, 2229.

190. *Ibid.*

191. *Ibid.*

As approved, the code was endorsed again in 1922 by the AIEE's Board of Directors, but by the 1940's desires to update the code took hold in the society.¹⁹² A committee with Jackson as its chairman proposed a revised Canon of Ethics with thirty one items in 1942. The draft was reviewed by other American and Canadian engineering societies, as well as the numerous subordinate organizations of the AIEE, gaining final approval by the AIEE's Board of Directors in November 1947. Further changes to the code then ensued in order to incorporate some of the provisions of the 1912 Code of Professional Conduct. These changes were then adopted in August of 1950.¹⁹³

The 1950 Statement of Principles of Professional Conduct of the American Institute of Electrical Engineers was broader in scope than its predecessor. While still emphasizing the business portion of the engineering profession, the code expanded upon the engineer's relationship with society. The code's forward noted this transformation: "It is his duty to interest himself in the public welfare, and be ready to apply his special knowledge for the benefit of mankind."¹⁹⁴ The engineer should have "due regard for the safety and health of the public and employees who may be affected by the work for which he is responsible."¹⁹⁵

192. H. B. Smith from Worcester served on this committee before his death. See *Statement of Principles of Professional Conduct of the American Institute of Electrical Engineers*. Board of Directors. 4 August 1950.

193. Ibid.

194. Ibid.

195. Ibid.

The new code still maintained the attitude that the public was not sufficiently knowledgeable to second guess the professional in the course of his normal duties. The engineer was still advised to avoid publicly discussing engineering subjects unless fully apprised of all of the facts, to not allow non-technical persons to overrule his engineering determinations, and to “present clearly the consequences to be expected from deviations proposed” by the overruling of such calculations.¹⁹⁶ The engineer was again expected to inform the responsible actors if he detected unsafe conditions, but at the same time it was anticipated that he would avoid commenting on public policy unless he indicated the interests he was speaking for. While striving to inform the public, he would “discourage the spreading of untrue, unfair and exaggerated statements regarding engineering.”¹⁹⁷ Restraint should also be exercised when criticizing other engineers in public, leaving such discourse to professional journals and engineering societies.¹⁹⁸ The public was not expected to either comprehend or handle the issues that the engineer had expertly mastered.

Post War Expansion and Enthusiasm

The operators of the electric power grid entered the postwar period with a large number of factors that influenced their actions. They had been successful in creating a new technological system using the blueprint invented by Thomas Edison at his initial Pearl Street mini-grid in New York City. The electric power grid of the 1950’s dwarfed

196. Ibid.

197. Ibid.

198. Ibid.

Edison's plant in terms of power generated and customers served, but conceptually it was very similar in terms of power generation, transmission and distribution. The Insull doctrine of "build and grow" was still perceived as a valid model as the increased energy efficiency of postwar power plants promised room for future growth. The population could envision a better quality of life through increased electricity use and the postponed consumer demand from the war was finally being felt in the commercial realm.

Technical and business problems that had arisen in the 1920s and 1930s had been analyzed and overcome. The occasionally burdensome holding company structures had for the most part been discarded, allowing the utility companies to focus on doing what they performed most proficiently. The managers and engineers of these enterprises were well aware of their past successes and failures, and considered their technical and commercial acumen sufficient to handle future problems. Educated and trained that their method of solving problems was necessary as well as sufficient, the utility leadership felt secure in their level of technical expertise. The utilities had survived the challenges of the Great Depression and had met the demands of the Second World War using these skills. It is not unreasonable to assume that NEES had similar pride in surmounting the trials of the past decades with optimistic expectations for the future.

Focused on building and growing, NEES expansion in the 1950s attempted to make up for lost time. Some of the older plants were refurbished or expanded to increase the overall efficiency of the electric power grid. Energy usage rates to run the electric generation stations declined by over a third as higher efficiency plants came on line. The Manchester Street station in Providence gained two new 45 MW high pressure steam plants, while a smaller station in Worcester expanded with a 33 MW plant in 1950. A

new station in Salem Harbor just north of Boston had two 75 MW plants with another 150 MW plant added later in the decade. When the last Salem unit came on line, the site produced over half of NEES's total generating capacity. To maintain the steady flow of fuel to the plant, the Army Corps of Engineers directed the dredging of Salem's harbor channel, allowing the larger tankers and colliers to discharge directly to the site.¹⁹⁹ Older less efficient plants were retired, such as the aged 25 Hz turbines at the Manchester Street that had powered the UER's trolleys. The South Street station in Providence was partially upgraded with a 2000 pounds per square inch (psi) boiler that ran a 55 MW turbine generator. The low pressure steam turbines at the plant were retired.²⁰⁰ While the main hydroelectric plants on the Deerfield and Connecticut Rivers were maintained, smaller units that had silted up or been degraded over the years were shutdown.²⁰¹ Two new hydroelectric plants were also constructed. One at Wilder, Vermont in 1950, added 33 MW to the electric power grid. The Wilder station generated local resistance to the project as the citizens losing their farmland for the site did not appreciate NEES's desires to add newer more reliable sources of electric power to its inventory. Addressing and allaying the fears of excessive farm land loss, building fish runs past the dam, and

199. The Salem plants could burn either oil or coal, whichever was less expensive. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 146-148.

200. *Ibid.*, 148-149.

201. The water turbine at the Scituate Reservoir was maintained. Only requiring four hours of daily power generation to run the water purification system, NEES could use the other 1800 KW at a low cost. See Gary Kulik and Julia Bonham, *Rhode Island, An Inventory of Historic Engineering and Industrial Sites* (Washington, DC: Government Printing Office, 1978), 224.

convincing state and federal organizations to grant the necessary licenses took years and added to the project's overall cost.²⁰² A much larger station on the Connecticut River just down stream from the dam at the company's Comerford Station was added in 1957 after a four year construction project. When finished, NEES could generate up to 530 MW of electric power from its hydroelectric plants.²⁰³

While capacity was growing, so was the demand for power, accelerated by the company's advertisement campaigns. Consumers were advised of the "virtues of electric living" while contractors were advised on the best ways to install new electric appliances for the expanding housing market.²⁰⁴ The increased household consumption of electric power exceeded the reduction used in industrial activity as the New England region and Rhode Island in particular suffered economically following the end of the war.²⁰⁵ In Providence, the remaining large scale textile firms were shuttered while other factories moved to the suburbs. Almost 50,000 people left the city in the 1950s, a population decline of 16.6 percent.²⁰⁶

202. A harbinger of future resistance to electric power generation projects, the Wilder Dam delays could have alerted NEES management to a possible change in the utility operating environment. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 151.

203. *Ibid.*, 149-150.

204. *Ibid.*, 160.

205. *Ibid.*, 157.

206. Lisa Fink, *Providence Industrial Sites* (Providence, RI: Herald Press, 1981), 31.

Problems with the NEES business model caused by external forces became more pronounced even as the growth of the decade continued. The high transportation costs to the power plants in New England resulted in NEES paying greater costs for fuel, even factoring in the advantages of seaborne coal delivery transport for the tidewater plants.

Stronger unions resulted in greater labor costs, winterizing transmission lines to handle the climate was more expensive, and higher local taxes than in other regions all added up to a lower net profit for the utility. With the completion of the last plant on the Connecticut River in 1957, there was not another easily exploitable location to create any new hydroelectric station.

Even within the NEES organization, local utility subsidiaries had divergent goals that were at odds with the corporate headquarters' intent. For example, the operators at Narragansett Electric, now a valued NEES subsidiary for over two decades, still had a stubborn streak that at times struggled against higher level direction. This independence was not always inefficient; Narragansett pioneered business practices that diffused into the rest of the company. Company leadership was typically content to let the Providence centered Narragansett Electric as its reliability made up for its other foibles.²⁰⁷ The net result of these issues, related to both the hardware of the system itself as well as the control of the organizations that supported the grid, resulted in costs of up to ten times that of other regions.²⁰⁸

207. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 271-272.

208. *Ibid.*, 157-160.

Narragansett Electric was emblematic of NEES' concerns of electric power demand growing faster than capacity, or at least faster than the company's ability to profit from the increasing demand for electricity. Increased commercial and consumer demand for electric power was calculated to increase more than one hundred percent by 1972, a worrisome figure particularly when utility planners had to ensure that peak power loads could be met.²⁰⁹ Concurrently, the Public Utility Commissions were not excited about increasing the rate tariffs for the company. In 1956, Narragansett Electric applied to the Rhode Island Public Utility Commission for its first rate increase in thirty years. Presenting their case for a raise in rates, the advocates for Narragansett Electric stressed the increased fuel costs, depreciation of assets, cost of new generating plants, and anticipated expenses compared to expected revenues. While appreciative of these arguments, the commissioners were unpersuaded by Narragansett's desires for a healthier rate of return. The firm's conception of the generating capacity required to meet peak loading during the largest demand periods was questioned by the regulator's subject matter experts, who concluded:

In a large measure the respective judgments of the engineers who prepared and submitted studies of separations of Narragansett plant between inter and intrastate business were predicated upon their interpretation of the nature of firm versus interruptible power and the degree which Narragansett's surplus capacity constituted a reserve of power for the entire New England Power System.²¹⁰

209. Ibid., 149.

210. The hearings on the proposed rate increase also included the first public discussion of building an electric generating station on land that Narragansett Electric owned at Rome Point in North Kingstown, RI on Narragansett Bay. The Commission members did not find this part of the discussion enlightening as they considered that it was filled with more assumptions than factual analysis. See State of Rhode Island and Providence Plantation, *Forty-Sixth Annual Report of the Public Utilities Commission of*

The Public Utilities Commission rejected Narragansett's electric rate increase in 1957. Such defeats were not taken well by NEES management or the shareholders. Despite a steady increase in overall plant efficiency and system reliability, the company was spending more money to build greater electrical generating capacity to meet the higher postwar demand for its product, fueled partly by the company's own advertisement campaigns. Household electricity consumption had more than doubled, increasing by almost 1000 kilowatt-hours (kWh) since the end of the war, yet the electric utility had not been able to profit at the same consumer rate of change. Still, New England averaged higher costs than the nation, a fact understood by the Public Utilities Commission.²¹¹

The Lure of Nuclear Power

As a way out of this conundrum, NEES began to consider alternate methods to generate electricity. In the 1950's the appeal of nuclear powered electric generation plants began to entice the electric utility business. This technology, rising from a portion of the research from the Manhattan Project during the Second World War, looked promising to the utility industry for a number of reasons. The plants, powered from the

the Department of Business Regulation for the Year Ending December 31, 1957 (Providence, RI: William R. Brown, Co., 1958): 51-89.

211. Consumption had risen from 911 kWh to 1,900 from 1946 to 1956 though the monthly electric bill to NEES had gone up only \$26.49 from the \$40.82 charge. This still placed New England approximately 16 percent more costly than the national average. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 167 and William D. Shipman, "The Impact of Nuclear Power in New England," *The Journal of Industrial Economics* 14, no. 1 (Nov., 1965): 78.

fission of the Uranium 235 isotope, were estimated to result in a significant reduction in the cost of fuel burned per kilowatt of electricity generated.²¹² With fuel costs in New England already higher than the national average, this estimate was attractive. Larger generating capacity nuclear powered plants might allow greater economies of scale for the utilities, particularly if the smaller companies pooled their resources to build the larger plants. Using higher voltage transmission lines, these plants would be able to transmit more power with fewer line losses, again increasing the profitability of the venture. Linked in to the other regional systems, these plants would provide greater reliability and stability to the electric power grid, particularly in peak power periods. While the initial cost of the plants would be high, pooling the capital required for construction would limit the risk to any one utility.²¹³ Nuclear power was considered merely another heat source; a new way of boiling water to run the steam generators in the station.²¹⁴

The Federal government was willing and eager to support the repurposing of atomic energy out of its destructive mode into one more conducive for economic growth. The Atomic Energy Commission (AEC) had been established in 1946 by President Harry

212. Estimates up to as much as a 74 percent reduction of fuel costs for advanced reactor designs were proposed. When other direct effects were considered a more realistic estimate of 8 percent was proposed. See William D. Shipman, "The Impact of Nuclear Power in New England," *The Journal of Industrial Economics* 14, no. 1 (Nov., 1965): 74.

213. *Ibid.*, 74-83.

214. Nuclear power plants were considered "inherently safe and are designed safe with barrier upon barrier of engineered safeguards," according to the manufacturer. See Eric H. Smith, "Economic and Competitive Factors in the Nuclear Power Industry. Part I," *Financial Analysts Journal* 22, no. 1 (Jan. – Feb., 1966): 117.

S. Truman to promote and manage the “peacetime development of atomic science and technology.”²¹⁵ One of the members of the Military Liaison Committee to the AEC was William Webster. A 1916 graduate of the United States Naval Academy, the Navy had sent Webster to the Massachusetts Institute of Technology for graduate work in naval architecture. He had served in the Navy for twelve years before resigning his commission and returning to the civilian world. After departing the service, Webster had worked as the Vice President of Narragansett Electric, moving to NEES in the early 1940s. During the war Webster had served with the Office of Scientific Research & Development where his talents attracted the attention of senior leadership.²¹⁶ Webster later served as Assistant to the Secretary of Defense (Nuclear and Chemical and Biological Defense Programs) and held other jobs in the Eisenhower Administration. Returning to NEES in 1951, Webster had become a firm advocate of the use of nuclear energy to power the electric industry. Supported by NEES president Irwin Moore, Webster assembled a team of engineers and sent them to various military led nuclear projects to gain practical experience in harnessing the new power.²¹⁷

Webster also coordinated the efforts of other New England utility companies to examine the civilian uses of nuclear power. In this respect he was running with the tide

215. Alice Buck, *The Atomic Energy Commission* (Washington, DC: U.S. Department of Energy Office of Management Office of the Executive Secretariat Office of History and Heritage Resources, 1983): 1.

216. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 106, 123, 131-132.

217. *Ibid.*, 162-163.

of the era as the Federal government was promoting the use of this new technology through new legislation. The Atomic Energy Act of 1954 allowed the civilian ownership of nuclear reactors (though not the uranium fuel) as well as the sharing of technical information and generous licensing regulations, all of which opened the gates for the civilian nuclear power industry.²¹⁸ Gaining support of other neighboring utility companies, Webster formed Yankee Atomic Energy Company in 1954 to take advantage of this opportunity. NEES acquired a thirty percent share by contributing twenty million dollars in the company's formation, though the other utility companies were willing to let NEES manage the nascent firm. Webster helped synchronize the research efforts of the AEC, the Westinghouse Corporation, one of the nation's leading nuclear technology firms, and NEES itself to assist the construction of the first atomic power plant in Shippingport, Pennsylvania. This design was a modified U.S. Navy submarine pressurized-water reactor and, though experimental, provided significant construction experience to all parties. Additionally, the state governments all passed legislation that

218. Senator John O. Pastore (D-RI) was one of the sponsors of nuclear energy legislation in the nation. A former claims adjuster for the Narragansett Electric Company in the 1920s, Pastore had ascended the Rhode Island political ladder and served as Governor from 1945-1950 and Senator from 1950-1976. See Alice Buck, *The Atomic Energy Commission* (Washington, DC: U.S. Department of Energy Office of Management Office of the Executive Secretariat Office of History and Heritage Resources, 1983): 6-7, Richard Goldstein, "John Pastore, Prominent Figure in Rhode Island Politics for Three Decades, Dies at 93," *New York Times*, July 17, 2000, Ruth S. Morgenthau, *Pride Without Prejudice, The Life of John O. Pastore* (Providence, RI: The Rhode Island Historical Society, 1989), 23, and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 163.

paralleled the federal ordinances and were highly favorable to these endeavors.²¹⁹ Thus by 1957 when Yankee Atomic Energy was ready to build its own nuclear power plant, the design and construction teams from the various companies involved in the Shippingport project were more capable of building it. The nuclear power plant was built in Row, Massachusetts, not far from the NEES monitoring team at the Harriman Station and adjacent to important transmission lines. Finished ahead of schedule and under budget in 1960, the station provided 145 MW of electric power to the regional grid, later increasing its capacity to 175 MW.²²⁰

The future of nuclear power in New England looked bright following the success of this construction, but NEES did not follow it up with its own fully owned plant. Despite Webster's success and optimistic predictions for nuclear power in the world, NEES did not push this initiative for another decade.²²¹ Other nuclear power plants being constructed in New England gained financial and engineering support from NEES, but

219. Rhode Island passed its Atomic Energy law in 1955 establishing an Atomic Energy Commission. Massachusetts only passed a law regarding radiological safety but permitted the locating of nuclear plants in its boundaries. See William A. W. Krebs and Robert L. Hamilton, "The Role of States in Atomic Development," *Law and Contemporary Problems* 21, no. 1 (Winter 1956): 194-195.

220. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 163-167.

221. In 1966, at the 10th General Session of the International Atomic Energy Agency, Webster would predict that "In a period of just over thirty years we look forward to providing a world power system that is six to eight times larger than all we have in the world to-day a group of systems that represent an expenditure of over one trillion dollars. This is a measure of the huge field that our developing nuclear plants are undertaking to share." "Atomic Energy in this Century and the Next," *IAEA Bulletin*, <http://www.iaea.org/Publications/Magazines/Bulletin/Bull084/08401200712.pdf> (accessed March 29, 2014).

the company did not attempt to build one for its own portion of the electric power grid during this period. The company thought that the licensing process for the next generation of nuclear plants would be lengthy and other types of plants might be more profitable.²²² NEES followed a course of action in the next decade that favored integration with other utilities as opposed to blazing a trail of technological innovation that its initial success in the nuclear power plants might have suggested.²²³ Instead, the company mimicked actions from its earlier successes, confident that the same actions in the future would guarantee growth and profits.

Into the 1960s

The actions of NEES during the 1960s belied any concern for future perturbations in their business model. The Insull “build and grow” method of creating larger electrical demand from industry and consumers while simultaneously building larger and more efficient power plants was continued. Marketing leadership in the company pushed their salesmen to advocate all electric heating in residences and commercial properties, providing lower rates for those dwellings. With revenue from residential electrical loads growing at seven to eight percent per year, such marketing was both effective and profitable. The national economic prosperity of the early 1960s also permitted industry

222. NEES acquired shares in nuclear power plants in Connecticut, Vermont and Maine, all of which came on line in the late 1960s and early 1970s. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 182.

223. NEES was not considered one of the top technological innovators in electric power generation during the period 1950-1970. See Bruce A. Smith, “Technological Innovation in Electric Power Generation, 1950-1970,” *Land Economics* 50, no. 4 (Nov., 1974): 336-347.

to spend more on electricity which added money to NEES's bottom line and assisted the company's stock valuation.²²⁴

Increasing load still required an increased ability to meet the demand, which in turn required building plants of greater capacity and efficiency. In the early 1960s NEES began construction of two new electric power plants on Brayton Point on Mount Hope Bay, an estuary of Narragansett Bay, near Somerset, Massachusetts. The new facilities were designed to be the largest and most efficient electric generation plants in the NEES inventory. The Brayton Point projects were lauded as cutting edge designs with numerous "firsts" in electric plant technology.²²⁵ When completed in 1964, each plant could produce 250 MW of electric power, eclipsing the Salem Station capacity by fifty percent. The plants were ten percent more efficient as well, making them amongst the most efficient in the nation. This new capacity allowed NEES to retire less efficient plants and to place the stations at Lynn and Worcester, Massachusetts in reduced status. Fuel transportation costs could also be reduced by bringing the coal in by sea from other parts of the nation or foreign sources. In the mid 1960s a further addition was ordered to be constructed at the same location. Brayton Point #3 promised much greater capacity (650 MW) and efficiency than the previous plants when it came on line in 1969 but reliability issues would significantly degrade the profitability of this facility.²²⁶

224. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 169-171.

225. "Four "Firsts" At Brayton Point," *Technology Review* (November, 1964): 1.

226. NEES considered building the new power plants at their Rome Point holdings in Rhode Island but shifted to Massachusetts. The combination of land disputes

Other power plant construction began during the decade to provide the capacity required to keep up with the expanding demand though they were capital intensive would not be available until the early 1970s. The Brayton Point #4 station and Salem Harbor #4 station were designed to provide 430 MW of power to meet peak electrical loading using coal-fired boilers. A pumped storage hydroelectric station at Bear Swamp on the Deerfield River was licensed in 1969. This station used relatively inexpensive electric power to pump water to an elevated reservoir at night when electric load on the grid was at a minimum. During the day, the direction of water flow was reversed and the pumps acted as electric turbine generators, producing power for the hungry system. When completed in 1974, the plant would provide an additional 600 MW of power to the grid. Finally new transmission lines were built to bring the power to the required locations for distribution. Coordinating with other local and regional utilities, NEES assisted in the construction of 345 kV high voltage transmission lines linking the major generation stations in the area. Interconnections with other utilities allowed the transmission of excess power out of or into the New England area as the demand varied. These projects were important to NEES to meet demand, but cost overruns on these projects ate into corporate profits and construction delays impacted system reliability and flexibility.²²⁷ In

with local owners, higher state taxes and the memory of Rhode Island's Public Utility Commission denial of a rate increase in 1957 caused a reevaluation. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 172, 180, 275.

227. The Brayton Point #4 station cost \$38 million more than the essentially same Salem Harbor plant #3 and was year late in starting to produce power due to legal delays from the new environmental legislation. The Bear Swamp plant cost over four times the initial \$30 Million estimate though did come on line as contracted. See John T.

the meantime, in an effort to reduce fuel costs, the coal-fired plants were altered to burn oil instead. With a surplus of oil on the market from the Middle East oil fields despite the turmoil from the Six Day War, the decision in 1967 by NEES executive Guy Nichols to shift to oil burning was highly beneficial to the company. Oil was a cleaner fuel to burn, was easier to transfer and use in the electric power plants, and led to NEES having the least expensive fuel costs in the area.²²⁸

Other methods were applied to increase the efficiency of the system. Company management duties and responsibilities were reorganized in 1960 when Webster became the NEES president after Moore had moved up to chairman. The new organization was structured along functional lines with central control but authorized the regional retail power providers to take action to solve local problems. This permitted standardized doctrine for the local service providers in the operation of the grid components. Later in the decade, Webster empowered the NEES vice-presidents with greater authority and responsibility. New faces rose to leadership positions during Webster's shakeup. Guy Nichols, a WPI graduate, was placed in charge of day-to-day operations in addition to his responsibilities for engineering, construction and labor relations. The company began to use a new technology, the digital computer, to examine the efficient operation of its

Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 182-183, 185, 277.

228. Despite the frequent turmoil in the Middle East, production actually increased eight percent following the 1967 conflict. See Daniel Yergin, *The Prize, The Epic Quest for Oil, Money & Power* (New York: Simon & Schuster, 1991): 558, and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 180.

components within the overall system. At first, the company computers were used as an accounting tool for billing and inventory control, but as operators became familiar with the capabilities, other portions of grid operation were analyzed. By the end of the decade NEES had moved its system headquarters to Westborough, Massachusetts, close to its computing facility.²²⁹

Externally, NEES looked at possible mergers to increase its efficiency and profitability, efforts which were costly in time and ultimately unsuccessful. As the company's financial underpinnings improved during the decade, it looked at neighboring utilities as possible merger partners in the hope that such fusion would lower administrative costs and provide economies of scale that would increase overall profits. Initially NEES president Webster was more interested in promoting regional consensus on nuclear power plants, a delay which cost the opportunity to merge with adjoining Western Massachusetts Electric (WME). Spurned in its initial courtship, WME executives turned to other Connecticut utilities, Hartford Electric Light and Connecticut Light & Power to form a new conglomerate, Northeast Utilities, in 1965. NEES objected to this merger with the SEC and even countered WME's plans with a lucrative offer, but the SEC denied NEES's protestations and WME rejected NEES's bid.²³⁰

Defeated in its efforts to expand to the west, NEES looked east to the Boston metropolitan area and Cape Cod. Boston Edison, a company with long term ties with NEES was attentive, and in turn generated interest from the new Northeast Utilities to

229. *Ibid.*, 174-178.

230. *Ibid.*, 186-187.

form a super company that would power the region. After Northeast Utilities dropped out of merger talks in 1966, Eastern Utilities Associates joined in. With service to northern Rhode Island and the Fall River area as well as Boston, Eastern Utilities Associates was a good fit with the other two companies. Stockholders gave an initial approval to the merger and the Internal Revenue Service signaled their endorsement, but the SEC and local governments were not impressed by the proposed union. The municipalities feared the loss of control over the local retail power companies from the new behemoth and filed numerous suits against the merger with the SEC. The legal struggle lasted into the mid 1970s before the SEC would conditionally permit the merger. By then the interests and finances of the various signatories had diverged and the companies dropped the matter rather than renegotiate the deal.²³¹

System Catastrophe: The Great Northeast Blackout

In the interim the electric grid and the companies operating it had received one of the largest shocks to the system. In 1965 the electric power grid experienced the largest loss of power in its history. Commencing at approximately 5:16 PM on November 9th of that year, an estimated 30 million people in Canada and the United States lost power for periods of a few minutes to more than half a day. The outage covered 80,000 square miles in the greater northeastern area, including all of Rhode Island, New York, Massachusetts, Connecticut, and portions of New Hampshire, Vermont, Pennsylvania, New Jersey and Ontario. The temporary power loss involved a total of 28 electric utility

231. Ibid., 186-187.

companies in the United States and Canada which had various levels of connectivity to provide electric power in the area.²³²

The proximate cause of the event was the opening of a single circuit breaker on a single high voltage (230kV) transmission line in Ontario, Canada that sent power into the United States. The resultant electrical transient on the Canadian lines, as that portion of the grid attempted to regain equilibrium, caused additional circuit breakers to open, dropping over 550 MW of electric power from the system. As the other electric generating stations in the United States attempted to pick up the load, the instability in the system triggered the automatic opening of further circuit breakers throughout the region. Within less than a minute the cascading electrical transients caused a loss of power being transmitted to New York City and Boston. Operators in New York City at the Convex power station manually opened the transmission lines to NEES through Connecticut, causing some NEES plants to shut down. By 5:21 PM most of the electric power grid under NEES auspices had lost power and, along with most of the northeast United States, went black.²³³

Throughout the area, transportation systems were paralyzed as subways lost power and stop lights went out. Hospitals lost commercial power and many did not have a backup power supply. Communications, television stations and telephone systems were interrupted, and public services such as water and sewage systems were disrupted. Even

232. Federal Power Commission, *Northeast Power Failure, November 9 and 10, 1965. A Report to the President by the Federal Power Commission December 6, 1965* (Washington, DC: Government Printing Office, 6 December 1965): 2.

233. *Ibid.*, 53-56.

national defense installations were affected, though these typically had additional sources of power to stay in operation. In Massachusetts, prisoners at the Walpole State Penitentiary rioted, causing 75 thousand dollars worth of damage to the facility.²³⁴

Rhode Island was deenergized with the rest of the northeast. As power plant and system operators struggled to determine what had occurred, the state government responded with equal inertia. The Republican governor of the state, John H. Chaffee, was on a plane over the Pacific Ocean, the lieutenant governor was in Boston and equally out of communication, the next in line, the president pro-tem of the senate, was in Puerto Rico, while the fourth individual in the line of authority was in Hawaii. The first deputy secretary of state was in Rhode Island but was ignorant of the fact he was in charge. Eventually the governor's executive secretary took charge and directed emergency actions on Chaffee's behalf.²³⁵

In New England, NEES operators worked rapidly to restore electric power to the area. As operators were able to shut open circuit breakers, power was transmitted from the Harriman hydroelectric plant in Vermont down to Worcester, which permitted the restoration of the Webster Street station by 6 PM. The plant was fully operational by 7:33 PM. At Brayton Point, both plants dropped off line during the initial surge conditions. The #1 station was back on line by 6:25 PM but the #2 station was not

234. Ibid., 37-40.

235. "Govt. Also Lacked Power," *Providence Journal*, November 10, 1965.

restarted until the next day.²³⁶ In Providence, the lack of an emergency generator delayed the restoration of power until one could be sent in from Millbury, Massachusetts. Other regional utilities had spare power and once the interconnecting links had been restored, the rest of the city was reenergized. By 10 PM most of the electric power grid had been restored in Rhode Island, though Boston and New York City took longer to regain all of their power.²³⁷

Calls for an investigation into what had gone wrong began even before the lights were restored in the northeast. President Lyndon B. Johnson directed the Federal Power Commission to investigate the power outage and an advisory panel to the Commission delivered their report less than a month later. The panel members worked diligently with members of the utilities to identify the root causes of the power outage as well as draw the necessary conclusions from the events to make purposeful recommendations to prevent a recurrence of the event. The investigators resolved both the technical and the human portions of the blackout, from the initial cause of the transient in Canada where a circuit breaker had tripped due to an incorrect setting to the poor response of the operators in New York City that had resulted in the complete shutdown of the system.²³⁸

The investigation suggested that the reliability of the electric power grid was not as high as the utility managers desired. The linking of numerous electrical generators all

236. Federal Power Commission, *Northeast Power Failure, November 9 and 10, 1965. A Report to the President by the Federal Power Commission December 6, 1965* (Washington, DC: Government Printing Office, 6 December 1965): 32.

237. *Ibid.*, 59-60.

238. *Ibid.*, 17-20.

operating at the same voltage and frequency specifications was not sufficient to counteract the transients experienced on November 9, 1965, or that the electric power grid was likely to see in the future. While the reserve capacity of the on line generators might have suggested an ability to meet the power demand when other generators began to drop off line, in reality these stations could not come up to speed in time to avert the casualty. The “pooling” of power by the utility companies through interconnection of their individual systems did make the system more reliable but additional work was required. Larger capacity transmission lines and larger plants were also desirable, particularly nuclear power plants, to provide greater flexibility to the system and permit automatic emergency assistance.²³⁹ The panel recommended that the utility companies take action to create an “integrated and coordinated power pool” by improving the transmission networks between the regional companies, led by a “unified planning group.”²⁴⁰ While more studies were required, the panel recommended that the utilities err on the side of reliability when balancing this against other economic factors. The panel also made a number of recommendations regarding establishing back up power supplies for hospitals, transportation and communications systems as well as conducting additional training for electric power operators.²⁴¹

239. This may have been overstating the case for the utility of nuclear power plants for power pooling. None of the regional nuclear power plants were on line at the time of the casualty thus determining if their presence would have mitigated the casualty was not possible. Federal Power Commission, *Northeast Power Failure, November 9 and 10, 1965. A Report to the President by the Federal Power Commission December 6, 1965* (Washington, DC: Government Printing Office, 6 December 1965): 20-21, 35.

240. *Ibid.*, 43-44.

241. *Ibid.*, 43-45.

Utility companies took these lessons to heart, as the electric power grid had failed in an unexpected manner and faster than the automatic safety devices or human operators could effectively counter. The electric utility companies had considered the electric power grid to be too large with many diverse power generation sources to be threatened in the manner that caused the Northeast outage. The alleged reliability of the system had been shown to be less than advertised and immediate actions were the order of the day. Additional automatic low frequency circuit breaker modifications were installed to protect the electric generators from overload conditions. Emergency diesel generators were installed at the Brayton Point and Salem Harbor stations to permit those plants to be restarted independent of other grid facilities. Regional utilities worked together to install higher capacity transmission lines to safely carry a greater load. The new 345 kV transmission lines became the new standard for the area.²⁴²

Perhaps more importantly, the regional utilities began to work more closely together to address the power pooling recommendations of the Federal Power Commission. In the late 1960s the regional utilities began to develop procedures and technologies that permitted the more continuous monitoring of the electric grid operating parameters of electric load and frequency. To some extent the utilities had always had this capability, but under the pressure from the federal government to prevent another regional black out, the companies were more amenable to both share information and electric power with their adjacent competitors. New computer technology, connected

242. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 192, 279.

high voltage power lines and consolidated command post allowed the operators to shift power between the various utility companies to meet dynamic load conditions.²⁴³ In 1967, the region's utility companies established the New England Power Exchange (NEPEX). NEPEX had the authority and responsibility to coordinate the power transmission of four subordinate dispatching centers. Connecticut, Maine and New Hampshire each had their own dispatching center, while Massachusetts was divided between the Northeast Utilities' Connecticut dispatching center and NEES' center in Westborough, MA. This station, known as Rhode Island-Eastern Massachusetts-Vermont Energy Control (REMVEC), controlled electric power transmission in Rhode Island, Eastern Massachusetts and Vermont.²⁴⁴

This new setup was initially open to possible abuse by the utilities contributing to the region's electric power. Companies avoided operations of lower efficiency plants to cover dynamic loads, preferring to let the other utilities pick up the costly requirements. Cost and financial transactions arguments bedeviled the leadership of the larger utilities, while the smaller ones attempted to play off the larger ones to their advantage. While the operators at the regional dispatch centers could make local decisions on the grid, the

243. David B. Sicilia. Electric Power and Electrification. In *The Encyclopedia of New England*, ed. Burt Feintuch and David H. Watters, 851. (New Haven, CT: Yale University Press, 2005).

244. This station was allegedly "bomb proof." Given the U.S. government's own bleak assessment of the survival of the electric power grid under Soviet nuclear attack, this description may have been optimistic. See U.S. Department of the Interior, *Vulnerability of Electric Power Systems to Nuclear Weapons* (Washington, DC: Government Printing Office, 1965), and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 189.

companies still had to balance the books and the load at the end of the day. These concerns would lead to the formation of the New England Power Pool (NEPOOL) in 1971 with greater coherence amongst its members to deal with power transmission issues and decisions throughout the region. NEPOOL had authority from the member electric utilities to direct the most efficient plants to be started up to meet emergent electric power demand. Less efficient electric power stations would only be operated if demand exceeded supply. This was more efficient than the previous NEPEX methods but still encouraged electric power utilities to minimize construction of any excess capacity electric power generation as this would be rarely used.²⁴⁵

End of Decade Concerns

As the end of the 1960s approached, the operators and owners of the electric power grid in southeastern New England could look with some satisfaction on their accomplishments over the past decades. Electric power was readily available to the population at a manageable price. A wide range of electric power generating stations could provide safe and reliable power to all the commercial and residential loads throughout the region. Whether the customer wanted to run a vacuum or a blast furnace, the power was available. The compactness of the area allowed for relatively short transmission lines between the numerous power plants, and the hydroelectric plants and steam powered generators were ready to make up for each other's advantages and

245. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 191-195 and ISO New England, "History, ISO New England," http://www.newengland-rto.net/aboutiso/co_profile/history/index.html (accessed June 14, 2014).

disadvantages. The burgeoning interconnectedness between utilities promised to make the grid even more reliable and potentially even more profitable.

Within the state of Rhode Island, a total of five electric utility companies had survived to reach the 1960s. While the Narragansett Electric Company (a NEES subsidiary) was the largest company providing power to the greatest area and population, smaller companies such as the Newport Electric Corporation (supplying power to Aquidneck Island), and the Blackstone Valley Electric Company (providing power to communities in the Pawtucket area) were still viable companies though with smaller horizons.²⁴⁶ With its interstate assets from NEES, Narragansett Electric was still the first amongst equals. The Blackstone Valley Electric Company was owned completely by Eastern Utilities Associates while Newport Electric was a private firm. Even smaller companies provided power for niche markets. The Block Island Power Company was responsible for that island's electrification, while the Pascoag Fire District purchased power from Blackstone Valley and distributed it to customers in the Pascoag and Harrisville Fire Districts.²⁴⁷

Rhode Island consumers could also take some satisfaction in the ready access to this power source. Even if electricity costs in New England were higher than the national average they were not excessive. A typical family living in Providence might pay 14.40

246. Narragansett had sales (\$59.95 million) of over three times that of Blackstone Valley (\$18.97 million) with Newport (\$7.09 million) less than half of Blackstone Valley. See State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission and the Division of Public Utilities and Carriers for the Years 1969 and 1970* (Providence, RI: Wm. R. Brown Printing Co., 1971): IX-X.

247. *Ibid.*, III-IV.

dollars a month to the Narragansett Electric Company for their electric bill, while a Newport resident would pay slightly higher (15.95 dollars) to the Newport Electric Corporation.²⁴⁸ With a median income in the state of \$8,617, the electric bill was within the means of the average citizen.²⁴⁹

On the other hand, there were rising economic, technical, and regulatory challenges to the standard methods of operating the electric power grid, issues that would threaten the normal mode of operation of the utility companies. While previously any one of these issues would be detected, analyzed and resolved, the combination of forces would prove to be highly disruptive to the standard methods of operation that had been successful. The effective doctrine of managing the new electrical generating or transmission technology, or surmounting the financial abyss of the Great Depression, or disruptive tendrils of federal regulation from the Public Utilities Holding Company Act, was going to be tested in a new environment, and, like any doctrine, was going to be found lacking if strictly applied to scenarios that it was not designed to handle. As always, perceptive and insightful analysis would be required to surmount the challenges and adapt to the new conditions. Electric utilities with managers who could properly analyze the changing environment and adapt to the new conditions were better poised to

248. Federal Power Commission, *Typical Electric Bills* (Washington, DC: Government Printing Office, 1970): 90.

249. United States Census Bureau, Table S1, Median Household Income by State: 1969, 1979, 1989, and 1999, <http://www.census.gov/hhes/www/income/data/historical/state/state1.html> (accessed June 14, 2014).

survive. Those lacking this vital component, wedded to the past, were more likely to suffer.

Economically, the combination of poor financial policies and the expensive stresses of the Vietnam War and domestic programs had caused a relative decline in the expansion of the national economy and an acceleration of the rate of inflation. The nation's gross national product expansion rate declined to a mere 2.6% as the decade ended from more torrid rates in the mid 1960s. In the 1950s and through the mid 1960s the inflation rate had been slightly over 2%. As the 1960s ended, the inflation rate had risen to 5%. This led to higher financial costs for the capital intensive utility companies, costs that were hard to bear. The prime rate from banks approached 8% in 1969 even as the economy was about to enter a recession.²⁵⁰ With long lead times between ordering and paying for expensive components of their power plants and those plants coming on line and actually producing a profit, industry managers found their bottom lines being squeezed even more tightly.²⁵¹ Narragansett Electric had to pay these higher costs when it issued bonds in 1970 to meet its short term debts and pay for capital expenditures.

250. *Economic Report of the President, 1980* (Washington, DC: Government Printing Office, 1980): 207, 278.

251. The manager of the Seabrook, New Hampshire nuclear power plant reported in 1985 that the interest related costs of the plant had risen from 44% in 1973 to 87% by 1985. Construction for this plant began in 1972 but the plant did not begin operation until 1990. See Richard F. Hirsh, *Technology and Transformation in the American Electric Utility Industry* (1989. Reprint, Cambridge, UK: Cambridge University Press, 2002), 110.

Smaller companies such as Blackstone Valley Electric and Newport Electric typically had to pay higher rates when they issued bonds as both had to in 1970.²⁵²

While inflation and recessions were national issues, they also affected the utilities in New England, particularly when combined with technical problems of the most recent advances in power generation technology. Toward the end of the 1960s, the companies supplying the major electrical plant components to the utilities found that their research and development was not on par with their advertising. Major suppliers such as Westinghouse and General Electric promised their customers that their latest electric turbine generators and steam plant components, though more expensive, would provide greater overall thermodynamic efficiency in the steam plants. These components required higher operating temperatures and pressures to achieve these efficiencies and had more exacting tolerances for all components. While such promises looked good in theory, and proved irresistible to the utilities throughout the country which were wedded to the doctrine of “grow and build,” in practice the new devices failed to deliver. The materials the machines were constructed from could not withstand these higher temperatures and pressures, and often required costly shutdowns and repairs.²⁵³ Scaling up of previously effective technology, particularly in the turbine generators, also proved less effective than anticipated. The manufacturers had replaced their conservative design

252. State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission and the Division of Public Utilities and Carriers for the Years 1969 and 1970* (Providence, RI: Wm. R. Brown Printing Co., 1971): 275-277, 387-390, 417-428.

253. Richard F. Hirsh, *Technology and Transformation in the American Electric Utility Industry* (1989. Reprint, Cambridge, UK: Cambridge University Press, 2002), 89-93.

methods of “design by experience” with one of “design by extrapolation,” rapidly constructing up-scaled components of the older power plant models with little pre-production testing. This method had poor results with the newer machines failing at a much higher frequency than the more conservatively designed ones.²⁵⁴ Newer plants generating 600-800 MW of electric power required three to five times as much corrective maintenance and repair work than the smaller 200 MW plants. These unplanned outages were due to both poorly designed components as well as the sheer complexity of the larger plants, neither of which were properly considered when the plants were constructed.²⁵⁵ NEES was not immune to these problems. The Brayton Point high pressure electric turbine generators made by Westinghouse and installed in the number three plant proved particularly problematic, requiring expensive repairs and rarely meeting the advertised maximum performance.²⁵⁶

The threat of new and more restrictive regulatory regimes also loomed on the horizon for the utility industry. The growing environmental movement in the United States was generating its own impetus and beginning to cause concern within the electric utility industry. Rachel Carson’s *Silent Spring* energized a new cohort of interested citizens who held divergent views on the benefits of capital intensive technological

254. Ibid., 47-48, 62-63.

255. Ibid., 96-98.

256. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 180.

enterprises.²⁵⁷ A series of highly publicized events maintained the pollution hazards of modern technological society in the national consciousness, from the detection of radioactive isotopes in the atmosphere from the fallout of nuclear weapons testing to the infamous fire on the Cuyahoga River in Cleveland, Ohio resulting from oil and chemical runoff from nearby industries.²⁵⁸ In southeastern New England, pollution in Narragansett Bay from Providence industrial activity, both from the city's electric power plant and other firms, became more noticeable as people started to see it as less as the cost of economic progress and more as a health hazard to the community.²⁵⁹ An oil spill from a ship in 1960 deposited over 420,000 gallons of fuel oil south of Jamestown at the mouth of the bay. Other water pollution from less drastic oil releases from ships bringing coal and oil to the Providence electric plants contributed to a rise of hydrocarbon sediment on the sea floor.²⁶⁰ The public became more cognizant of earlier industrial activity that had affected the watershed as well. Investigators found high concentrations of chemical pollutants from the formerly vital jewelry and textiles industries as well as organic wastes

257. Richard F. Hirsh, *Technology and Transformation in the American Electric Utility Industry* (1989. Reprint, Cambridge, UK: Cambridge University Press, 2002), 47-148.

258. Steven Stoll, *U.S. Environmentalism Since 1945*. (Boston, MA: Bedford/St. Martin's, 2007): 156-157.

259. Providence had its own problems with air pollution from the NEES power plant at the Manchester Street Station. James T. Kaull, "Clean Air Linked to Political Action," *Providence Journal*, April 21, 1970.

260. Jeffrey L. Hyland, *A Review of Oil Polluting Incidents In and Around New England* (Narragansett, RI: U.S. Environmental Protection Agency, 1977): 12-13.

from poorly functioning wastewater facilities.²⁶¹ Burning coal in the industrial facilities around the state also deposited pollutants in Narragansett Bay, as well as soot and particulate around the state.²⁶²

As a national consensus emerged regarding the severity of pollution affecting the country's atmosphere and waterways, legislation was passed by Congress to address these concerns. A series of laws, starting with the Air Pollution Control Act of 1955, the Clean Air Act of 1963, and the Water Quality Act of 1965 were positive indications that the population was interested in limiting the pollution associated with modernity. In 1970, Congress issued a more stringent series of amendments to the Clean Air Act, created the Occupational Health and Safety Administration and established the Environmental Protection Agency (EPA) as result of this continued interest.²⁶³

Initially these concerns had been viewed as more of an anti-pollution regimen, anxieties that the utility companies were not averse to addressing. Burning oil, as well as being more efficient, had less particulate air pollution. NEES had incorporated noise reduction assemblies for its substations and had oil booms positioned around ships to

261. Rhode Island Department of Environmental Management, *Narragansett Bay Water Quality: Status and Trends* (Providence, RI: Rhode Island Department of Environmental Management, 1998): 7-12.

262. Scott W. Nixon, "A History of Metal Inputs to Narragansett Bay" (Graduate School of Oceanography paper, University of Rhode Island, 1990), 37-40.

263. Steven Stoll, *U.S. Environmentalism Since 1945*. (Boston, MA: Bedford/St. Martin's, 2007), 156-157.

restrict any oil spills.²⁶⁴ NEES was less receptive to other local concerns. Proposals to run new higher voltage (345 kV) lines from the Brayton Point plant to a substation in Ayer, MA, northwest of Boston, ran into legal problems in 1965 when towns resisted NEES's plan to build large towers on the rights-of-way. The towns desired the utility to run the lines underground, which was feasible, but only at a much higher cost. NEES balked and spent the next three years fighting the legal challenges before rejecting that design effort and building a different route through Millbury, MA.²⁶⁵

While NEES took some action to resolve regulatory deficiencies associated with these new legal regimes, these issues appeared more as noise in the system than indications of a growing environmental awareness in the country. To the engineers of the time, air pollution from industrial activity, and especially the generation of electricity, seemed to be a necessary cost to achieve the high standards of living the nation enjoyed. The demand for electric power was increasing every decade, in part to power the increased consumer use of new electrical appliances such as color television sets, dishwashers and air conditioners, even as electric heating was being installed in new homes. The air pollution caused by burning fossil fuels as well as the "esthetic pollution" from more electric power transmission lines and electric substations caused angst from conservationists who attempted to limit their spread.²⁶⁶ Such electric power generating

264. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 280.

265. *Ibid.*, 194.

266. Gordon S. Friedlander, "Power, Pollution and the Imperiled Environment," *IEEE Spectrum* (November 1970): 42-43.

plants did create smoke and soot, but previously these indications had accompanied economic growth and had been welcome.²⁶⁷ The smoke plume included toxins such as particulate matter containing heavy metals, carbon dioxide (CO₂), sulfur dioxide (SO₂) and various oxides of nitrogen, all of which were hazardous to human health. Since the plants burned thousands of tons of coal or oil each day, the amount of such waste products produced was dramatic. An efficient 1000 MW plant could easily produce 30,000 tons of CO₂, 600 tons of SO₂ and 80 tons of NO₂ each day.²⁶⁸ While electrostatic precipitators might limit most of the particulate exhaust from the smoke stacks, the enormous exhaust volume still meant tons of undesirable toxins would still be produced. None of the exhaust gases would be mitigated.²⁶⁹ Nuclear power plants were not immune to producing pollutants, though they discharged small amounts of low level radioactive effluent as well as large amounts of hot water that had to be cooled.²⁷⁰

The increasing public awareness of pollution as well as the pollution abatement technology required to minimize power plant exhaust products were known to the electric power grid operators. Engineers, contemplating these issues using economic analysis, suggested technical solutions to the problems. “Increasingly there is but one way into the

267. Bruce E. Kester, “Air Pollution – Rule and Regulation,” *IEE Spectrum* (May 1969): 238.

268. Philip Sporn, “Our Environment – Options on the way to the Future,” *IEEE Spectrum* (May 1971): 52-53.

269. Bruce E. Kester, “Air Pollution – Rule and Regulation,” *IEE Spectrum* (May 1969): 239-240.

270. Philip Sporn, “Our Environment – Options on the way to the Future,” *IEEE Spectrum* (May 1971): 52-53.

future - the technological way,” was a common theme when considering pollution issues.²⁷¹ Since elimination of pollution was impossible regardless of the means of electric power generation, the public needed to use a cost-benefit analysis to evaluate what level of abatement they would be willing to pay for. Thwarting the actions of individual polluters was not considered possible so society as a whole would be forced to respond to the problem.²⁷²

Solutions were proposed, from better electrostatic precipitators on power plant smoke stacks to siting plants further away from population centers. Philip Sporn, a former chief executive officer of the American Gas and Electric Company and insightful observer of the electric power industry, noted these changes but warned that pollution abatement would be expensive and take a long time to fully implement. Natural gas was recognized to be a much cleaner fuel than coal in terms of toxic materials released into the atmosphere, though burning it would still generate CO₂. Nuclear power was generally considered to be a safe alternative with minimal pollution problems and worth the cost. Niche sources of energy, such as tidal flows, geothermal, or the wind and the sun were dismissed as being too small and unreliable to support the current, let alone the future demand for electric power.²⁷³ Cleanup of existing polluted areas would take a decade or more and cost hundreds billions of dollars. Any major deviation from the

271. Loren Eiselay, quoted in Philip Sporn, “Our Environment – Options on the way to the Future,” *IEEE Spectrum* (May 1971): 56.

272. Bruce C. Netschert, “Air Pollution and Electric Power,” *IEEE Spectrum* (July 1969): 71.

273. *Ibid.*, 75, 77.

current setup of electric power generation, transmission and distribution would take a generation to achieve and cost even more. Such a drastic course change would require immense studies and a national effort to achieve such alterations in the construction and operation of the electric power grid. With the prospect of continued growth and demand for electric power, such proposals were not considered seriously even as the utilities were on the verge of technological culmination.²⁷⁴

Theory vs. Practice: Eighty Years of Progress for the Electric Power Grid

Judging the over eighty years of progress and growth of the electric power grid in southeastern New England as more indicative of either technological determinism or momentum is not simple. Both theories of the development of advanced technology systems are able to take the presented data and fit the observations into the range of behavior the theories propose to explain. Equally, there are events during this period that fall outside of either theories' best fit curve resulting in some cognitive dissonance to accept that they are worthy of inclusion at all.

274. Sporn suggested the numerous lines of effort to better comprehend the scope of the new problems, including further investigation of the electric powered vehicle, enhanced research on nuclear power, burying transmission cables and other measures. Some of his population control suggestions, while in line with the budding environmental movement, were more extreme. Despite his position as one of the institute's leading thinkers and an industry giant, Sporn took considerable criticism for these and other proposals and criticisms of the electric power industry. He was not always correct but he was willing to think through possible problems and propose solutions, even unpopular ones. See Richard F. Hirsh, *Technology and Transformation in the American Electric Utility Industry* (1989. Reprint, Cambridge, UK: Cambridge University Press, 2002), 175-177, 251, and Philip Sporn, "Our Environment – Options on the way to the Future," *IEEE Spectrum* (May 1971): 55-58.

The narrative of growth of the electric power grid is often presented as a linear process, at least when viewed in terms of technology. Here, the smaller firms led by creative entrepreneurs and insightful technicians built a progressively more capable system of generating, transmitting and distributing electric power throughout the region. As the technology improved to permit greater amounts of electric power to be transmitted longer distances, the local firms coalesced into a smaller number of regional electric power utilities. The pinnacle of this evolutionary consolidation was the mammoth holding company, which directed the business activities of numerous electric utilities at a national level. Eventually political concerns caused the break up of the electric utility holding companies, with the resulting businesses more focused on the maintenance, operation and construction of the electric power grid.

The New England Electric System emerged from this period as a capable and efficient organization led by a cohort of individuals well tested in surmounting the extreme challenges of the Great Depression and powering the required industrial production of the Second World War. Its underlying ethic of efficiency and engineering excellence was well inculcated in the membership of the company. Infused with this ethic and with the experience of successive technological achievements, even harnessing the atom to energize the electric power grid, this confident veteran group could be excused some of their exuberance.

Proponents of either model of technological development can claim this narrative falls within their respective theoretical construct. Certainly Mumford would not be surprised by the development to this point. Noting the electric power grid's growth, Mumford observed that modern society's functions were supported by new technological

networks, chief among them the electric power grid. The unification of the various smaller and larger electric utility companies to power the collective system was a logical consequence of the technical limitations and advantages of the different facilities:

The electric power grid, in contrast, is rather a network of power plants, some big, some small, some worked by waterpower, some by coal, scattered over a large area, often thousands of square miles. Some of these plants by themselves could supply only their immediate community, others have greater range.²⁷⁵

Mumford's description of the electric power grid correlates well with NEES's actions to build and buy a variety of electric power plants in order to attain greater system reliability and efficiency, and hence profitability. Mumford was also reflexive on the ability of the electric power grid to transmit electric power to where it was desired, irrespective of preexisting urban structures. Much like a large library system that allows users to borrow books from any authorized branch, users of the electric power grid could receive power from any power plant once they were connected to the system itself.²⁷⁶ This system construction permitted the diffusion of economic activity beyond the former urban locations, which corresponded to the reduction of Providence's economy as the textile industry moved south.

Mumford was less coherent on how the electric power grid would permit the decentralization of human control. In his earlier works he conjectured that advanced technology systems might permit a "new urban order" including two-way political intercourse between the humans controlling these systems and those using them.²⁷⁷

275. Lewis Mumford, *The City in History* (New York: Harcourt, 1961), 565.

276. *Ibid.*, 565-566.

277. *Ibid.*, 566.

While acknowledging that these systems could be “misused and perverted by the existing political systems,” Mumford exhibited some optimism regarding the continued development of the electric power grid and how it might help the human condition.²⁷⁸ His later work was less hopeful.²⁷⁹ Now the electric power grid was a vital component of the smothering national megamachine that pursued material abundance for the population and the maintenance of efficiency.²⁸⁰ Admittedly that arrangement had provided any number of devices that provided short term benefits to the population’s quality of life, such as the electric powered refrigerators, television sets and washing machines. In acquiring those goods the population had acquiesced to the cost-benefit analysis of technocrats and engineers without assessing what had been abandoned. The trends were not favorable:

These tendencies have already gone far enough to permit one to forecast their ultimate consequences in no counter-movement takes place. The final triumph of technocratic society would be the consolidation of every human activity into an autocratic and monolithic system. This would produce a mode of existence in which functions that cannot be canalized would be suppressed or extirpated.²⁸¹

Mumford saw the increased interaction between the operators of the electric power grid and national leadership as foreseeable based on the bargain the population had

278. Ibid., 566-567.

279. Mumford’s biographer, Donald L. Miller, suggests that Mumford felt his values and ideals had been spurned by his own culture. This sentiment had promoted Mumford to write a more negative attack on that same society, *The Pentagon of Power, The Myth of the Machine Volume Two*. This book received more positive reviews. See Donald L. Miller, *Lewis Mumford, A Life* (New York: Grove Press, 1999), 530-533.

280. Lewis Mumford, *The Pentagon of Power, The Myth of the Machine Volume Two* (New York: Harcourt Brace Jovanovich, 1964, 1970), 323-324.

281. Ibid., 330.

accepted with the megamachine. To maintain the large scale manufacturing processes perfected during the Second World War, mass advertising would be used to keep the population consuming the rationalized production of industry. This cooperation might entail regulation by the government to maintain the continuity of power as evidenced in the investigation of the root causes of the 1965 Northeast power failure. Sharing of nuclear technology to build electric power plants would be another predictable facet of this trend. Moving towards a regional control of the electric power grid along the lines of NEPOOL would also be within the boundaries of Mumford's anticipation for any advanced technology system.²⁸² Given the development of the electric power grid in southeastern New England towards greater centralization, Mumford's later thoughts seem more aligned with reality.

Jacque Ellul's thoughts on the development of advanced technological systems are less specific for the electric power grid though he also stated that the smaller networks would coalesce:

Electrical networks may remain for some time independent of one another. But his situation cannot last when it is found that independence gives rise to general costs of no inconsiderable magnitude, difficulties in arranging the courses of the lines, and even practical difficulties in electrical technique. The interconnection of electrical networks is demanded by all technical men. Again, the only question is: who will execute it? And it is immediately clear that only the state is in a position to do so.²⁸³

While state control of the electric power grid had not been accomplished in New England, there were certainly greater regulatory efforts to manage the network. The

282. Ibid., 323-326.

283. Jacques Ellul, *The Technological Society*, trans. by John Wilkinson (New York: Vintage Books, 1964), 237.

federal government's Public Utility Holding Company Act and amendments to the Federal Power Act all indicate that Washington was interested and more than willing to intercede to maintain the continuity of power.

Members of NEES certainly personified Ellul's adage that modern man was "so enthusiastic about technique, so assured of its superiority, so immersed in the technical milieu, that without exception they are oriented towards technical progress."²⁸⁴ NEES provided electric power at a geometrically increasing rate to meet demand using a "Grow and Build" business model that worked for decades. Managers such as William Webster brought his fervor for atomic energy back to NEES following his stint in the government in the Second World War. The leadership of AIEE created their own code of ethics of how electrical engineers should conduct their affairs while operating the electric power grid.

Advocates of Thomas P. Hughes' concept of technological momentum can also point out numerous examples that support this theory. For this model of reality, the organizations that directly or indirectly support the electric power grid would take greater precedence than the overwhelming centralizing influence of technique or the megamachine. While the actions of the organizations that eventually merged into NEES are important, of equal consequence are the actions of institutions such as the Rhode Island Public Utility Commission, the industries that made the wires for the electric utility transmission lines, and the universities that educated the operators of the electric power grid. Advanced technology systems like the electric power grid spawned any

284. *Ibid.*, 85.

number of entities with their own vested interests, providing the “mass of technical, organizational, and attitudinal components that tends to maintain their steady growth and direction.”²⁸⁵ Improved technology to make more efficient turbine generators or transformers to increase the transmission line voltage were necessary for the growth of the electric power grid, but the supporting organizations were the ones that made growing and building more than a concept.

All of the theorists profited from writing retrospectively on the development of advanced technological systems. The electric power grid fits into the suggested theories as the electric power grid’s expansion was used to assist in the development of the respective theories. Yet each of the theories has problems in fitting all of the data to the match the hypothesis. Was the creation of the immense holding companies such as International Paper & Power necessary to fund the large capital investments required to build the electric power grid? The name of the company suggests that its focus was not primarily on the electric power generation component of the business. If technique was singularly important at driving all organizations toward efficiency, should not the portions of the company devoted to the production of paper been sloughed off in order to maintain the highest efficiency for the electric power production side? Instead, it took a force of the magnitude of the Great Depression leading to the public Utility Holding Company Act of 1935 to cause this divorce.

285. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Penguin Books, 1989), 460.

The case for technological momentum also requires some massaging to make the data fit the curve. The case of International Paper & Power is again illustrative. Hughes states that “forces analogous to those that killed off the dinosaurs are needed” to alter advanced technological systems.²⁸⁶ The Great Depression appears to be that apocalyptic event, but even after the dust from the Public Utility Holding Company Act of 1935 had settled, the electric utility companies were performing the same operation. Regardless of the ultimate authority in the business end of the electric power grid, the generation, transmission and distribution of electricity continued. It appears that for the theory of technological momentum to be clearly established, the advanced technology system has to actually change its trajectory. Merely generating momentum is not sufficient to distinguish the path from that of technological determinism. Additional events would be required to establish which theory was more accurate.

286. *Ibid.*, 462.

CHAPTER 3

CONSERVATION TO ENVIRONMENTALISM IN THE OCEAN STATE

The arch-enemy of the Affluent Society would not be Karl Marx but Henry Thoreau.

- Lewis Mumford, *The Pentagon of Power*

During the development of the electric power grid, numerous smaller companies were established independently of one another. Over time, as they expanded, they ran into the geographic boundaries of other similarly organized electric power grids that were constrained by the same physical laws. The companies often merged or were subsumed in the business takeovers of the era. In the end, only the most technically proficient and economically viable organizations adapted and survived. From the myriad smaller electric utility companies, the New England Electric System (NEES) emerged as the main player in the southeastern New England area.

The beginning of the environmental organizations in the same area during the concurrent period of electric utility growth followed a completely different model. Towards the end of the nineteenth century there were only a small number of conservationist minded organizations in the region. Under the fertilization of the new ideas of the burgeoning environmental movement, these groups either adapted to the new landscape and grew, or failed to incorporate these new concepts and became less relevant. New organizations with more fundamental ideas also arose, filling different niches in the landscape of civil society. These different pedigreed groups were not

always aligned with one another but could use shared values and doctrines to coalesce around for particular issues. Much like the electric power grid, the growth of these organizations was protracted. Unlike the electric power grid, environmental ethics evolved faster than the organizations that were motivated by them.

The Beginning of Environmental Thought in America

The growth and development of the environmental movement in Rhode Island was similar to that in the rest of the country, though it often lagged or was out of phase with the national trends and was willing to strike out on independent paths. The early Puritans in New England viewed the wilderness as something to be overcome to establish a New Jerusalem, not something to be retained or exalted.¹ While later upper class individuals might view the wilderness as a novelty with an element of danger and as an alternative to the drudgery of civilized life, this was not the popular view of the masses.² Romantic views of the wilderness were fine for those not engaged in the toil of bringing civilization and progress to the New World. The settlers were focused on slashing and burning their way through the forest to create civilization in their desired form.³

Closer to Rhode Island, Massachusetts philosopher Henry David Thoreau was more strident in the defense of the natural landscape. Perhaps the first environmentalist in the modern sense, at least in thought and word, Thoreau observed the approaching industrial revolution and was troubled with the coming “death of pastoralism in the

1. Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 38.

2. *Ibid.*, 57.

3. *Ibid.*, 77.

United States.”⁴ Thoreau’s writings are laced with many of the themes of the modern environmentalist movement, from despair of the corporation’s focus on profitability being the center of modern life, to the rejection of the increasingly materialistic, urban culture where human life was progressively becoming more specialized to meet the demands of factory production.⁵ Rejecting the fears of his Puritan forefathers, Thoreau viewed the wilderness as an expanse to balance these modern stresses and help maintain equilibrium for humans. Instead of pacifying the wilderness to extend civilization, humans should become one with the natural world, just as they were with the human constructed one. In this manner, they could achieve the best of both worlds by experiencing the blending of these antipodes.

Thoreau’s writings defy easy reductionism to either pro- or anti- naturalism. Living in a spartan cabin in Concord, Massachusetts, Thoreau could avoid many of the harsher aspects of creeping modernity, while still be close enough to it to avoid absorption by the still powerful wilderness. The moral worth of both was important to human spirituality. “I would not have . . . every part of a man cultivated, any more than I would have every acre of earth,” Thoreau explained.⁶ Nature was due reverence for its own existence and not merely because it might be of some economic value.⁷ While

4. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 47.

5. Ibid.

6. Quoted in Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 92.

7. J. E. de Steiguer, *The Origins of Modern Environmental Thought* (Tuscon, AZ: The University of Arizona Press, 2006), 8.

Thoreau was interesting as a philosopher, his ideas did not gain traction with the spirit of the era, that of Manifest Destiny and the pushing back of the wilderness.⁸

Another New Englander, Vermont's George Perkins Marsh, also advanced human thinking regarding the environment. In his 1864 book, *Man and Nature*, Marsh proposed that nature is essentially in equilibrium until human activity disturbs it. Even the most extreme natural forces of storms and seismic activity cause surface damage at best to the environment. Man, with his rapidly expanding technological prowess, can do more lethal and longer lasting damage. Extensive agriculture destroyed the forests and turned previously fertile land into deserts. As humans generated greater power to alter the landscape, longer lasting damage might result. Marsh believed in human agency and knowledge to restore the balance between civilization and nature, but worried that such knowledge might only be attained after it was too late to make a difference.⁹

Limited federal action was taken to preserve land that had not already been acquired by the settlers rapidly collapsing the western frontier. Congress had designated several important landscapes in the nation as nature reserves and then later as national parks, such as the Yosemite Valley (1864), the Mariposa Redwood Grove (1864) and the

8. The presentation of Thoreau as a radical environmentalist increases over time. Nash viewed him more of a balancer between the wilderness and civilization, while Shabecoff, writing a generation later, saw him as a precursor to the modern eco-terrorist. See Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 84-95 and Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 48.

9. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 51-52.

Yellowstone National Park (1872).¹⁰ There was no national policy on the protection of these federal properties other than keeping the properties out of the control of private enterprise despite the concern of other citizens in conserving the area's primordial attractiveness for "aesthetic, spiritual or cultural values."¹¹ In 1876, the Department of Agriculture, under President Ulysses S. Grant, created a special agency to assess the forests of the nation including the previously protected areas. This office was expanded in 1881 to become the Department's Division of Forestry.¹² In 1891 the Forest Reserve Act allowed the federal government to create National Forests, though Congress did not specify the function of these newly protected areas.¹³ Few of these areas received any protection from the logging industry attempting to cut down the last branch in the areas to increase their profits.¹⁴

Competing Visions: Gifford Pinchot and John Muir

In 1896 the Secretary of the Interior, Hoke Smith, formed an advisory commission to counsel the government on the proper policy for managing federal properties. Included in this panel were two of the leading voices of American conservation and environmental thinking, Gifford Pinchot and John Muir. Their

10. Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 108.

11. *Ibid.*, 108.

12. U.S. Forest Service, "Our History," U.S. Forest Service, <http://www.fs.fed.us/learn/our-history> (accessed June 30, 2014).

13. Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 133.

14. *Ibid.*, 134.

cooperation and subsequent parting of ways would set the intellectual boundaries on how the nation would consider these ideas for much of the next fifty years.

Gifford Pinchot, the paladin of efficient land use and the scientific management of natural resources perhaps best embodied the national the spirit of conservation. Pinchot, the son of a well-off family, was a Yale graduate who later earned an advanced degree in forestry in Nancy, France. In Europe, Pinchot observed the scientific management of the forests to provide long term lumber yield, as opposed to the United States, where the lumber industry was only interested in immediate profits. Convinced that government control was essential to prevent the complete deforestation of the continent, Pinchot also realized that the ability to accrue continuous gain had to be demonstrated to secure popular support. Pinchot worked in the lumber industry following his return to the United States, interrupted by stints in government service under Presidents Grover Cleveland and William McKinley, ending up as the head of the Department of Agriculture's Forestry Department. As the Department of the Interior managed the nation's forests, this position was without real power and Pinchot spent years unsuccessfully attempting to convince the interagency apparatus that his department should control these resources.¹⁵

While Pinchot personified the conservation movement of the era, describing himself as the "father of conservation," John Muir would become the one of the true

15. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 59-60.

founding members of the modern environmental movement.¹⁶ A Scot by birth, Muir's family had emigrated to Wisconsin in 1849.¹⁷ There he spent a tough childhood under the watchful eyes of his severe father who emphasized hard work and learning the Bible.¹⁸ Following a short stint at college where he impressed the faculty with his mechanical and intellectual ability, Muir spent time hiking through Florida and from Indiana to the Gulf of Mexico. In 1868 Muir went to California and set out for the wilderness of the Sierra Mountains.¹⁹

Here Muir was able to translate his previous thoughts on nature from his youthful observations into a coherent gospel on how to view the natural world. Muir's thoughts were not dissimilar to previous thinkers, seeing elements of nature as direct exhibitions of God's work on earth. Observing nature allowed one to see the divine with the forests acting as "temples" in the terrestrial plane.²⁰ Western civilization, based on Judeo-Christian creeds, had tended to obscure this concept in its distinction between humans and nature.²¹ Muir felt that being alone in the wilderness allowed the perceptive human

16. Ibid., 59, 63.

17. Tom Turner, *Sierra Club, 100 Years of Protecting Nature* (New York: Harry N. Abrams, Inc., 1991), 28-30.

18. When leaving his home to attend college, Muir had asked his father if he might request money if hard times arose. His father's negative response is truly one for the 21st century. See John Muir, *John Muir's Book Collection* (Scotts Valley, CA: IAP, 2009), 82.

19. Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 124-125.

20. Ibid., 125.

21. Ibid., 39.

to revel in its inspiring harmony and minimize civilization's partition. The wilderness was not only different from civilization, it was better. Since humans had originated in the wilderness, they must periodically return to their roots to dissipate the physical and emotional stresses of civilization.²² Muir saw nature as having its own inherent value and not just as a function of its relationship to humans.²³ Compared to Thoreau, who desired to keep one foot in each venue to achieve balance, Muir preferred to spend as much time as possible in the wilderness where even the reptiles and offensive flora and fauna had their own place and rights, no less than human ones. Finally the interconnectedness of the natural world was highly complex with numerous unknown relations and influences. Reducing any one particular element out of the environment to propose as a root cause or insignificant factor was not possible. Anticipating future environmental thinkers, Muir stated that "When we try to pick out anything by itself, we find it hitched to everything else in the universe."²⁴

Upon selection to the Department of the Interior's advisory commission, Pinchot and Muir found much in common with their appreciation of the forests they visited and struck up a friendship.²⁵ They initially shared common goals in protecting the remaining verdant areas in the American west, but the two differed on the ultimate purpose of their

22. Ibid., 127-128.

23. J. E. de Steigeur, *The Origins of Modern Environmental Thought* (Tucson, AZ: The University of Arizona Press, 2006), 8.

24. Quoted in Roderick Nash, *The Rights of Nature, A History of Environmental Ethics*. (Madison, WI: The University of Wisconsin Press, 1989), 40.

25. Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 135.

travel. Muir and his faction of the commission wanted to decide which areas required preservation, while Pinchot and the rest were more interested in how to economically manage the designated areas. The federal executive and legislative branches vacillated between these two views, initially supporting Muir's position and putting aside 21 million acres of forest reserves in 1897. Muir editorialized that some leeway in the culling of mature growth for economic gain was permissible. Later in the year Congress passed the Forest Management Act that was more favorable to commercial gain. With this Muir ceased all his support for the legislation and broke with Pinchot who had always wanted to use the land, though with the proper management, to ensure it could be available for successive generations.²⁶

While Muir's proposals had been rebuffed by Congress, his ideas gained exposure through his prolific writing and interaction with other concerned individuals. In 1892, he and a group of like minded citizens formed the Sierra Club, with Muir as its first president, dedicated to the preservation of the forests and other aspects of the Sierra Madre Mountains.²⁷ The organization was locally focused initially, but expanded its horizons as it gained greater stature. Muir also became more involved in the political sphere as he attempted to influence the national discourse on conservation. Here he was assisted by his relationship with the new President, Theodore Roosevelt, who had ascended to the office following the assassination of William McKinley in 1901. In 1903

26. Ibid., 135-138.

27. See Tom Turner, *Sierra Club, 100 Years of Protecting Nature* (New York: Harry N. Abrams, Inc., 1991), 47-48 and Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 65.

Muir and Roosevelt went camping in the mountains and Muir was able to captivate the President with his views on preserving the wilderness, at least for a short while.²⁸ The subsequent balancing between Muir, the apostle for the rights of the wilderness, Pinchot, the advocate for the scientific use of nature to fuel civilization, and Roosevelt, the consummate politician of the progressive era was interesting in its own light. Muir obscured his more extreme views on environmental equality between humans and other species to gain political acceptance, though using the full range of Old Testament scorn and derision to lambaste his opponents. Pinchot appears as the technocrat of his era, ready to appropriate shares of the nation's expanses to continue civilization's development, though using scientific elements and design to prevent long term despoliation of any area. Roosevelt valued each man's views, though with Pinchot was in Washington, it was easier for him to catch the President's ear. Each of these viewpoints had their victories and defeats in the decades before and after the turn of the century. Muir had been successful in cajoling Congress to create the national parks in Yellowstone and Yosemite; Pinchot's faction had prevailed in the passing of the Forest Management Act of 1897 where other natural preserves would be open to some economic activity.²⁹ Under Roosevelt's direction, Pinchot had finally been able to engineer the

28. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 65.

29. Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 137.

transfer of the Department of Agriculture's Forestry Department to the Department of the Interior in 1905.³⁰

The greatest battle of these two views began in 1908 when Muir and other preservationists learned of the city of San Francisco's application to use a portion of the Yosemite National Park in the Hetch Hetchy valley as a reservoir. The federal government had earlier refused the application but after an earthquake had severely damaged the city in 1906, the city had resubmitted the request. Despite the area being in a protected location, a waiver was granted for the city to build a dam in the Hetch Hetchy valley for a water reservoir and later, to generate electricity to help power the reconstruction of the city.³¹

Muir and his followers took this decision as a call for action, protesting vigorously at the state and federal level against this intrusion into hallowed ground. The resulting national dialogue on the preservation of the wilderness for its own sake energized large segments of the population. Roosevelt was sympathetic to Muir's viewpoints, but thought that the requirements of San Francisco prevailed over the desire to keep Hetch Hetchy untouched. As Muir's associates kept the issue alive in the press, they shifted from their talking points about the value of the pristine area to attacks against those organizations that would exploit Hetch Hetchy for profit. This effort was more

30. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 59-60.

31. Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 163-164.

successful in gaining support and even President Roosevelt stepped back from his prior position, despite Roosevelt's friendship with Pinchot, who favored building the dam. The action shifted to Congress which eventually had to weigh the competing demands. Public support for Muir caused Congress to table the proposal in 1909. The California delegation was not prepared to lose courteously and argued that the needs of San Francisco in quantifiable terms of water, energy and human health should not be upset by the commendable, but inestimable qualities of the wilderness. Construction advocates even submitted that the resulting dam and reservoir would actually add to the beauty of the area. Parochial arguments such as these fractured some of the wilderness groups defending Hetch Hetchy from human intrusion, with splinter segments of the Sierra Club willing to permit the construction of the dam. In Congress, where the city's application was to be decided, the effective lobbying by the Californian delegation was telling. Despite the strong dissent, politicians in both houses of Congress acceded to the Californian point of view and passed a statute in 1913 allowing the dam to be built. President Woodrow Wilson signed the law in December of that year.³²

Muir was deeply disappointed by the loss, but was somewhat soothed by the national outcry the issue had caused. Certainly the more utilitarian point of view of Pinchot had prevailed, and the organizations that Muir had nurtured were wounded by the conflict.³³ Muir himself would die a year later.³⁴ Perhaps more important was the fact

32. Ibid., 162-180.

33. Ibid., 180.

34. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 67.

that a debate on the merits of preservation had even been conducted, let alone at the highest levels of national government. While Muir's point had lost in this argument, his views had set markers that later environmental thinkers, leaders and politicians would adopt as they attempted to make reasoned decisions. The dispute also showed that each group was willing to use the dialog and tactics of the other to advance their points of view. The preservationists were willing to use the negative attacks in the popular media to undermine the dam's conservationist advocates, while the conservationists attempted to promote the augmented beauty that the reservoir would portend.³⁵ In the end, the political process prevailed. Pinchot, more in line with the conservationist spirit of his times, got the dam and power he desired. Muir empowered his vision of the rights of nature and sowed the groundwork for long term success.³⁶

The First Conservation Groups in Rhode Island

The creation of the Sierra Club in California by Muir and his associates had occurred as the nation began to become more interested in protecting the remaining wilderness on the continent. Small groups throughout the nation commenced organizing to protect the natural resources of the country. Individuals in these new organizations were primarily interested in conserving or preserving these assets for the future:

35. Ibid., 67.

36. Placing Muir as the paladin of the environmental movement and Pinchot as the champion of the harmful destruction of the wilderness is too simplistic. In their own times, "Muir was considered the supporter of a shortsighted, elitist preservationist philosophy and Pinchot, the progressive conservationist whose views were in step with the prevailing public sentiment that natural resources should enrich the lives of all Americans, not just the wealthy." See J. E. de Steigeur, *The Origins of Modern Environmental Thought* (Tuscon, AZ: The University of Arizona Press, 2006), 12.

Conservation groups emphasized the efficient use and development of physical resources to combat inefficient land management. Conservationists put forth a developmental strategy based on efficiency, scientific management, centralized control, and organized economic development. This strategy was exemplified by management systems, which were created to emphasize the balance between immediate and long-term production necessary to sustain a continuous yield.³⁷

One of the first such conservation groups in Rhode Island was responsible for creating Roger Williams Zoo in Providence.³⁸ In 1871, Betsy Williams, a descendant of the state's founder, Roger Williams, left her 102 acre farm to the city in her will. The city accepted the land, seeing the area where the citizens could relax and partake some of the natural sights of the state. The next year a section of the park was used to display a small "menagerie" of "wildlife" including such species as "raccoons, guinea pigs, white mice, squirrels, rabbits, hawks, peacocks and anteaters."³⁹ The city of Cranston provided more land to the park in 1873, and in 1883 Providence began the construction of larger facilities to house more interesting flora. When completed in 1890, the zoo could show off a tiger, a leopard and a pair of lions.⁴⁰

37. Stacy J. Silveira, "The American Environmental Movement: Surviving Through Diversity," *Boston College Environmental Affairs Law Review* 28, no. 2 (2001): 499.

38. Kelly Maree Nichols, "From Climate Justice to Green Business: A Rhode Island Case Study of Current Trends in the Environmental Movement" (Environmental Studies thesis, Brown University, 2009), 78.

39. Roger Williams Park, "History of Roger Williams Park Zoo," Roger Williams Park, <https://rwpzoo.org/103/history-roger-williams-park-zoo> (accessed June 24, 2014).

40. The larger cats could presumably keep the white mice population in check. See Roger Williams Park, "History of Roger Williams Park Zoo," Roger Williams Park, <https://rwpzoo.org/103/history-roger-williams-park-zoo> (accessed June 24, 2014)

In Boston, two prominent members of society, Harriet Lawrence Hemenway and Minna B. Hall, were responsible for initiating the Audubon Society, named after the renowned American ornithologist, John James Audubon. Appalled by the seemingly wanton killing of numerous bird species to obtain feathers for fashion apparel, the two were able to persuade other Bostonians to sponsor them with financial and moral backing. They coopted the Bostonian scientific community and other noted ornithologists to join their operation. In 1897, the Massachusetts Audubon Society was created to formalize Hemenway's and Hall's bird protection and conservation mission. The Society grew rapidly and by 1905 the National Association of the Audubon Societies for the Protection of Wild Birds and Animals attained national prominence.⁴¹

This vision of bird protection spread south to Rhode Island. The Audubon Society of Rhode Island was established in 1897 by a group of interested citizens in Providence motivated by Hemenway's and Hall's concerns.⁴² While the Rhode Island organization followed the Massachusetts' and later the national organization's general guidance and intent, it remained out of the orbit of the larger association, preferring to remain independent. The Rhode Island chapter also grew rapidly. By 1907, two years after the national organization had been formed, the state chapter had 1300 members.

41. Wayne R. Petersen. Audubon Societies. In *The Encyclopedia of New England*, ed. Burt Feintuch and David H. Watters (New Haven, CT: Yale University Press, 2005), 544-545.

42. Ken Weber, *A Century of Dedication, The First 100 Years of the Audubon Society of Rhode Island* (Audubon Society of Rhode Island, 1997), 7.

The Rhode Island chapter focused on the education of local students on natural conservation.⁴³

In the Ocean State conservationist groups were less contentious than Muir's Sierra Club, perhaps because there were so few of them. From the turn of the century to 1970 perhaps five new groups with conservationist agendas would be created.⁴⁴ In 1921, the Narragansett Chapter of the Appalachian Mountain Club, itself chartered in Boston in 1876, was formed. Somewhat the East Coast compliment to the Sierra Club, the Appalachian Mountain Club focused its efforts on land conservation and trail construction for all members of society to enjoy. Reaching a membership of 45 by the end of the year, the Narragansett Chapter concentrated on trail clearance in South County and lodge maintenance of its headquarters in Kingston, RI. In the 1930s, chapter members worked to create a trail from the lodge to the western border of the state where it would connect with a similar Connecticut endeavor. Other organizations such as the local Boy Scouts were engaged to both support the club's work but also to be educated in

43. Audubon Society of Rhode Island, "A Brief History," Audubon Society of Rhode Island, <http://www.asri.org/history/history-of-audubon-society-of-rhdoe-island.html> (accessed June 25, 2014).

44. This number is an estimate as groups that formed but later collapsed or were absorbed or superseded left few records. Even more established groups, such as the Environment Council of Rhode Island (ECRI) have tenuous records. See Kelly Maree Nichols, "From Climate Justice to Green Business: A Rhode Island Case Study of Current Trends in the Environmental Movement" (Environmental Studies thesis, Brown University, 2009), 78.

the club's vision. The paths' purpose was not merely for exercise but to allow the hikers "to enjoy the rolling country, abandoned wood roads and wildest Rhode Island."⁴⁵

In the 1920s, the Audubon Society of Rhode Island acquired its first two properties to act as bird sanctuaries, the Kimball Bird Sanctuary in Charlestown, RI, and the Parker Woodland Sanctuary in Coventry, RI. The Society was active in expanding its educational program for schools and homeowners up to the Second World War, while maintaining visibility on the federal and local legislative efforts promoting conservation. The Society was not aggressive in promoting its views of conservation in the political sphere, concentrating more on grass root programs to gain acceptance and funding.⁴⁶

The next Rhode Island conservation group to be founded was the Norman Bird Sanctuary in 1949. In that year, at the behest of her will, Mabel Norman Cerio provided a parcel of land in Middletown, RI "for the propagation, preservation, and protection of birds, and where birds and bird life may be observed, studied, taught, and enjoyed by lovers of nature and by the public generally so interested in a spirit of humanity and mercy."⁴⁷ Named after her father, the sanctuary focused on the education of people,

45. Narragansett Chapter of the AMC, "Trail History 1921 to 2001," Narragansett Chapter of the AMC, http://www.amcnarragansett.org/our_chapter/archives/a%20view%20of%20long%20pond%20page%201_1.jpg (accessed June 28, 2014).

46. Ken Weber, *A Century of Dedication, The First 100 Years of the Audubon Society of Rhode Island* (Audubon Society of Rhode Island, 1997), 14-16.

47. Norman Bird Sanctuary, "Our Mission," Norman Bird Sanctuary, <http://normanbirdsantuary.org/about/our-mission/> (accessed June 28, 2014).

primarily children, through various programs at its site. The site expanded to 325 acres over the years.⁴⁸

Nationally, the Sierra Club lapsed into a more conservationist mindset in the years following the Hetch Hetchy dispute, looking more like the Appalachian Mountain Club to the east with a focus on hiking and wilderness appreciation.⁴⁹ There were some clashes with the federal government on the disposition of federal property, and the organization was adept at leveraging the conflicting guidance and seams between federal agencies to prevent Kings Canyon National Park from being dammed up for hydroelectric use in the 1930s.⁵⁰ Otherwise the organization appeared more internally focused in building up its California support.⁵¹

Another countrywide conservation minded organization that came into being in the 1930s was the National Wildlife Federation. In 1934, President Franklin D. Roosevelt had named Pulitzer Prize winning cartoonist, Jay N. “Ding” Darling, as the head of the U.S. Biological Survey. A practicing journalist, Darling was not a fan of

48. Norman Bird Sanctuary, “Education,” Norman Bird Sanctuary, <http://normanbirdsantuary.org/education/> (accessed June 28, 2014).

49. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 79.

50. The National Park Service, under the Department of the Interior, wanted to retain the land in a fallow condition. The Forest Service, under the Department of Agriculture, wanted to allow some development at the site. Eventually, the Secretary of the Interior, Harold Ickes, reached a compromise that favored the Sierra Club proposals for Kings Canyon. See Tom Turner, *Sierra Club, 100 Years of Protecting Nature* (New York: Harry N. Abrams, Inc., 1991), 123-125.

51. *Ibid.*, 90.

Roosevelt but he had accepted the President's offer.⁵² An energetic leader and manager of the Biological Survey during his tenure, Darling appealed to the President and Congress to fund a number of conservationist minded organizations to study wildlife problems, propose practical solutions, and instruct classes on such matters at the universities.⁵³ In 1936, Darling convinced Roosevelt to convene a meeting of conservation minded groups in Washington, DC, at the North American Wildlife Conference. At this conference, the General Wildlife Federation was born. Focused on protecting American wildlife, the association selected Darling, who had recently resigned from his federal post, as its first president.⁵⁴ The General Wildlife Federation was quickly renamed the National Wildlife Federation (NWF) and was designed to provide a central forum for the consortium of hunting, fishing and other wildlife appreciation

52. Darling, a committed waterfowl hunter, had been drawn to the conservation movement to ensure the duck population in the United States was not decimated by overeager hunters with too much firepower and too little discipline. See Timothy W. Luke, "The Pleasure of Use: Federalizing Wilds, Nationalizing Life at the National Wildlife Federation," *Capitalism, Nature, Socialism* 12, no. 1 (March 2001): 12-14 and Robert D. Brown, "The History of Wildlife Conservation and Research in the United States – and Implications for the Future," NC State University, Department of Forestry and Natural Resources, <http://cnr.ncsu.edu/fer/directory/documents/Article-HistoryofWildlifeResearch.pdf> (accessed July 6, 2014).

53. Robert D. Brown, "The History of Wildlife Conservation and Research in the United States – and Implications for the Future," NC State University, Department of Forestry and Natural Resources, <http://cnr.ncsu.edu/fer/directory/documents/Article-HistoryofWildlifeResearch.pdf> (accessed July 6, 2014).

54. National Wildlife Federation, "History," National Wildlife Federation, <http://web.archive.org/web/20080906182733/http://www.nwf.org/about/history.cfm> (accessed July 7, 2014).

groups to work together on conservation issues and to influence policy.⁵⁵ Backed by both hunting groups and the firearms and other industries, local societies, and conservation minded individuals, the organization rapidly expanded across the nation.⁵⁶ An Ocean State affiliate, the Rhode Island Wildlife Federation (RIWF) was founded in 1938.⁵⁷ These groups were generally unobtrusive, in line with most of the conservationist groups of the era. Wildlife, and perhaps more importantly, game animals, and their habitat needed to be preserved so American hunters and wildlife enthusiasts could enjoy them, often down the barrel of a gun. The NWF's success was somewhat of an ever enlarging cycle of petitioning the federal government to acquire more land for wildlife. Such acquisitions would also advance the interests of hunters and fishermen. The NWF would then promote those victories to its membership to garner new contributions. Such monies could then be spent on further lobbying efforts to advance organizational efforts. By the end of the Second World War, the NWF was the largest national group advocating conservation issues in the country.⁵⁸

55. National Wildlife Federation, "Creation of National Wildlife Federation," National Wildlife Federation, <http://www.nwf.org/Who-We-Are/History-and-Heritage/Creation-of-NWF.aspx> (accessed July 6, 2014).

56. See Timothy W. Luke, "The Pleasure of Use: Federalizing Wilds, Nationalizing Life at the National Wildlife Federation," *Capitalism, Nature, Socialism* 12, no. 1 (March 2001): 15 and Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 80.

57. Guy N. Lefebvre and Rick Laferriere, "History," Environment Council of Rhode Island <http://environmentcouncilri.org/content/history> (accessed July 6, 2014).

58. Timothy W. Luke, "The Pleasure of Use: Federalizing Wilds, Nationalizing Life at the National Wildlife Federation," *Capitalism, Nature, Socialism* 12, no. 1 (March 2001): 15-16.

Aldo Leopold and the Creation of a Land Ethic

The establishment of the National Wildlife Foundation also advanced the career of Aldo Leopold, a former member of the Forest Service. Leopold, a native of Iowa, was a committed hunter and nature lover. Instructed in the ethics of honorable hunting by his father, Leopold brought these ideas with him into his professional life.⁵⁹ Leopold attended Yale University, graduating in 1909 with a master's degree from the institution's Forest School.⁶⁰ In the first decades of his professional career, Leopold spent most of his time working for the U.S. Forest Service with a short sojourn with the Albuquerque Chamber of Commerce. Posted to the U.S. territories in the southwest, Leopold observed the decreasing amount of game animals in the prospective states of Arizona and New Mexico.⁶¹ Leopold organized associations of hunters, instructing them on the "protection and enjoyment of wild things" in order to maintain their future populations for human use.⁶² Noting his trusted subordinate's initiative and enthusiasm for such ventures, the head of the District placed Leopold in charge of the area's hunting

59. Ibid., 20-21.

60. This school had been established in 1900 with a financial assist from Gifford Pinchot's family. See Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 183.

61. Despite this time in these future states, the Sierra Club described Leopold as having "little experience in the West" and was more important as the father of future environmentalists than for his own work. Perhaps Leopold's failure to join the Sierra Club or willingness to countenance growth in wilderness mitigated his reputation in that society. See Tom Turner, *Sierra Club, 100 Years of Protecting Nature* (New York: Harry N. Abrams, Inc., 1991), 133-135.

62. Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 183.

and recreation management, a job for which Leopold was admirably suited. Here he also developed his writing skills, publishing journal articles and Forest Service doctrine on game management and protection. As the territories' populations expanded, greater pressures arose to develop federally owned land and convert it to private property, construction that would have significantly degraded the area's ability to support wildlife. While appreciative of the fruits of civilization, Leopold was also convinced that the complete subjection of the wilderness was not desirable. With this in mind he worked with the Forest Service to preserve portions of the Gila National Forest in New Mexico for wildlife preservation.⁶³ In 1924, Leopold transferred to the Forest Service Forest Products Laboratory in Madison, Wisconsin, where he served as the assistant director. In the early 1930's, Leopold left the federal bureaucracy for academia, and was awarded a teaching position at the University of Wisconsin where he served as a professor of game management until his untimely death in 1948.⁶⁴ Along with Darling, Leopold was considered one of the founding members of the NWF.⁶⁵

While Muir came to his concept of a moral equality of man and nature and later leveraged his writing and oratory skills to influence governmental policy on the preservation of the wilderness, Leopold grew into his beliefs while functioning as a member of one of the organizations Muir was attempting to influence. Both men were

63. Ibid., 183.

64. J. E. de Steigeur, *The Origins of Modern Environmental Thought* (Tucson, AZ: The University of Arizona Press, 2006), 14.

65. Timothy W. Luke, "The Pleasure of Use: Federalizing Wilds, Nationalizing Life at the National Wildlife Federation," *Capitalism, Nature, Socialism* 12, no. 1 (March 2001): 13.

skilled authors but Leopold's calm reasoning and balance, not unlike Thoreau's, was perhaps more appealing to the public than Muir's cool aesthetic. Initially Leopold was more influential, affecting the ideals of the National Wildlife Federation and its national audience. Muir's writing was popular, but the Sierra Club had fewer members and less national penetration than the NWF.⁶⁶

Leopold's evolution as a conservationist thus began as a hunter apprehensive about the diminishing numbers of game animals and what could be done to ensure their future presence. Yet merely managing the land to ensure the survival of those species most interesting to humans, while perhaps necessary, was not sufficient. In one event he described shooting a wolf and her pups to prevent them from culling the local deer population. While the wolves were killed the effect was not beneficial to either humans or nature:

Since then I have lived to see state after state extirpate its wolves. I have watched the face of many a newly wolfless mountain . . . I have seen every edible bush and seedling browsed, first to aemic desuetude, and then to death. I have seen every edible tree defoliated to the height of a saddle-horn. Such a mountain looks as if someone had given God a new pruning shears, and forbidden Him all other exercise. In the end the starved bones of the hoped-for deer herd, dead of its own too-much, bleach with the bones of dead sage, or molder under the high-lined junipers.⁶⁷

66. The Sierra Club appears to be more interested in the preservation of California wilderness areas during this period. The National Wildlife Federation with its state affiliates was more pervasive. See Tom Turner, *Sierra Club, 100 Years of Protecting Nature* (New York: Harry N. Abrams, Inc., 1991), 133-140 and Timothy W. Luke, "The Pleasure of Use: Federalizing Wilds, Nationalizing Life at the National Wildlife Federation," *Capitalism, Nature, Socialism* 12, no. 1 (March 2001): 15-16.

67. Aldo Leopold, *Thinking Like a Mountain, A Sand County Almanac* (New York: Oxford University Press, Inc., 1949; repr., New York: Ballantine Books, 1970), 138-140 (page references are to the reprint edition).

While hardly unique, Leopold's early writing and actions had suggested that the conservation of the federal lands was vital to maintain some portion of the wilderness in its primordial state. After he had become a member of the University of Wisconsin faculty, his thoughts broadened to the interrelationships of humans and wildlife, and the human duties and responsibilities in this affiliation.⁶⁸ Examining this association would indicate to humans that their environment was one with shared attributes and not only one with commodities to use at their leisure. An ethical consideration of these issues would in turn impute greater value to the other elements of the wilderness.⁶⁹

Leopold's most famous work was *A Sand County Almanac*, first published in 1949 shortly after his death. In this collection of essays, he proposed a different set of guidelines to promote ethical behavior by humans when interacting with the natural community. Not as doctrinaire as the ethical behavior for electrical engineers that the American Institute of Electrical Engineers (AIEE) was concurrently revising, Leopold still attempted to place limits on human undertakings. Leopold saw the relationships between man and the environment as an incredibly complex interaction that required great humility when attempting to regulate. He proposed that this required a new ethical relationship that changed "the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow members,

68. Roderick Nash, *Wilderness and the American Mind*. Rev. ed. (New Haven, CT: Yale University Press, 1973), 188-191.

69. *Ibid.*, 192.

and also respect for the community as such.”⁷⁰ Leopold often examined these relationships in terms of energy exchange between the participants, but the actors were not simply loads that could be plugged into or removed from the circuit. The members had expansive functions whose limits could not be easily determined. In any case the environment was not a substrate for purely economic endeavors. The protection of the environment required a personal commitment towards conservation as economic and political motivations were not sufficient.⁷¹ Leopold’s oft quoted adage that “A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise,” should not be deconstructed to presume the total inviolability of nature.⁷² Leopold did not propose equal rights for animals and plants, but desired responsible and prudent interaction with the environment by mankind. Leopold did emphasize the personal responsibility for change and saw conservation as an important human activity. Still, the land and the wildlife on it were not to be abused for the sheer joy of human mastery. A more harmonious interaction was the ideal with the species in the wilderness attaining some moral status.⁷³ Leopold was opposed to damming up or polluting rivers as this disrupted the energy flow of the environment,

70. Aldo Leopold, *A Sand County Almanac* (New York: Oxford University Press, Inc, 1949; repr., New York: Ballantine Books, 1970), 240 (page references are to the reprint edition).

71. *Ibid.*, 250-251.

72. *Ibid.*, 262.

73. J. E. de Steiguer, *The Origins of Modern Environmental Thought* (Tuscon, AZ: The University of Arizona Press, 2006), 14-15.

though he did not explicitly inveigh against particular elements of the electric power grid.⁷⁴

Leopold's Land Ethic was descriptive, not prescriptive as the AIEE standard was. It placed humans as a participant in the ecological system and not merely as an observer or manager of it. The economic aspect of this view was also considered insufficient to deal with the enormity of the relationship.⁷⁵ Land in Leopold's view was not merely some volume of space filled with soil but included all of the biological organisms and air and water streams that maintained the energy levels at a self sustaining level. Human activity had a greater and often incalculable effect on the land than natural selection and evolution ever had, particularly in highly populated areas, and thus they should tread lightly upon the land to prevent upsetting this energy balance. Leopold rejected both an economic rationale and government regulation as the ultimate arbitrators to prevent unrecoverable damage to the land. The former was an insufficient force to prevent land owners from abusing their property to attain short term profits; the latter might grow too large and onerous to be supported by the population. Both made the effort of conservation too easy and thus "trivial."⁷⁶

74. Aldo Leopold, *A Sand County Almanac* (New York: Oxford University Press, Inc, 1949; repr., New York: Ballantine Books, 1970), 255 (page references are to the reprint edition).

75. *Ibid.*, 251.

76. *Ibid.*, 246, 253-255.

Instead, humans needed to evolve an “ecological conscience” to achieve such coherence between land and nature.⁷⁷ Such an “ethical obligation on the part of the private owner” was required to surmount the otherwise inadequate concern for the land’s health.⁷⁸ This conscience was the result of not merely more training or education, but also a principled approach to the entire issue. Man could no longer be the “conqueror” of the land; he must be the “biotic citizen of it.”⁷⁹ Leopold was hopeful that such an ethic would prevail, though not through the normal economic or scientific training. Instead, an evolving disapproval of the majority of the population for the harshness inflicted on the environment would eventually shame the offenders into more ethical behavior.⁸⁰

While Leopold’s proposals for the ethical treatment of land appear to be a step forward, his ideas do not seem to have gained great visibility in the minds of his countrymen. Perhaps it was because of his untimely death just as his most comprehensive work was accepted for publication; perhaps because at the time it was initially published the rest of the nation was more interested in the post war issues of economic advancement untroubled by major war; perhaps the other conservationist and environmental groups were interested in different projects at the time. In any event his writings appeared to hover in the consciousness of the time without being acted upon. The population was unwilling to accept any further limits to the normal models and

77. *Ibid.*, 251.

78. *Ibid.*, 250.

79. *Ibid.*, 260-261.

80. *Ibid.*, 262-263.

methods of growth that had previously been so successful and profitable in subduing the frontier.⁸¹

Rachel Carson and *Silent Spring*

It would take another decade until the next seminal work arrived to influence environmental ethics. Rachel Carson's *Silent Spring*, published in 1962, was truly one of the most important works of the post war era. Carson's book inspired others to take action to alleviate particular problems more than it presented a precise formula that advocated additional ethical requirements for humans when dealing with the environment.⁸² Carson, a former teacher with degrees in zoology and biology, had entered federal service in 1935 to write radio scripts for the Bureau of Fisheries. A talented writer, Carson moved up in the organization (later known as the U.S. Fish and Wildlife Service) to become its chief editor. Writing books on oceanographic natural history outside of her federal job, Carson became a well known and economically secure author; she left the government in 1952 to concentrate on her writing.⁸³

81. Reviewers of the *A Sand County Almanac* were less perceptive than Leopold was and sales lagged until the volume was reissued in the 1960s. See Roderick Frazier Nash, *The Rights of Nature, A History of Environmental Ethics* (Madison, WI: The University of Wisconsin Press, Ltd., 1989), 73.

82. Samuel P. Hays, *Beauty, Health and Permanence: Environmental Politics in the United States, 1955-1985* (New York: Cambridge University Press, 1987), 208

83. J.E. de Steiguer, *The Origins of Modern Environmental Thought* (Tucson, AZ: The University of Arizona Press, 2006), 36-37.

Silent Spring was an impassioned narrative for Carson.⁸⁴ She had researched the effects of the new classes of synthetic chemicals developed during and after the Second World War to eradicate undesired organisms and allow human mastery over the environment. In their desire to get ahead of the problem, humans had applied such chemicals to kill insects that ate human crops, spread disease or harmed other more desirable organisms. These compounds were used without great comprehension of their effects on the environment other than that of insect destruction; the subsequent effects were barely investigated.⁸⁵ The compound dichloro-diphenyl-trichloro-ethane (better known as DDT) particularly aroused Carson's concern. First used as an insecticide in 1939, its use had grown dramatically; first to protect humans from lice, next to kill insects eating crops and then on to exterminate invasive gypsy moths harming trees in human occupied spaces.⁸⁶ Such chemical applications were not effective at suppressing the insect population for long, as sufficient numbers managed to survive and pass on their resistance to the next generation. Consequently, higher doses of toxins were needed to achieve the same effect of culling the next generation's swarms. Additionally, the toxic

84. Nash suggests that Carson wanted to shock the public with her claims of chemical abuses on the land though she was sufficiently insightful to know that raising insects up in the ethical levels of concern might be difficult to sell. See Roderick Frazier Nash, *The Rights of Nature, A History of Environmental Ethics* (Madison, WI: The University of Wisconsin Press, Ltd., 1989), 79.

85. Carson wrote about other chemicals but she is best known for her discussion of DDT. See Rachel Carson, *Silent Spring* (New York: Houghton Mifflin Company, 1962), 23-32 and J.E. de Steiguer, *The Origins of Modern Environmental Thought* (Tucson, AZ: The University of Arizona Press, 2006), 30.

86. Rachel Carson, *Silent Spring* (New York: Houghton Mifflin Company, 1962), 20-21, 158-159.

chemical deposits took exceptionally long to decay, allowing the harmful residue to become concentrated in other portions of the food chain. The buildup of DDT in the food chain affected small birds such as robins and even the American Eagle and could be as destructive as any direct attack on those populations.⁸⁷ This subsequent accumulation of the chemicals could spread into the human food chain as well, leading to a long term accumulation of the toxic compounds in the human body.⁸⁸ Perhaps worse than the realization by the population that some additional environmental damage was occurring was that the authorities responsible for the insecticide spraying were ignoring public concerns. Citizens that asked not to be doused with DDT were often disregarded while animal residents were being extirpated.⁸⁹ DDT was also lethal against other organisms in the affected area; collateral damage in the war against undesired fauna. Quoting the description of the death throes of small mammals under this chemical barrage, Carson hit a nerve in the American public that Muir's approval of cold blooded reptiles or Leopold's of predacious wolves did not.⁹⁰ Carson questioned the effect these actions had,

87. Ibid., 118-127.

88. See Rachel Carson, *Silent Spring* (New York: Houghton Mifflin Company, 1962), 22-23 and J. E. de Steiguer, *The Origins of Modern Environmental Thought* (Tucson, AZ: The University of Arizona Press, 2006), 30-31.

89. The gypsy moth infestations in the northeast were destructive, but self correcting in the way that the chemical application of insecticides were not. The Department of Agriculture was quite willing and able to out match local resistance though unable to meet its objective of eradication. See Rachel Carson, *Silent Spring* (New York: Houghton Mifflin Company, 1962), 156-161.

90. One wonders if Carson had used the moniker "tree rats" as opposed to "squirrels" how the subsequent concern might have been altered. See Rachel Carson, *Silent Spring* (New York: Houghton Mifflin Company, 1962), 91-100.

considering that by “acquiescing in an act that can cause such suffering, who among us is not diminished as a human being?”⁹¹ Leveraging this repulsion, Carson made the case for the attenuation of the human condition more than the raising of lower order organisms to the moral plane of humans. Carson was also annoyed at the overweening arrogance of government agencies and companies as they attempted to destroy unwanted pests:

Who has decided – who has the *right* to decide – for the countless legions of people who were not consulted that the supreme value is a world without insects, even though it be also a sterile world ungraced by the curving wing of a bird in flight? The decision is that of the authoritarian temporarily entrusted with power; he has made it during a moment of inattention by millions to whom beauty and the ordered world of nature still have a meaning that is deep and imperative.⁹²

Carson suggested other means to control undesired insect populations without the chemical poisoning of the entire landscape. Insect sterilization, sexual deception and the encouragement of other predatory species could limit damage and shift the biologic equilibrium more toward the human side without causing irreparable damage to the rest of the environment. Merely using a simple chemical tool such as DDT to deal with the initial problem was neither elegant nor effective and caused more damage than the perceived insect scourge. A much greater modesty was required to both comprehend the nature of the problem as well as propose solutions to it:

The “control of nature” is a phrase conceived in arrogance, born of the Neanderthal age of biology and philosophy, when it was supposed that nature exists for the convenience of man. The concepts and practices of applied entomology for the most part date from that Stone Age of science. It is our alarming misfortune that so primitive a science has armed itself with the most

91. Rachel Carson, *Silent Spring* (New York: Houghton Mifflin Company, 1962), 100.

92. *Ibid.*, 127.

modern and terrible weapons, and that in turning them against the insects it has also turned them against the earth.⁹³

While Carson emphasized the dangers of unrestricted chemical warfare against insects, she was also concerned with the release of radioactive pollution into the watershed as well and the diffusion of air pollution from industrial activity. Human created carcinogens arising from advanced technological manufacturing might also eventually affect as many as a quarter of the population. While Carson did acknowledge that the increase in cancer rates in the First World nations may be more correlation than causation, the signs were disturbing. It was far better to prevent the possible causes, Carson suggested, than to come up with a cure for cancer.⁹⁴

Reaction to *Silent Spring* was swift and severe. While readers deluged Congress and federal agencies regarding Carson's allegations, agricultural chemical companies threatened to sue the book's publisher, trade journals accused Carson of poor science and antediluvian leanings, and the American Medical Association abrogated any responsibility to assess the potential dangers of the chemicals. The popular press was more sympathetic. Carson's appearance on television discussing her findings cemented the public perception that the government and industry really did not comprehend what they were doing or the ramifications of what they had done with such powerful chemical tools. In mid 1962 President John F. Kennedy directed the Department of Agriculture to investigate Carson's claims, many of which were validated in 1963 by a U.S. Office of Science and Technology report on "Use of Pesticides." Later in the year Carson

93. Ibid., 276-297.

94. Ibid., 219-243.

appeared before Congressional hearings in both the U.S. Senate and House of Representatives advocating legislation to curb the unrestrained use of pesticides. By then Carson's health was failing from cancer and she died in 1964.⁹⁵

It is difficult to underplay the effects of Carson's work on the growth of the environmental movement in the United States, even if her ethical suggestions were straight forward progressions from Leopold's work. Carson reiterated that the environment was much more complex than humans imagined and that it was appropriate to include it in the human moral calculus. Every organism was worthy of inclusion, not merely the economically lucrative ones. Like Leopold, she suggested that the entire ecosystem was deserving of protection.⁹⁶

In the political realm, Carson was much more important. Leopold's work was perhaps ahead of its time, or at least not in harmony with the spirit of the immediate postwar era. Carson was, if not a catalyst for the concerns of the early 1960s, then certainly an indication of what lay ahead. Carson's book was the impetus behind public awareness of the harmful effects of imprudent chemical use. Such knowledge and public action by the citizenry would propel Congress to create additional federal regulatory bodies to research and limit future chemical abuse. These forces would lead to the creation of the Environmental Protection Agency in 1970 and the transfer of the duties

95. J. E. de Steiguer, *The Origins of Modern Environmental Thought* (Tucson, AZ: The University of Arizona Press, 2006), 34-40.

96. Roderick Frazier Nash, *The Rights of Nature, A History of Environmental Ethics* (Madison, WI: The University of Wisconsin Press, Ltd., 1989), 82.

and responsibilities of pesticide oversight from the Department of Agriculture, where commercial agricultural concerns held sway, to the new agency.⁹⁷

The United States in the early 1960s was more able to process and act upon the information synthesized by Carson, even if the ethical standards proposed still required some conceptual digestion by the public. Several factors were behind this increased interest. The nation was economically more vigorous compared to the period of the Great Depression, but increased population growth accompanying this development placed pressures on the community that were becoming more noticeable. Industrial air pollution was more visible than chemical overuse and the irritants to the population in the sprawling urban areas were equally apparent to the lungs and health of the residents. As urban area populations grew, the waste products of human existence became larger and more concentrated. Using the local environment as the ultimate waste pit or heat sink was no longer considered to be a viable alternative.⁹⁸

Carson's work, which appeared as a practical discussion of a particular problem, thus struck a resonant chord with the population. A problem had been discovered and answers had been proposed in terms the population could grasp, even if these solutions were only to not make the problems worse. Carson's compelling writing style further eased the penetration of the postulates of *Silent Spring* into the national consciousness, even as the ethical asides were less demanding. Such a catalyst was felt at both national

97. Edward O. Wilson, afterword to *Silent Spring* by Rachel Carson (New York: Houghton Mifflin Company, 1962), 361.

98. Samuel P. Hays, *A History of Environmental Politics Since 1945* (Pittsburgh, PA: University of Pittsburgh Press, 2000), 16-21.

and local levels in the conservationist and environmental groups, where previous concerns with protecting what natural resources remained started to metastasize into a desire to do more to protect what little endured, and perhaps, roll back the forces of progress.

The Growth of Rhode Island Conservation Groups

This desire eventually spread into the Ocean State, whose conservation efforts had been subdued during the Eisenhower Administration. The only new conservation organization created in that period was the Rhode Island Beach Buggy Association (RIBBA). Established in 1958, the RIBBA was perhaps the last of the old style conservationist organizations in the state. As dune buggies grew in popularity, the group changed its name to the Rhode Island Mobile Sportsfishermen (RIMS) Club to prevent confusion with other, fossil fueled groups. The people in this Charlestown, RI based organization were focused on family efforts to preserve the beaches in southern Rhode Island for future fishing activities. In the late 1950s the group would bring down discarded Christmas trees to eroded beaches to help restore sand dunes for future use. The group continued with these efforts, later called OPERATION CHRISTMAS TREES, as a practical means to protect and preserve the sand dunes.⁹⁹

Carson's admonitions had greater effect on the Audubon Society of Rhode Island (ASRI). Alfred Hawkes, hired by ASRI in 1955 as an education specialist, became a

99. The Rhode Island Mobile Sportsfishermen Club, "History," The Rhode Island Mobile Sportsfishermen Club, <http://www.rimobilesportfishermen.org/Pages/default.aspx?fSc9UPrywD6ZH5HqHvJJ50jC%2fcgfrnb4%2f%2beRWTvtHi8%3d> (accessed June 28, 2014).

spearhead in moving the organization to address the issues raised in *Silent Spring*. By 1958 Hawkes had ascended to the organization's management and promoted a more aggressive attitude to stop the worst cases of pollution abuse in the state. As *Silent Spring* had described some of the instances of the worst effects of DDT pollution on birds, this seemed a natural fit. Residents of the state however seemed more interested in protecting their trees from the gypsy moth infestation than protecting the local bird population. Perseverance on Hawkes' part and the accumulation of evidence on the effects of chemical insecticides resulted in the state outlawing the use of DDT in 1965. Hawkes was an effective advocate for pollution abatement, eventually triggering the state to rescind its policy of airborne mosquito spraying that was equally harmful to the area's osprey population, suing industries that were polluting the waterways of the state, and creating greater awareness of the dangers of oil spills.¹⁰⁰ The other Rhode Island wildlife organizations appear to have been less vocal, continuing to pursue the same goals of conservation and nature appreciation, leaving Hawkes and the Audubon Society as the only forces advocating limiting pollution in the state.¹⁰¹

Lynn White, Jr. and the Religious Component of the Environmental Crisis

As the decade progressed and further evidence was generated supporting Carson's observations, other authors began to expand the conception of the environment as an area worthy of ethical consideration. These thoughts were less practically or empirically

100. Ken Weber, *A Century of Dedication, The First 100 Years of the Audubon Society of Rhode Island* (Audubon Society of Rhode Island, 1997), 21-23.

101. "Minutes of the Rhode Island Federated Sportsmen's Clubs Inc." (January 17, 1966), Audubon Society of Rhode Island Archives, Smithfield RI.

based than Leopold or Carson, but added to the overall depth of thought. In 1967, noted medieval scholar Lynn White, Jr. published “The Historical Roots of Our Ecological Crisis” in which he considered why Western civilization in particular had proved so destructive to its environment. The same culture that had developed the technology to subdue the natural environment had simultaneously failed to comprehend the destruction that it had wrought in the process:

Our present combustion of fossil fuels threatens to change the chemistry of the globe's atmosphere as a whole, with consequences which we are only beginning to guess. With the population explosion, the carcinoma of planless urbanism, the now geological deposits of sewage and garbage, surely no creature other than man has ever managed to foul its nest in such short order.¹⁰²

For White, the religious component of Western civilization was a root cause in this development. The religions of the West, Christianity and its Judaic precursor, had both positioned humans and nature as separate realms. Humans, created in God’s image, held a favored and superior position.¹⁰³ The rest of the world existed for humans to use for their benefit without any particular concern. In White’s analysis, “God planned all of this explicitly for man's benefit and rule: no item in the physical creation had any purpose save to serve man's purposes.”¹⁰⁴ With an acquiescent substrate upon which to act, Western culture’s call for individual action seemed divinely sanctioned. Accelerated by the discoveries of the Industrial Revolution, humans were able to gain a decisive edge in

102. Lynn White, Jr., "The Historical Roots of Our Ecological Crisis," *Science* 155, no. 3767 (March 10, 1967): 1204.

103. Roderick Frazier Nash, *The Rights of Nature, A History of Environmental Ethics* (Madison, WI: The University of Wisconsin Press, Ltd., 1989), 88.

104. Lynn White, Jr., "The Historical Roots of Our Ecological Crisis," *Science* 155, no. 3767 (March 10, 1967): 1205.

achieving domination of the environment in ways they had previously desired but had never truly fathomed reaching. Such technological mastery had been a function of empiricism, not science. Ethical concerns were less compelling than the ability to actually solve a problem, whether in ballistics or navigation. Later, as science developed new methods for technology to exploit, the synergy between science, technology and the Christian theology devoted to comprehending God's contemplations became more pronounced.¹⁰⁵ White doubted that more technology was the answer to the ills that current technology had produced, writing that "More science and more technology are not going to get us out of the present ecologic crisis until we find a new religion, or rethink our old one."¹⁰⁶ Since science and technology had found support from Christian theology, only a revision to that doctrine would suffice:

Both our present science and our present technology are so tintured with orthodox Christian arrogance toward nature that no solution for our ecologic crisis can be expected from them alone. Since the roots of our trouble are so largely religious, the remedy must also be essentially religious, whether we call it that or not. We must rethink and refeel our nature and destiny.¹⁰⁷

Saint Francis of Assisi's ideals of human equality with nature as opposed to mastery over it was a better model for modern times, suggested White, even recommending that Saint Francis be named a the patron saint of ecologists.¹⁰⁸

105. Ibid., 1203.

106. Ibid., 1206.

107. Ibid., 1206.

108. White's mention of wolves and birds seems as much an allusion to Leopold's and Carson's admonitions as a reminder of Saint Francis' works. See Lynn White, Jr., "The Historical Roots of Our Ecological Crisis," *Science* 155, no. 3767 (March 10, 1967): 1207.

White's article interjected the religious view into the expanding intellectual basis of the environmental movement, though not necessarily in a positive manner. As might be expected, the theological reaction, as well as the popular one, was not always angelic. Pilloried as a Kremlin-inspired neophyte Antichrist, White absorbed a fair amount of criticism from enthusiastic church members and their leadership, who were at least willing to engage with him on his central thesis of the ecological guilt of Christianity.¹⁰⁹ Academic criticism was more muted, willing to accept White's criticism of Christianity, though over time exposing many of the flaws of his hypothesis. White's work would engender many responses over the coming decade, but it served as an entry point for the theological community to engage with the ecological problems of the time.¹¹⁰

Barry Commoner and the Laws of Ecology

Another author, Barry Commoner, a Columbia and Harvard educated biologist, examined the ecological issues from a different perspective. Commoner had served in the U.S. Navy during the Second World War. In 1942, Commoner headed a group that designed a device allowing torpedo bombers to spray DDT on jungle environments to degrade the mosquito-borne pests that American soldiers were encountering. First tested in Panama, the airborne spraying proved effective in killing both the primary target

109. J. E. de Steiguer, *The Origins of Modern Environmental Thought* (Tucson, AZ: The University of Arizona Press, 2006), 103.

110. White commented in 1978 that "Fifteen years ago almost no theologian knew what the world *ecology* meant." See Roderick Frazier Nash, *The Rights of Nature, A History of Environmental Ethics* (Madison, WI: The University of Wisconsin Press, Ltd., 1989), 94.

insects as well as fish in the adjacent littorals.¹¹¹ Following the war, Commoner first worked as the Navy's liaison to the newly created Atomic Energy Commission where he gained insight into the connections between the scientific community and political world.¹¹² Next he accepted a position at Washington University in St. Louis, Missouri where he studied both science and its influence on national policy and politics.

Commoner became concerned that the collaboration between the government and industry forged during the war had fatally compromised scientific integrity in the pursuit of financial gain and advanced weaponry. American science needed to reframe itself for service to the public in order to redeem itself.¹¹³

In the 1950s Commoner became involved in the actions to stop the above ground testing of nuclear weapons, following Nobel Peace Prize winner Albert Schweitzer's warnings of the dangers of radioactive fallout from these explosions. In these endeavors Commoner was often ahead of the positions that the American Association for the Advancement of Science (AAAS), with which he was affiliated, was prepared to endorse. Commoner was much more willing to accept ambiguity and uncertainty regarding the issue as he regarded the problem as much a social one as a scientific one. To promote his viewpoints Commoner created a group of like minded individuals to broadcast information regarding the potential health hazards presented by the nuclear testing in

111. Michael Egan, *Barry Commoner and the Science of Survival* (Cambridge, MA: The MIT Press, 2007), 20.

112. *Ibid.*, 29.

113. *Ibid.*, 31.

nearby Nevada.¹¹⁴ The scientific and political discourse regarding the safety hazards of above ground testing continued until the enactment of the nuclear Test Ban Treaty in 1963 between the United States and the Soviet Union. Commoner emerged from this confrontation as a persuasive author and an effective organizer of concerned citizens and researchers, but also as a besmirched scientist. By taking positions outside the provable or accepted knowledge base, Commoner was decried to have suborned the objectivity he had earlier promoted.¹¹⁵

These experiences also firmed up a number of ideas regarding the creation of science policy in a democratic society. Primarily, Commoner thought that scientists should not be insulated from the social ramifications of their research. Since science and technology were becoming more complex, scientists had a duty to assist society in comprehending the decisions they were making in the public realm. Information had to be widely and freely disseminated to an educated citizenry, not merely the government officials making policy, and not tightly controlled by the government for national security or other reasons.¹¹⁶ Lastly, scientists had to disabuse themselves of the notion that their specialized knowledge permitted them to promulgate ethical edicts. The public and politicians had to make their own informed decision after weighing the advantages and disadvantages of any science policy; scientists could merely assist with that procedure

114. Samuel P. Hays, *Beauty, Health and Permanence: Environmental Politics in the United States, 1955-1985* (New York: Cambridge University Press, 1987), 174.

115. Michael Egan, *Barry Commoner and the Science of Survival* (Cambridge, MA: The MIT Press, 2007), 45-77.

116. *Ibid.*, 57.

and not subvert the process. Doing otherwise would exacerbate the already numerous threats to scientific integrity.¹¹⁷

Commoner's conversion to an environmental mindset arose from the struggle to confirm the Nuclear Test Ban Treaty. As Commoner viewed it, "The Nuclear Test Ban Treaty should be regarded, I believe, as the first victorious battle in the campaign to save the environment – and its human inhabitants - from the blind assaults of modern technology."¹¹⁸ He was not impressed with the Atomic Energy Commission's protestations that the health risks to humans from nuclear fallout were acceptable, let alone that the effects of radiation on other organisms would be tolerable.¹¹⁹ Commoner promoted this new perspective throughout the rest of the decade, as he continued to author articles on the hazards of advanced industrial methods on the environment. In 1965 Commoner opened up the Center for the Biology of Natural Systems at Washington University. This organization attempted to conduct a systems analysis of the effects of pollution on the environment.¹²⁰ Commoner explained:

Too often, today, we fail to perceive this system as a complex whole. Too often has this blindness led us to exaggerate our power to control the potent agents which we have let loose in the environment. Only too often in the recent past has our unperceived ignorance led to sudden hazards to life - contamination of our

117. Barry Commoner, *Science & Survival* (New York: The Viking Press, 1967), 108-109.

118. Barry Commoner, *The Closing Circle, Nature Man, and Technology* (New York: Alfred A. Knopf, 1971), 56.

119. Michael Egan, *Barry Commoner and the Science of Survival* (Cambridge, MA: The MIT Press, 2007), 74-76.

120. *Ibid.*, 93.

streams with powerful but poorly understood biochemical agents; pollution of the air with powerful but poorly understood radiation.¹²¹

Similar to the exploration of the problems of DDT use that had been exposed in *Silent Spring*, Commoner looked at other industrial byproducts and their effects, not just on humans, but on the other inhabitants of the polluted areas. Mercury from the combustion of fossil fuels, particularly from coal-fired electricity generating plants was one of the problems Commoner considered, as the element was a hazard to both marine and human life.¹²² Commoner became a visible critic of such industrial practices that, while profitable to the industrial concerns in the short run, in the long run caused a significant harm to humans and other organisms. He began a newsletter, *Scientist and Citizen*, which later expanded into the magazine *Environment*, exploring the issues of industrial pollution in the nation.¹²³ A spirited lecturer and lobbyist, Commoner was energetic in spreading the word to the American people who he believed should be the final arbiter in deciding how to manage these risks.

In 1971 Commoner published *The Closing Circle* on the emerging environmental crisis. Partly written in response to other books that had identified overpopulation growth as the root cause of the emergency as compared to industrial pollution, Commoner's book

121. Barry Commoner, *Science & Survival* (New York: The Viking Press, 1967), 46.

122. Michael Egan, *Barry Commoner and the Science of Survival* (Cambridge, MA: The MIT Press, 2007), 94-95.

123. *Ibid.*, 97.

was less ground breaking analysis than a careful synthesis of existing knowledge.¹²⁴ In the volume, the author examined how technological society had literally missed the forest for the trees when assessing the environmental consequences of industrial production, particularly how the waste products of industry had to go somewhere when they were produced.¹²⁵ There was no place beyond the environment to deposit such complex chemical waste without it eventually coming back to affect other life forms, often human ones:

In sum, we can trace the origin of the environmental crisis through the following sequence. Environmental degradation largely results from the introduction of new industrial and agricultural production technologies. These technologies are ecologically faulty because they are designed to solve singular, separate problems and fail to take into account the inevitable “side effects” that arise because, in nature, no part is isolated from the whole ecological fabric. In turn, the fragmented design of technology reflects its scientific foundation, for science is divided into disciplines that are largely governed by the notion that complex systems can be understood only if they are first broken into their separate component parts. This reductionist basis has also tended to shield basic science from a concern for real-life problems, such as environmental degradation.¹²⁶

124. Commoner opposed the views of Paul R. Ehrlich who suggested in his book, *The Population Bomb* rev. ed. (New York: Ballantine Books, Inc., 1968, 1971), that the exponential growth of the human population was the primary cause of the environmental crisis. To Commoner, the expanding population and resultant consumption was less an issue than the resultant waste streams of advanced technological activity into the environment. The resultant effects were more than the biological filters could absorb, leading to system breakdown and catastrophe. See Samuel P. Hays, *Beauty, Health and Permanence: Environmental Politics in the United States, 1955-1985* (New York: Cambridge University Press, 1987), 212.

125. “The Closing Circle by Barry Commoner,” *The New Republic* (November 6, 1971): 28-29.

126. Barry Commoner, *The Closing Circle, Nature Man, and Technology* (New York: Alfred A. Knopf, 1971), 193.

Within the book Commoner proposed a set of cautionary postulates to assist humans when taking actions that might affect the environment. These “laws of ecology” were not as exacting or precise as any in physics or chemistry, but they provided general guidelines to prevent human caused damage to the environment. The First Law of Ecology stated that “Everything Was Connected to Everything Else.”¹²⁷ The myriad of connections in any biological system, mostly unknown and unimagined by humans, allows great flexibility when permitted to reach its own equilibrium. Upsetting that balance and forcing human desired outcomes into the system, was bound to cause disruptions and the possible collapse of the environment.¹²⁸ Commoner’s Second Law read that “Everything Must Go Somewhere,” since in “nature there is no such thing as ‘waste.’”¹²⁹ The conversion of base materials into complex chemicals that had never been released into the environment before resulted in toxic concentrations in biological systems.¹³⁰ In the Third Law, “Nature Knows Best,” Commoner submitted that any large scale human-generated change to a natural system is likely to be more detrimental than advantageous.¹³¹ Two to three billion years of evolution was unlikely to be bested by a few years of human research and development.¹³² Finally, in the Fourth Law, Commoner

127. Ibid., 33.

128. Ibid., 33-39.

129. Ibid., 39.

130. Ibid., 39-41.

131. Ibid., 41.

132. Ibid., 41-45.

enjoined that “There Is No Such Thing as a Free Lunch.”¹³³ Every gain in the economic realm had a resultant environmental cost, often unrealized until the damage had accrued. The cleanup, if possible, was often more costly than the previous gain, suggesting that humans should be prudent prior to undertaking activities that might cause such damage.¹³⁴ These precepts were not prescriptive but suggested that, like any natural law, violating them would eventually lead to significant problems. Over time these principles would be expanded upon but in 1971 they were ground breaking.

While a critic of American technological excess, Commoner was not proposing a new ethical standard of behavior for the population. If anything Commoner suggested that the moral and social views of the technical experts were suspect.¹³⁵ His analysis was firmly based on the scientific method to determine the magnitude of the problem, but required actions by educated citizens to make the democratic decision of how to proceed. Commoner also had little to say at this time about the electric power grid in any of its generation, transmission or distribution portions. He did link the growth of affluence in the nation to its energy consumption and hence to its ability to generate electric power. The electric power generation to achieve this level of affluence, however, was the cause of:

major pollution problems: sulfur dioxide, nitrogen oxides, and dust emitted by fossil-fuel burning plants; radioactive emissions and the small but enormously catastrophic potential of an accident from the operation of nuclear power plants;

133. Ibid., 45.

134. Ibid., 45-46.

135. Michael Egan, *Barry Commoner and the Science of Survival* (Cambridge, MA: The MIT Press, 2007), 138.

and the emission of waste heat to the air and nearby surface waters by both types of plants.¹³⁶

Commoner also suggested that the true costs of generating electricity from electric power plants were much greater than the values that the ledgers of any utility company might state. Citizens needed to discern the hidden costs from pollution cleanup of the fossil fuel emissions or the increased health costs from lung cancer caused by pollutants when assessing the true expenses of a power plant. These hidden costs might be worthwhile, but often the social costs of such problems were borne by the population without any knowledge they even existed. The companies operating the industries that generated the pollution enjoyed the financial profits but avoided the cleanup costs.¹³⁷

Commoner believed that science and scientists could help inform citizens on the risk versus gain calculus on such issues, but only so much. Much of western science was reductionist in focus and the complex environmental systems resisted such facile analysis. An interdisciplinary approach, Commoner believed, was required; “Life, as we live it, is not encompassed by a single academic discipline. Real problems that touch our lives and impinge on what we value rarely fit into the neat categories of the college catalog, such as physical chemistry, nuclear physics, or molecular biology.¹³⁸ Still, Commoner had some cause for optimism. An awareness of the environmental crisis was the first step in altering the path towards destruction. Since the environmental crisis was

136. Barry Commoner, *The Closing Circle, Nature Man, and Technology* (New York: Alfred A. Knopf, 1971), 171-172.

137. *Ibid.*, 194-196.

138. *Ibid.*, 192.

a function of human social activity it was equally amenable to change at a rapid pace. Commoner proposed that “Since the environmental crisis is the result of the social mismanagement of the world’s resources, then it can be resolved and man can survive in a humane condition when the social organization of man is brought in harmony with the ecosphere.”¹³⁹

Commoner would write more on energy, the electric power grid and the environment in the later part of the 1970s, but his role as a prophet of the environmental crisis was firmly established. Such views as his, along with those of Paul Ehrlich and Ralph Nader to name but two, informed both the population and the politicians of the environmental hazards of the current industrial processes. If Commoner’s prescriptions for socialist remedies were less palliative, his descriptions of the symptoms were sufficient to help maintain public awareness and legislative momentum.¹⁴⁰

Into the 1960s

The environmental movement was one of many affecting society in the turbulent decade of the 1960s. Certainly the resistance to the Vietnam War was the most apparent one, but the ongoing civil rights, feminist and anti-nuclear weapons movements all were buffeting American society. Each of these movements learned from the victories and defeats of the others, sharing tactics and lessons learned. Participants moved somewhat seamlessly between the movements, as membership requirements were nonexistent,

139. Ibid., 299.

140. Michael Egan, *Barry Commoner and the Science of Survival* (Cambridge, MA: The MIT Press, 2007), 139.

though depending on the issue of the day, one undertaking might have attracted more attention than another from the population.¹⁴¹ The protestors often looked at the moral response of the anti-nuclear discussions, appropriating those elements that were applicable.

In the nation's capital a large amount of legislation designed to protect the environment against some of the more severe depredations was passed in the mid to late 1960s due, in some small part, to the increasing awareness of the various environmental problems brought to light by the activists. In 1964 Congress passed the Wilderness Act that protected a National Wilderness Preservation System of over nine million acres of land. Following President Lyndon B. Johnson's election, a new flurry of legislative action brought forth the Water Quality Act, the Noise Control Act, the Solid Waste Disposal Act, and the Beautification Act in 1965.¹⁴² The Water Quality Act set the standards for water purity for federal or state regulation and enforcement.¹⁴³ The other legislation consisted mainly of amendments to previous ordinances setting more stringent standards or providing greater authority to the federal and state governments to enforce

141. Jon Agar, "What Happened in the Sixties?" *British Society for the History of Science* 41, no. 4: 578-580.

142. Steven Stoll, *U.S. Environmentalism Since 1945*. (Boston, MA: Bedford/St. Martin's, 2007), 157.

143. William D. Ruckelshaus, *The Challenge of the Environment: A Primer on EPA's Statutory Authority* (Washington, DC: Environmental Protection Agency, 1972), 13.

them.¹⁴⁴ The next year the Fish and Wildlife Conservation Protection Act was passed requiring the Secretary of the Interior to take action to protect several species of threatened animals while the Clean Water Restoration Act appropriated the funds to help states and local communities meet the technical standards of the 1965 Water Quality Act. The Endangered Species Act of 1966 was the first attempt to protect species threatened with extinction, while other ordinances added to the land in the National Wilderness Preservation System.¹⁴⁵ Subsequent legislation strengthened the Air and Water Quality Acts even as the Johnson administration's legislative efforts were culminating under the wilting stress of prosecuting the Vietnam War.¹⁴⁶ All of this legislation expanded the duties and responsibilities of the federal and state governments to monitor and take action to maintain the standards as set forth by the agencies of the federal government. The obligations were divided between the various departments, with Agriculture and the Interior having the lead for water standards.¹⁴⁷

144. David M. Bearden, et. al., *Environmental Laws: Summaries of Major Statutes Administered by the Environmental Protection Agency* (Washington, DC: Congressional Research Service, 2013), 3-4, 25-26, 52.

145. Alexander, Kristina, M. Lynne Corn, and Eugene H. Buck, *The Endangered Species Act: A Primer* (Washington, DC: Congressional Research Service, 2012), 1.

146. The Rhode Island Congressional Delegation were all members of the majority Democratic Party and were reliable votes to further this popular bipartisan legislation. See Govtrack.us, "Roll Call Votes, 1965 and 1966, 89th Congress," Govtrack.us, <https://www.govtrack.us/congress/votes#session=249> (accessed August 2, 2014).

147. LBJ Library, "Legislation on Conservation/Environment 1965-68," LBJ for Kids, LBJ Library, http://www.lbjlib.utexas.edu/johnson/lbjforkids/enviro_timeline.shtm (accessed August 1, 2014).

The national and local environmental organizations mirrored this incremental approach in the mid decade. The Sierra Club continued to lobby for greater amounts of land to be set aside for wildlife, while the National Wildlife Foundation seemed to parallel the concerns of the conservationist hunters and nature lovers by lobbying Congress to pass the various laws expanding pollution cleanup and environmental standards.¹⁴⁸ In Rhode Island, there was greater interest in the actions of the Audubon Society of Rhode Island, but no new organizations rose to ameliorate public anxieties. Only one new group, the Conservation Law Foundation (CLF), established in 1966 in Boston, Massachusetts, would have any effect in the Ocean State.¹⁴⁹ Created to oppose the construction of a ski resort on Mount Greylock, the highest point in Massachusetts, the CLF expanded its interests to consider other environmental problems.¹⁵⁰ Its initial director, Benjamin Nason, led a volunteer group of attorneys to provide legal and tax recommendations to other local conservationist organizations as well as provide input on pending state environmental legislation. Here they were more successful and the organization expanded to the other New England (with the exception of Connecticut)

148. National Wildlife Federation, "Legislative Victories - 1960s," National Wildlife Federation, <http://www.nwf.org/Who-We-Are/History-and-Heritage/Legislative-Victories/1960s.aspx> (accessed August 4, 2014).

149. Kelly Maree Nichols, "From Climate Justice to Green Business: A Rhode Island Case Study of Current Trends in the Environmental Movement" (Environmental Studies thesis, Brown University, 2009), 78.

150. In this respect they failed, though the experience the group gained permitted them to advise other groups on using legal means to address environmental issues. See John E. Bonine, "Private Public Interest Environmental Law: History, Hard Work, and Hope," *Pace Environmental Law Review* 26, no. 2 (Summer 2009): 469.

states.¹⁵¹ By the early 1970s they were actively coordinating with other New England environmental groups to take advantage of the federal tax code regarding charitable contributions to the organizations.¹⁵²

The Creation of Earth Day

As the 1960s ended, a fresh wave of environmental legislation was considered. Legislators and members of the executive branch were pressured by the public, who considered that the enforcement of the new environmental standards was too slow and that the existing pollution abatement efforts were taking a long time to resolve.¹⁵³ An increase in the number of television sets across the nation and a corresponding increase in the reporting of environmental incidents, such as the oil spill in January 1969 in southern California or the Cuyahoga River fire in Cleveland, Ohio brought the images of environmental damage to the living rooms of a greater numbers of citizens, who shared their concerns with their representatives.¹⁵⁴

In Washington, Senator Gaylord Nelson, a Democratic Senator from Wisconsin, had made a reputation as an advocate for the new environmental issues and legislation.

151. Conservation Law Foundation, *CLF 40 Years, Protecting New England's Environment* (Boston, MA: Conservation Law Foundation, 2006): 2-4.

152. Kelly McClintock, Conservation Law Foundation to Messrs. Bogfinger, Goodall, Hawkes, Kunz, Morgan and Webber, October 25, 1972, Audubon Society of Rhode Island Archives, Smithfield, RI.

153. Claudia Copeland, *Clean Water Act: A Summary of the Law* (Washington, DC: Congressional Research Service, 2010), 2.

154. Xin Liu, "The U.S. Environmental Protection Agency, A Historical Perspective on Its Role in Environmental Protection" (PhD diss., University of Munich, 2010), 63.

Nelson had earlier recommended to President John F. Kennedy that he help resolve environmental problems, but Kennedy's efforts had been cut short by his assassination in 1963. Nelson had observed the numerous demonstrations against the Vietnam War and thought that this method might be an appropriate way to educate and motivate the population regarding environmental concerns. In September 1969 while at a conference in Seattle, Nelson

announced that in the spring of 1970 there would be a nationwide grassroots demonstration on behalf of the environment and invited everyone to participate. The wire services carried the story from coast to coast. The response was electric. It took off like gangbusters. Telegrams, letters, and telephone inquiries poured in from all across the country. The American people finally had a forum to express its concern about what was happening to the land, rivers, lakes, and air – and they did so with spectacular exuberance.¹⁵⁵

The national response to Nelson's idea swamped his staff's ability to coordinate, and the Senator quickly shifted the responsibilities and authorities for coordination to the local levels. Nelson looked at various days in the spring to launch this demonstration. Eventually the 22nd of April was chosen, a date which would become known as "Earth Day."¹⁵⁶

The new administration of Republican President Richard M. Nixon noted this public concern and proposed new solutions for some of these issues. Nixon's first attempts to create a high level federal coordinating body to deal with environmental issues were not well received by the Democratic controlled Congress. In December 1969, Nixon attempted to deflect criticism by accepting Congress's National

155. Gaylord Nelson, "The History of Earth Day," <http://www.hawaiizerowaste.org/uploads/files/history.pdf> (accessed August 4, 2014).

156. Ibid.

Environmental Policy Act (NEPA) legislation, signing it into law on the first of January 1970. NEPA stipulated that all federal agencies would use “a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision-making which may have an impact on man’s environment.”¹⁵⁷ The statute also established the Council on Environmental Quality (CEQ) to evaluate environmental concerns as well as economic and technical ones when making decisions. Finally, all federal legislation or actions affecting the environment were now required to submit an environmental impact report to investigate possible “adverse environmental effects which cannot be avoided if the proposal be implemented.”¹⁵⁸

The passing of NEPA accelerated many of the emerging environmental activities. At both the federal and the local grass roots level things happened very rapidly, meeting many of the objectives of both politicians and environmentalists. In his first Annual Message to Congress on the State of the Union, Nixon touched on many of the issues that the previous environmental writers had touched upon:

The great question of the seventies is, shall we surrender to our surroundings, or shall we make our peace with nature and begin to make reparations for the damage we have done to our air, to our land, and to our water?

We have been too tolerant of our surroundings and too willing to leave it to others to clean up our environment. It is time for those who make massive demands on society to make some minimal demands on themselves. Each of us must resolve that each day he will leave his home, his property, the public places

157. *National Environmental Policy Act of 1969*, Public Law 91-190, 91st Cong. (January 1, 1970), 1-9.

158. *Ibid.*

of the city or town a little cleaner, a little better, a little more pleasant for himself and those around him.¹⁵⁹

Nixon followed up this speech with a 37-point environmental action program issued in February 1970 that provided additional strengthening of the federal programs dealing with water and air pollution, just in time for the upcoming “Earth Day.”¹⁶⁰

“Earth Day” as it came to be known throughout the country was a resounding success. Perhaps twenty million Americans across the nation participated in the peaceful demonstrations for environmental actions to clear up the worsening environmental conditions in the nation on the first Earth Day on April 22, 1970.¹⁶¹ The response astounded Nelson and other politicians struggled to keep up with the flourishing movement.

In Rhode Island, over one hundred activities were planned for the entire week encompassing Earth Day.¹⁶² The *Providence Journal* asserted that “All over Rhode Island, college students and others will be engaged in activities aimed at making reparations for man’s savages against his environment” as part of the state’s Earth

159. Nixon also suggested that overpopulation growth was one of the causes of the problem, something that Barry Commoner probably disagreed with. See Richard Nixon, “Annual Message to the Congress on the State of the Union,” January 22, 1970. The American Presidency Project, <http://www.presidency.ucsb.edu/ws/?pid=2921> (accessed August 3, 2014).

160. Jack Lewis, “The Birth of EPA” *EPA Journal* 12, no. 9 (November 1985): 7.

161. Ibid.

162. James T. Kaull, “Who Uses the Broom and Who Pays the Bills?,” *Providence Journal*, April 27, 1970, sec. N.

Week.¹⁶³ At the University of Rhode Island, Dr. John Rock, co-designer of the birth control pill, warned of the perils of overpopulation, while other students attacked the oil spill residue and debris at Fenner Pond in Cranston.¹⁶⁴ While April 22nd was partly cloudy with temperatures in the mid 50s, Earth Day itself was star studded in the state. At URI the former Republican governor, John H. Chafee, then the Secretary of the Navy, urged the over 800 assembled students to “make a fuss” about cleaning up the environment. Thomas L. Kimball, the executive director of the National Wildlife Federation, admonished the students that while concern for the environment was currently exciting, it risked the loss of interest among the population. Political action by concerned citizens was required but it could easily devolve into indulging the political parties by unscrupulous operatives. Other speakers at URI urged an increase in spending by the federal government to protect the environment, though Secretary Chafee urged caution on overspending in this area.¹⁶⁵

At Brown University in Providence, Barry Commoner attempted to harness the student energy into environmental activism. Noting that they were the first generation in human history to have radioactive isotopes from nuclear fallout and DDT in their bodies, Commoner exhorted them to reexamine the basis of their technological society as “Environmental pollution is not to be regarded as an unfortunate, but incidental, by-

163. “It’s Earth Day and a Busy One,” *Providence Journal*, April 22, 1970, sec A.

164. “Fenner Pond Cleanup to Start,” *Providence Journal*, April 22, 1970, sec A.

165. “R.I. Earth Day Observed by Young and Old,” *Providence Journal*, April 22, 1970, sec A.

product of the growth of population, the intensification of production, or of technological progress. It is, rather, an intrinsic feature of the very technology which we have developed to enhance productivity.”¹⁶⁶ Radioactive fallout, no less than the pollutants from the combustion of fossil fuels or toxic chemicals, was another indication of this problem. Yet the situation was not beyond repair, even if the complex problem of environmental contamination would take a long time to fix, let alone to understand the proximate causes.¹⁶⁷ “Ecological victories” were still possible by informed action, Commoner suggested, citing the work of Rachel Carson to influence government response on toxic chemicals.¹⁶⁸

At Salve Regina College in Newport, a board of faculty members discussed the environmental crisis. One suggested that industrial pollution was a side effect of the means of production required to allow the population sufficient leisure to send students to colleges such as Salve Regina. A theology professor, Father Richard Mandeville, opined

166. Michael Egan, *Barry Commoner and the Science of Survival* (Cambridge, MA: The MIT Press, 2007), 118.

167. Commoner’s analysis of the complex, ill-structured problem of pollution was ahead of many contemporaries who posited numerous panaceas to address the entire spectrum of the environmental crisis. “For having spent some years in the effort simply to detect and describe the growing list of environmental problems – radioactive fallout, air and water pollution, the deterioration of the soil – and in tracing some of their links to social and political processes, the identification of a single cause and cure seemed a rather bold step.” See Barry Commoner, *The Closing Circle, Nature Man, and Technology* (New York: Alfred A. Knopf, 1971), 10, and Michael Egan, *Barry Commoner and the Science of Survival* (Cambridge, MA: The MIT Press, 2007), 116-117.

168. “R.I. Earth Day Observed by Young and Old,” *Providence Journal*, April 22, 1970, sec A.

that the root cause of the problem was individual attitude, something that no change in technology or business could affect.¹⁶⁹

Some discussion on the responsibilities of the electric power utilities to the current pollution levels and the environmental crisis took place during Earth Week. At a panel discussion at Brown University, John Lebourveau, a New England Electric System engineer, stated that the utility was attempting to limit the amount of pollution it was creating with its Providence power plants by installing pollution monitoring devices and procuring a supply of low sulphur content oil to burn on days where the weather was conducive to serious air pollution problems. Other panel members suggested that the problem was essentially a political one to resolve.¹⁷⁰ Students at Brown University created an altercation with a member of the state air pollution control division when the official's discussion of Narragansett Electric's self monitoring of pollution proved unsatisfactory to the audience.¹⁷¹ An editorial in the *Providence Journal* conjectured about the ability of Narragansett Electric to spread the costs of eliminating air pollution to

169. Not all students were impressed by the panel. One stated that U.S. imperialism and capitalism were responsible for the ecological problems in the nation, resulting in a "vigorous discussion." See "'Earth Day' Panel Talk Held at Salve Regina," *Providence Journal*, April 22, 1970, sec A.

170. James T. Kaull, "Clean Air Linked to Political Action," *Providence Journal*, April 21, 1970, sec A.

171. The student was not convinced that Narragansett Electric's self monitoring efforts were either effective or conducted with integrity. See James T. Kaull, "Who Uses the Broom and Who Pays the Bills?," *Providence Journal*, April 27, 1970, sec. N.

its customers, though it recommended that cleaning up the pollution in the state was the responsibility for all citizens.¹⁷²

Even the state government participated in the activities. Governor Frank Licht, a Democrat, signed into law a new bill strengthening the authority of the state's health director to address water pollution in the state.¹⁷³ As one of the numerous bills dealing with pollution in the state, this was seen as a small step for public health and addressing the crisis. Continued pressure by the citizenry under the guidance of the growing number of environmental groups in the state would be required for further progress.¹⁷⁴

Founding the Environmental Protection Agency

The Nixon Administration was interested in exploiting the popular interest in environmental issues. Acceding to the recommendations of the Council on Environmental Quality, Nixon proposed the creation of the Environmental Protection Agency (EPA) in July 1970, combining the functions of the other federal departments under one new agency. The EPA's mission was to "establish and enforce environmental protection standards, conduct environmental research, provide assistance to others combatting environmental pollution and assist the CEQ in developing and recommending to the President new policies for environmental protection."¹⁷⁵ William D. Ruckelshaus,

172. "Paddling in Pollution," *Providence Journal*, April 21, 1970, sec A.

173. "Pollution Bill Signed by Licht," *Providence Journal*, April 25, 1970, sec A.

174. James T. Kaull, "Who Uses the Broom and Who Pays the Bills?," *Providence Journal*, April 27, 1970, sec. N.

175. Jack Lewis, "The Birth of EPA" *EPA Journal* 12, no. 9 (November 1985): 8.

a 38-year-old Assistant Attorney General in the Department of Justice, was confirmed by the Senate in December as the EPA's first director.

Ruckelshaus acted rapidly to establish the EPA as an aggressive federal agency committed to addressing the problems of pollution in the nation. Within the first three months of the agency's existence, he had threatened to sue the cities of Cleveland, Detroit and Atlanta for their failure to address their water pollution problems, and firmly stated that the new organization was not going to act to promote economic activity in the country at the expense of addressing environmental difficulties. Instead, Ruckelshaus desired the EPA to act as the government's watchdog for environmental improvement and to assist in the "development of an environmental ethic" among all members of the nation.¹⁷⁶

Other legislative activity followed the creation of the EPA. Congress passed an essentially entirely new and improved Clean Air Act and established the Occupational Health and Safety Administration (OSHA) in 1970, while the Federal Water Pollution Control Act (amending the Clean Water Act), the Coastal Zone Management Act, the Ocean Dumping Act and the Marine Mammal Protection Act were enacted in 1972.¹⁷⁷ The Federal Water Pollution Control Act of 1972 substantially altered the precepts of the earlier Clean Water Acts:

It set optimistic and ambitious goals, required all municipal and industrial wastewater to be treated before being discharged into waterways, increased federal assistance for municipal treatment plant construction, strengthened and

176. Ibid.

177. Steven Stoll, *U.S. Environmentalism Since 1945*. (Boston, MA: Bedford/St. Martin's, 2007), 157.

streamlined enforcement, and expanded the federal role while retaining the responsibility of states for day-to-day implementation of the law.

The 1972 legislation declared as its objective the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. Two goals also were established: zero discharge of pollutants by 1985 and, as an interim goal and where possible, water quality that is both "fishable" and "swimmable" by mid-1983.¹⁷⁸

Congress banned DDT in 1972, following that up in 1973 with the Endangered Species Act before pausing in the wake of the Watergate scandal that was demanding the attention of the national legislature.¹⁷⁹

Continued Environmental Action in Rhode Island

This acceleration of environmental activity was replicated at the local levels. Rhode Island, which had seen four conservation/environmental groups formed in the preceding fifty years, experienced the birth of nine new groups in the first two years of the 1970s.¹⁸⁰ Most of these new groups were focused on altering the environmental policies and procedures of the state and local governments. Many were initially very small. Save the Bay, created in October 1970, was in the beginning a three man team run by its executive director, John Scanlon. The group was originally focused on the effects

178. Claudia Copeland, *Clean Water Act: A Summary of the Law* (Washington, DC: Congressional Research Service, 2010): 2.

179. Steven Stoll, *U.S. Environmentalism Since 1945*. (Boston, MA: Bedford/St. Martin's, 2007), 157.

180. They were Environment Rhode Island, Narrow River Preservation Association, and Save the Bay (1970), Block Island Conservancy, Clean Water Action, Environment Council of Rhode Island, Pawtuxet River Authority & Watershed Council, Rhode Island Resource Conservation & Development Area Council, and Sakonnet Preservation Association (1972). See Kelly Maree Nichols, "From Climate Justice to Green Business: A Rhode Island Case Study of Current Trends in the Environmental Movement" (Environmental Studies thesis, Brown University, 2009), 78.

of developing energy facilities on Narragansett Bay.¹⁸¹ The group's mission was to protect the watershed and coastal areas of the bay "through an ecosystem-based approach to environmental action; defends the right of the public to use and enjoy the Bay and its surrounding waters; and fosters an ethic of environmental stewardship among people who live in or visit the Narragansett Bay region."¹⁸² Many other groups were narrowly focused on particular niche interests that paralleled the growing environmental mentality in the nation. The Block Island Conservancy, founded in 1972, was originally devoted to protecting a portion of land near Rodman's Hollow; greater aspirations would arise later.¹⁸³ The Narrow River Preservation Association, formed in 1970, acted to "preserve, protect, and restore the natural environment and the quality of life for all communities within the Narrow (Pettaquamscutt) River Estuary and Watershed."¹⁸⁴ Other groups were state affiliates of larger national organizations, such as Clean Water Action, established in 1972. The national organization was engaged in lobbying Congress for the passage of the Clean Water Act in the early 1970s, an objective that was achieved in 1972.¹⁸⁵

181. Save the Bay, "Our History," Save the Bay, <http://www.savebay.org/history> (accessed August 9, 2014).

182. Save the Bay, "About Save the Bay," Save the Bay, <http://www.savebay.org/about> (accessed August 9, 2014).

183. Block Island Conservancy, "History of Block Island Conservancy," Block Island Conservancy, <http://www.biconservancy.org/bic-history.html> (accessed August 10, 2014).

184. Narrow River Preservation Association, "About Us," Narrow River Preservation Association, <http://www.narrowriver.org/537698> (accessed August 10, 2014).

185. Clean Water Action, "Years of Success," Clean Water Action, <http://www.cleanwateraction.org/about/#70s> (accessed August 10, 2014).

The creation of the National Wildlife Foundation's new Rhode Island affiliate, the Environment Council of Rhode Island (ECRI), was perhaps the most important of the new organizations as it was an indicator in the direction of where the state's environmental movement was heading. In the late 1960s, members of Rhode Island Wildlife Federation (RIWF), the state affiliate of the National Wildlife Federation (NWF), had become dissatisfied with the direction of the organization. Some members of the RIWF wanted to embrace the political activism that was having some success in motivating Congress to create new standards for clean air and water. Other members of RIWF were not interested in becoming more vocal in their pursuit of state and local policy changes that were required to protect the state's environmental resources. When the national organization directed that state affiliates would be required to become more politically active to maintain their membership, the stage was set for a change in state environmental guidance.¹⁸⁶

Alfred Hawkes, the director of the Audubon Society of Rhode Island, was instrumental at redirecting this unrest towards a more positive course. Hawkes had spent much of the later portions of the 1960s and early 1970s shifting ASRI towards an environmental mindset. He had focused on primary education, coordination between other New England conservation and environmental groups and editing ASRI's publications. The ASRI monthly journal had published numerous articles investigating the effects of pollution in the early 1970s, including the role of electricity generating

186. Environment Council of Rhode Island, "History," Environment Council of Rhode Island, <http://environmentcouncilri.org/content/history> (accessed August 10, 2014).

plants in creating threatening wastes.¹⁸⁷ In 1971 Hawkes and a group of other education experts had written a campaign plan for the development of environmental education at the University of Rhode Island for use in elementary and secondary schools. The syllabus contained both classroom and field work to cement the education. While based on the scientific method, it required an interdisciplinary approach to be effective:

The committee conceives of environmental education as a means to inform students about the nature of the environment, both natural and man-made, and to suggest processes by which the environment can be managed in the interests of the society. This conception removes environmental education from the exclusive context of the natural sciences and prevents it from being considered as merely another discipline which should be added to established curricula along with existing subject matter. At bottom it perceives of environmental education as primarily devoted to affecting people's attitudes towards the environment and its management.¹⁸⁸

With this mindset, Hawkes became instrumental in affecting change in the Rhode Island constellation of environmental groups. In 1972, under the leadership of Hawkes, the Environment Council of Rhode Island was established as a state non-profit corporation.¹⁸⁹ ECRI, which was disposed to advocate governmental action to protect the environment along the lines of the National Wildlife Federation's guidance, was recognized as the state affiliate of the NWF. The Rhode Island Wildlife Federation was

187. James J. MacKenzie, "Social Costs of Energy," *Rhode Island Audubon* 5 (May-June 1971): 4-5.

188. The Advisory Committee for the Youth Science Center at the W. Alton Jones Campus, University of Rhode Island (June 15, 1971): 4. Audubon Society of Rhode Island Archives, Smithfield, RI.

189. Hawkes was corresponding with ECRI regarding the possible dangers of nuclear power plants as early as 1971, but the group was not incorporated as a non-profit organization until 1972. See Alfred L. Hawkes to Ollie Hauk, National Wildlife Federation, 12 November 1971, Audubon Society of Rhode Island Archives, Smithfield, RI.

disaffiliated from the national organization and ECRI took its place.¹⁹⁰ Building a new organization with a similar mindset to Hawkes would assist building pressure on the state's agencies to address environmental problems.¹⁹¹ This would be similar to other actions Hawkes had taken to create new venues to educate and interest the public in environmental concerns.

From its birth ECRI was a different organization than its predecessor. Its bylaws incorporated environmental precepts and the requirements for action:

ECRI is hereby established to coordinate, to initiate, to promote and to unify efforts of Rhode Island organizations concerned about the problems of our natural environment consistent with the right of the people to a clean, healthy and productive environment in which to live, work and play, and to lobby and advocate for that right.¹⁹²

While its influence was small in its first years, ECRI grew to become an important clearinghouse where the other state environmental groups could coordinate their efforts and learn of the important legislation affecting the environmental health of the state. The

190. Environment Council of Rhode Island, "History," Environment Council of Rhode Island, <http://environmentcouncilri.org/content/history> (accessed August 10, 2014).

191. While the documentary evidence is slight, it appears that Hawkes' thinking was ahead of rank and file of the RIWF. Creating the ECRI was an effective bureaucratic way cutting off the RIWF from interfering with the pressures for environmental action while tapping into the national resources of the NWF. ECRI was more aggressive and in line with Hawkes' thinking. RIWF was not. RIWF was unsuited for the changing environment. Failing to adapt and unable to migrate, RIWF was unsuited for the changing environment, RIWF withered and died as an organization as ECRI took over its niche.

192. Environment Council of Rhode Island, "ECRI Bylaws," Environment Council of Rhode Island, <http://environmentcouncilri.org/content/ecri-bylaws> (accessed August 10, 2014).

organization was also committed to harnessing the citizens of the state to assist ECRI in its efforts, using education and volunteer assistance to help achieve their objectives.¹⁹³

The start of the 1970s provided many indications that environmental organizations would project a greater force in the decisions that might affect the state's natural resources. There were an expanding number of organizations which, while small, were connected to one another to exchange information, ideas, and best practices. Nationally the environmental movement had achieved significant legislative victories that energized the local memberships. While the ethical basis of many of these organizations were often limited to addressing specific problems related to their whereabouts, such ideas were rapidly diffusing and creating fertile ground for the next generation of environmental thinkers. If the actual accomplishments of these local organizations appear slight, the preconditions for greater and more effective action were present. All that was required was the necessary spark to energize the rest of the population out of their apathy. It was about to come.

Environmental Thinking and Efficiency

Environmental thinking in the United States took over a hundred years of evolutionary discussion and analysis to reach the 1960s fervor of protecting nature and the wilderness. Conceptualizing the wilderness as some expanse to subdue, or at least exploit for human desires, slowly changed into interests for conserving this area and its resources for future generations. This ambition to preserve the wilderness was more for utilitarian reasons than aesthetic desires, but still led to important portions of the country

193. Ibid.

being insulated from human development. This attention for conservation diffused into the national consciousness, only to be trumped by a greater apprehension regarding the pollution caused by the very engines that propelled the country's technological society. It was no longer sufficient to merely seclude small segments of the nation to provide a wilderness reprieve for the population. Instead, the environment of the entire country if not the world had to be protected to prevent harm occurring to humans.

In parallel with these apprehensions, the ethical standing of the environment also progressed. The abject destruction of any species was no longer considered as an acceptable course of action, particularly if the animal was considered visually appealing. The entire inventory of plants and animals in a given area was now seen as a collection of living organisms that had some value based on their existence and not simply how humans might use them. Some of these ideas were still developing, but they were at least present in the conversation within the human population.

This new perspective for the environment was the sum of the work from important writers, conservationists and wilderness management practitioners who built on the efforts of their predecessors, as well as from independent authors who investigated different designs. Pinchot impacted Leopold who influenced Carson who inspired Commoner, while Muir and White proposed their own concepts of how humans should interact with the environment. The net result was not one coherent ethic or doctrine, but a critical mass of ideas that suggested human actions in this realm had not been prudent and needed to change in order to maintain human survival if not improve human virtue.

The evolution of environmental thinking was reflected in the different organizations interested in promoting conservation and then later environmental designs.

As the conservation mindset changed to an environmental one, the interests of the national and local groups altered as well, though often lagging the developing attitudes. The influence of these organizations varied with the national organizations such as the NWF having more political clout in Washington than the state level organizations, for example ASRI, had in Providence. These groups typically had peripheral concerns regarding the electric power grid, being more interested in opposing the overall effects of pollution or preserving specific areas than increasing the efficiency or effectiveness of any particular technology, including the electric power grid. Compared to the changes in society being made by the electrification of industry and the home, these groups might well be considered to have had comparatively little influence. The organizations were often focused on one particular issue that motivated their members and until the 1960s were only intermittently successful in shaping policy. Unless one was a member, the efforts of the groups might easily be lost in the noise of other events.

Certainly Lewis Mumford was not impressed by their activity. His major works do not consider the efforts of conservationists or the evolution of environmental thinking in the United States. While professing optimism that the human spirit would resist the forces of the growing technocracy, Mumford did not show any appreciation that the environmental movement might provide it.¹⁹⁴ Unable to consider how or who might resist the expanding megamachine, Mumford left his faith in miracles and saints without

194. Mumford's service in the Navy in Newport, RI, during the First World War did not lead to any comprehension of the state's conservation organizations. Mumford did attain the rank of Radio Electrician Second Class while studying in the "arsehole of the Universe." See Donald L. Miller, *Lewis Mumford, A Life* (New York: Grove Press, 1999), 102-107.

looking about to see if any living humans might be capable of handling the mission.¹⁹⁵

From the perspective of the sweep of thousands of years of human civilization, Mumford might not have considered the most recent environmental activity important compared to the centuries of increased centralization enabled by advanced technology.

Similar to Mumford, Jacque Ellul had little to say about the conservation and environmental movements. Much of Ellul's work occurred before the rise of the environmental movement and like Mumford, he did not appear to be impressed by the work of conservation groups despite his brief membership in an organization opposed to the French government's land development plans.¹⁹⁶ Compared to techniques actions to desacralize all aspects of human life, conservation and later environmental efforts would probably be considered as less futile than irrelevant.¹⁹⁷ The preservation of a portion of the environment for any aesthetic reason would not be considered an efficient use of resources. Even Carson's application of science to prevent pollution from harming human life and proposal to elevate the ethical standing of the environment was not

195. Donald L. Miller, "The Myth of the Machine: I. Technics and Human Development," in *Lewis Mumford, Public Intellectual*, ed. Thomas P. Hughes and Agatha C. Hughes (New York: Oxford University Press, 1990), 162.

196. Ellul served as the president of the "Committee for the Defense of the Aquitanian Coast" in 1968. See Jacques Ellul, *Sources & Trajectories*, Translated and Edited by Marva J. Dawn (Grand Rapids, MI: Wm. B. Eerdmans Publishing Co., 1997), 167 and John Byrne and Leigh Glover, "Ellul and the Weather," *Bulletin of Science, Technology & Society* 25, no. 1 (February 2005): 4.

197. Jacques Ellul, *The Technological Society*. Trans. John Wilkinson (New York: Vintage Books, 1964), 142.

important compared to technique.¹⁹⁸ All that the environmental groups had accomplished in this era might be considered a minor irritation affecting the efficient use of resources.

The conservation and environmental groups and their ethical concerns do not appear to be a major component of either Ellul's or Mumford's theories. These organizations and concerns are equally negligible in Thomas P. Hughes' work. Conservationists were essentially non-existent, with the exception of Gifford Pinchot, who is mentioned more for his views and work on the electric power grid when he was Governor of Pennsylvania than for his work in the Forestry Service.¹⁹⁹ Rachel Carson and Barry Commoner receive only a passing mention.²⁰⁰ While the environmental thinking and groups might eventually create a change in values in the rest of the population, by the beginning of the 1970s the technological momentum of the electric power grid had yet to be affected. This state of affairs would not be continued.

198. Ibid.

199. Thomas P. Hughes, *Networks of Power* (1983; repr., Baltimore, MD: The Johns Hopkins University Press, 1993), 297-305.

200. Thomas P. Hughes, *World Human Built World, How to Think About Technology and Culture* (Chicago, IL: University of Chicago Press, 2004), 87.

CHAPTER 4

RHODE ISLAND GOVERNMENT AND REGULATORY BODIES

An honest voter is one that stays bought.

- Charles R. Brayton

The evolution of the Rhode Island state polity from a government dominated by a single party, the Republicans, to a government dominated by a single party, the Democrats, is well deserving of its own study. The corruption of the state's political processes, regardless of the party in power, was a steady state narrative. Suffice it to say that the ability of either of the political parties to control the political activity within the state had important regulatory effects on Rhode Island's businesses, including the operation and maintenance of the electric power grid. The polarity of these effects could be positive or negative, depending upon the desires of the political party in charge. It was incumbent on the electric power grid ownership to enhance the positive ones while trying to short-circuit the negative ones.

Parallel with this development, Rhode Island created several regulatory bodies to conserve the state's natural resources for future generations. The initial purpose of these regulatory organs was the maintenance of foodstuffs and recreation areas for the citizens of Rhode Island. Such human focused actions tended to be unmindful to the preservation of the environment unless such actions directly contributed to a human need or desire. This was a common trait of the period, but did little to engender any ethical concern for

other species, unless they were considered tasty. Such neglect would lead to real problems with contamination of the state's natural areas, and in time a popular reaction against real or perceived polluters, including those that operated the area's electric power grid.

The Republican Machine in Rhode Island

As has been previously discussed, the introduction of the electric power grid in Rhode Island was assisted by the close relationship between the state government and the financiers and proprietors of the local electric power companies. It is not an exaggeration to suggest that the differences in membership and mindset of the two groups were rather small. Certainly when Marsden Perry began the expansion of the Narragansett Electric Light Company in the 1880s his interactions with the Republican controlled state government were such that one might reasonably conclude he was at least the power behind the government, if not the owner of the legislature itself. The Republican Party leadership ably assisted his company's expansion and absorption of his competitors, even as he was filling the coffers of the party treasury.²⁰¹

In this respect the highly efficient party machine run by Charles R. Brayton proved decisive. As the bicameral state legislature's senate apportionment was based on location, not size of the municipality, Brayton could use the contributions of Providence businessmen such as Perry to buy up the votes in the smaller Rhode Island towns, particularly in the southern areas of the state. Using party funds to pay the voters for

201. William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970), 176-181.

their time on Election Day, Brayton was able to assure Republican control of the senate, and hence the General Assembly. “An honest voter is one that stays bought,” Brayton opined in a 1905 interview with Lincoln Steffens, who would describe the government as, “Rhode Island: A State for Sale.”²⁰² Using the well disciplined party machine, Brayton was able to control government appointments, manage the legislative deliberations in the Assembly and punish his political enemies.²⁰³ Even when the opposing party showed some life and ability to reform the system, Brayton used the derisively named “Brayton Act of 1901” to subvert the power of the governor by allowing the senate to rescind the governor’s patronage appointments with their own.²⁰⁴

While the state government was decidedly corrupt and only somewhat democratic, it was also capable of taking action to solve issues, at least when “General” Brayton thought it profitable enough to do so. The University of Rhode Island was established during this period even as Marsden Perry was electrifying the Providence lighting and banking industries and Brayton was bringing “the Republican party to its peak of corruption.”²⁰⁵ The ability of the state government to make deals with the myriad smaller electric utility companies of the era was probably overall beneficial to the future

202. Patrick T. Conley, “Charles R. Brayton” in *Rhode Island in Rhetoric and Reflection* (East Providence, RI: Rhode Island Publications Society, 2002), 407-409.

203. John D. Bunker, “The Politics of Resistance: The Rural-Based Yankee Republican Machines of Connecticut and Rhode Island,” *The New England Quarterly* 47, no. 2 (Jun 1974): 214.

204. Patrick T. Conley, “Charles R. Brayton” in *Rhode Island in Rhetoric and Reflection* (East Providence, RI: Rhode Island Publications Society, 2002), 408.

205. William G. McLoughlin, “Ten Turning Points in Rhode Island History,” *Rhode Island History* 45, no. 2 (May 1986): 48.

of the grid. The legislature or town governments could decide which company's proposals looked the most promising and allow specific monopolies to be established, permitting long term planning by the winning business. This allowed the acquisition of the necessary capital required to build the power plants, dams and transmission lines by the electric utilities. This also permitted standardization of the electrical systems in the state, though this was probably not a major concern for the party leadership. The same utilities were also more than happy to provide some overhead to keep the politicians satisfied. When the Republican Party suffered internal conflict in the first decade of the century, Brayton struggled to maintain his grip on the levers of power, but eventually regained his balance and authority. It was only his unexpected death in 1910 that broke Brayton's control of the party machine.²⁰⁶

The Republican machine was not run merely for the sheer joy of exercising political power. Brayton's "Machinests" were concerned that the influx of immigrants from Ireland, Italy and Quebec threatened the Yankee Protestant political supremacy in the state. Appealing to the Irish and German immigrants by waving the "bloody shirt" of Democratic Party perfidy in the American Civil War and using the control of the economy in Rhode Island to entice the new immigrants with promises of employment, the Republican Party was able to influence the electorate to vote as directed. Brayton was sufficiently astute to select a French-Canadian candidate for governor in 1908, Aram

206. Patrick T. Conley, "Charles R. Brayton" in *Rhode Island in Rhetoric and Reflection* (East Providence, RI: Rhode Island Publications Society, 2002), 409.

J. Pothier, further diluting the immigrant Democratic vote.²⁰⁷ This was Brayton's last success although his less colorful and less brazen successors were able to maintain Republican control of the state government until the 1930s.²⁰⁸

The Establishment of the Public Utilities Commission

The election of Aram Pothier as the Rhode Island governor maintained much of the continuity of the bankers' and public utility owners' control of the state government. Pothier was a well established Woonsocket banker and politician with ties to the Perry financial empire.²⁰⁹ First elected as state governor in 1908 under the guidance of the Brayton political machine, Pothier initially showed little appetite for reform or regulation of the electric utility companies that assisted funding of the Republican Party. By 1911, in his third term, Pothier changed his mind, urging that "This General Assembly enter upon a serious and thorough consideration looking to the enactment of a law creating a

207. Brayton was not above bribing willing Democratic politicians to cement his authority. Such "yellow dog" Democrats helped stave in party morale, even as the party wards were delivering the vote to the Republicans. See John D. Bunker, "The Politics of Resistance: The Rural-Based Yankee Republican Machines of Connecticut and Rhode Island," *The New England Quarterly* 47, no. 2 (Jun 1974): 228-233.

208. Paying voters for their time on Election Day or using the tax assessors (all good Republican Party members) to disenfranchise 20,000 Democratic voters in the 1912 election were all part of the machine play book. This is not to say the Democratic Party of the time was any better. They were merely less well funded to compete with the Republicans. Brayton opined that the Democrats were "just as bad, or would be if they had the money." When they had the opportunity, the Democratic Party would be equally self serving. See William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970), 162, and John D. Bunker, "The Politics of Resistance: The Rural-Based Yankee Republican Machines of Connecticut and Rhode Island," *The New England Quarterly* 47, no. 2 (Jun 1974): 223.

209. Both Perry and Pothier served on the board of the Union Trust Bank in Providence, Perry as the Chief Executive Officer and Pothier as the President of the Board. See *United States Investor* XXIV, no. 39 (27 September 1913): 78.

State Board of Public Utilities, with the powers of supervision over gas, electric light and power companies.”²¹⁰ In due course the state legislature approved his proposal and established the Public Utilities Commission in 1912.²¹¹

The Public Utilities Commission was initially structured along the lines of the state Railroad Commission that had been incorporated into the new organization. The commission had few members, little expertise, and resolved to settle disputes through informal meetings of the interested parties whenever it was possible.²¹² The commission did have the power to call witnesses and hear testimony if the disputes required formal consideration, though a lack of personnel significantly limited the power of the regulatory body.²¹³ Almost immediately, the three commissioners, appointed by the governor and confirmed by the senate, began to petition the state government for more resources to

210. “Briefly Told,” *American Gas Light Journal* XCIV, no. 2 (January 9, 1911): 50.

211. Democrats allied with Republican reformers led the legislature to pass this ordinance. See John D. Buenker, “Urban Liberalism in Rhode Island: 1909-1919,” *Rhode Island History* 30, no. 2 (May 1971): 45, and State of Rhode Island and Providence Plantation, *Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1912* (Providence, RI: E. L. Freeman Company, 1913): 5.

212. State of Rhode Island and Providence Plantation, *Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1912* (Providence, RI: E. L. Freeman Company, 1913): 6-10.

213. State of Rhode Island and Providence Plantation, *Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1912* (Providence, RI: E. L. Freeman Company, 1913): 69-78.

better examine how the public utilities were conducting business in the state.²¹⁴ The commission's attention was initially focused on the state's railroads and trolley companies allowing the electric utilities more freedom to conduct business, both commercial and political.²¹⁵

The Public Utilities Commission showed great continuity in its first decades of existence. There was no turnover among the senior commissioners and the commission was fairly liberal in granting electric rates (known as tariffs) to the numerous electric utilities. Although they had regulatory authority over the state's water, gas, railroads and electric companies, the commission usually spent more time resolving problems with the railroads. As an example, in 1919, the Rhode Island Company, the city of Providence's trolley company, petitioned the Public Utilities Commission to relocate a section of its track with the assistance of the Union Railroad Company. The commission accepted the application submitted by the company's advocates, including future Rhode Island governor, Theodore Francis Green, and approved the track relocation.²¹⁶ In 1921 the commission approved the merger of the United Electric Railways Company and Rhode

214. State of Rhode Island and Providence Plantation, *Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1912* (Providence, RI: E. L. Freeman Company, 1913): 95-96.

215. Since the trolley and electric companies were often synonymous with one another, this was probably reasonable in the commission's first year. See State of Rhode Island and Providence Plantation, *Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1912* (Providence, RI: E. L. Freeman Company, 1913): 8-9.

216. State of Rhode Island and Providence Plantation, *Eighth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1919* (Providence, RI: E. L. Freeman Company, 1920): 96-97.

Island Company, the latter having fallen on hard times despite Green's direction and political connections.²¹⁷ The Public Utilities Commission did receive some supplementary authorities. In 1918 the Rhode Island General Assembly granted the commission the right to suspend any utility rate increase until such time that the body had time to review the proposal.²¹⁸ This power was almost immediately used on the perennially financially troubled Rhode Island Company.²¹⁹

In 1924, the Public Utilities Commission became involved in the Narragansett Electric Lighting Company's contractual disputes with the Attleboro Steam and Electric Company over the sales of electric power across state lines. Public hearings were initially delayed while the Narragansett Electric Lighting Company gathered more

217. Green was not above calling in favors from his political friends in Washington to further his political fortunes. In 1918 he received a packet of confidential material from the Secretary of the Navy, Josephus Daniels, detailing the immorality of the Newport environs supporting the Naval Station located there. Green used this information to pressure his political opponents to support raising the allowable rates for the trolley company, as well as embarrass them for the upcoming congressional elections where Green hoped to ascend to Congress. The plan backfired and Green lost the election as well. Green's biography is silent on the acquisition of the Rhode Island Company by United Electric Railways. See Erwin L. Levine, *Theodore Francis Green, The Rhode Island Years* (Providence, RI: Brown University Press, 1963), 77-89, and State of Rhode Island and Providence Plantation, *Tenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1921* (Providence, RI: The Oxford Press, Printers, 1922): 76-91.

218. State of Rhode Island and Providence Plantation, *Seventh Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1918* (Pawtucket, RI: Pawtucket Linotyping Company, 1919): 3.

219. State of Rhode Island and Providence Plantation, *Sixth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1918* (Pawtucket, RI: Pawtucket Linotyping Company, 1919): 33-35.

information to support their case.²²⁰ This accumulation of information caused a delay of a year before the Public Utilities Commission was ready to make a decision. The analysis of the Narragansett Electric Lighting Company's claims against the Attleboro Steam and Electric Company was extensive and indicated a much higher degree of professionalism than previous work conducted by the commission. Prices charged over a full year were analyzed, as was the generating capacity of the firm, the costs of fuel and upgrades to the system, and a host of other issues. Having accomplished a rigorous review of the cost issues, the Public Utilities Commission found for the Narragansett Electric Lighting Company.²²¹ This decision precipitated a judicial appeal from the Attleboro Steam and Electric Company that soon reached the U. S. Supreme Court. In 1927 the Supreme Court would decide against the Rhode Island firm, not on technical grounds, but because the state of Rhode Island did not have the authority to regulate this commerce.²²²

220. State of Rhode Island and Providence Plantation, *Thirteenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1924* (Pawtucket, RI: The Auto Press, Printers, 1925): 116-117, 127, 152.

221. In some ways this was not surprising, even if the technical analysis supported the Narragansett Electric Lighting Company. The governor of Rhode Island was Aram Pothier, a Republican with financial ties to the utilities while the members of the Public Utilities Commission, William C. Bliss, Samuel C. Hudson and Robert F. Rodman, were political appointees who had been in their positions since the commission had been created. Deciding for a Rhode Island company with ties to the political authorities of the state was perhaps predictable. See State of Rhode Island and Providence Plantation, *Fourteenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1925* (Pawtucket, RI: The Oxford Press, Printers, 1926): 70-94.

222. Public Utilities Commission of Rhode Island et al. v. Attleboro Steam & Electric Co., 273 U.S. 83 (1927).

Seemingly unconcerned by this rebuff, the Rhode Island Public Utilities Commission returned to regulating the jitney trade in the state, while the bond sales, tariff requests and acquisitions of the electric utilities garnered little actual resistance from the regulators.²²³ The takeover of the Narragansett Electric Lighting Company and the Union Electric Railways by the New England Power Association (NEPA), International Paper & Power's electric utility subsidiary, using the support of the state Republican political leadership was thus unsurprising. It may have been a political issue in the 1926 gubernatorial election, but to the political elite of the state, both Republican and Democrat, it was a business opportunity to take advantage of. When the dust had settled from the takeover and the election, the Public Utilities Commission approved the bond sales necessary to clean up the residue of the deal.²²⁴

The "Green Revolution"

223. Jitneys were a type of share taxi travelling on fixed routes and usually owner operated. Owners would often petition the commission for the coveted licenses, using local lawyers for assistance. Frank W. Corcoran, father of Thomas G. Corcoran, assisted this process. Since jitney operation threatened the transportation monopolies of the railroads and taxis, the government became interested in their regulation. See Charles Carroll, "Six Decades in These Plantations," *Rhode Island History* 59, no. 2 (May 2001): 56 and State of Rhode Island and Providence Plantation, *Tenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1921* (Providence, RI: The Oxford Press, Printers, 1922): 146.

224. While Landry and Cruikshank suggest this was an important political issue in the election, Levine makes no mention of it at all in his biography of Green. Since Green stood to profit from the deal with his connections to the United Electric Railways, this may be understandable. See John T. Landry and Jeffrey L. Cruikshank, *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 74-78, Erwin L. Levine, *Theodore Francis Green, The Rhode Island Years* (Providence, RI: Brown University Press, 1963), 102-104, and State of Rhode Island and Providence Plantation, *Sixteenth Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1927* (Providence, RI: Snow & Farnham, Co., Inc., 1928): 218-228.

The 1926 election may have been the high-water mark of the Republican Party and electric utility company concordance. In 1928 Green became the Democratic state chairman while Aram Pothier, the popular Republican governor, died in office in February. With the departure of Pothier from the political landscape, the Rhode Island Democratic Party was able to harness the immigrant and religious voting blocs to displace the Republican political control of the state.²²⁵

Green had a difficult task ahead of him. Despite the increasing numbers of immigrants entering the state in the 1920s who generally were willing to vote for the Democratic Party candidates, the Republican Party machine perfected under “Boss” Brayton was still powerful. Fees collected by the Republican Party government appointees were often not recorded in the state ledgers, leaving a large sum to finance the party operations or at least enlarge the functionary’s salary. While the Democrats might win the state Governor’s post, the ability of the Republican controlled senate to frustrate efforts for reform was substantial as the Brayton Law ensured a veto capability for the Republicans to keep the state bureaucracy manned by party loyalists. The Republicans used the funding stream from the Providence tax base to fund political operations in the rural areas, maintaining their electoral advantage in the General Assembly.²²⁶

Green slowly and sometimes painfully assembled his growing coalition to overturn the “one-party rule and party patronage by the Republicans for the same kind of

225. The senate control of government patronage deflected many attempts at reform. See Erwin L. Levine, *Theodore Francis Green, The Rhode Island Years* (Providence, RI: Brown University Press, 1963), 106-107.

226. *Ibid.*, 103-104.

single-party patronage system by the Democrats.”²²⁷ Green’s initial attempt to forge this new political alliance was not successful; he lost the 1930 gubernatorial election to the incumbent Republican governor, Norman S. Case.²²⁸ Two years later the combination of the economic effects of the Depression, national dissatisfaction with the Republican Party, stronger support from the French Canadian immigrant and Roman Catholic voters, and better organization of the state Democrats, led to Green’s election and ascent to the governor’s mansion.²²⁹

Merely holding the governorship was not sufficient to break the Republican hold on the state legislature and hence the state bureaucracy. Without majorities in either the state House or Senate, Green was unable to get many of his appointees confirmed by the Senate to run the regulatory bodies of the government or pass any but the most pressing legislation. While Green’s political clout was enhanced by his close relationship with President Franklin D. Roosevelt and Green’s control of the federal monies flowing into the state, his first term was one of consolidation of his political base rather than involvement with launching new schemes.²³⁰

227. William G. McLoughlin, “Ten Turning Points in Rhode Island History,” *Rhode Island History* 45, no. 2 (May 1986): 49.

228. The Republicans were pilloried by the Democrats as the “tool of interests,” providing favors to the utilities and financial institutions for donations to the party coffers. See Erwin L. Levine, *Theodore Francis Green, The Rhode Island Years* (Providence, RI: Brown University Press, 1963), 124-126.

229. *Ibid.*, 129-144.

230. *Ibid.*, 145-172.

Green's reelection in 1934 was essentially a foregone conclusion, but the real drama was focused on the General Assembly. The initial returns brought an eight seat Democratic majority in the House, but the Republicans still retained an advantage of twenty three to nineteen in the Senate. A subsequent recount of the vote in Coventry under the watchful eyes of a bipartisan group shifted that race to the Democratic candidate, with the Senate now tilted to a twenty two to twenty seat Republican advantage. Convinced that the Republicans had destroyed ballots that would have tipped their narrow victories in South Kingstown and Portsmouth to the Democrats, Green and the Democratic Party leadership secretly planned a devastating response.

On the first of January, 1935, Lieutenant Governor Robert E. Quinn, a Democrat, opened up the first session of the Senate. Quinn declined to recognize the Republican Senators from South Kingstown and Portsmouth, stating that a protest had been lodged regarding the veracity of the election returns from those communities. With the Senate now evenly split, Quinn called for a voice count authorizing a recount of the now disputed returns, surprising the remaining Republican senators. Before the Republicans could react, the measure passed, Quinn acting as the tie breaker. The House rapidly approved the measure and Green signed the new law within minutes of its authorization. The subsequent recount on the grounds of the Senate later that afternoon led to narrow victories for both Democratic candidates. With the Senate now under their control, twenty two to twenty, the Democrats rapidly exercised their new power. The state Supreme Court was purged of its previous five Republican members and a new group, with three Democrats and two Republicans, was selected. Eighty state commissions were merged into ten new departments, with the previous office holders released. The

“Bloodless Coup” or the “Green Revolution” took less than twenty four hours. Later that month the notorious Brayton Law was repealed and the Republican lock on the state government was irrevocably broken.²³¹

The Democratic Machine in Rhode Island

Having supplanted Republican power, the Democrats preceded to use their political power to reward the party faithful with the fruits of patronage. At the Public Utilities Commission, the three superannuated Republican commissioners were quickly replaced by a new Division Chief.²³² Yet with a surplus of ambitious party stalwarts to fill the newly opened patronage positions, Green struggled at times to maintain party discipline under his leadership. Thomas P. McCoy, the politically powerful Irish Democrat from Pawtucket, proved to be one of Green’s largest opponents. In the early 1930s when McCoy was the mayor of Pawtucket, he had been convinced by the Pawtucket Public Works Commissioner, Albert J. Lamarre, that the local electric utility, Blackstone Valley Gas and Electric Company, was overcharging its customers, McCoy’s

231. Green and his trusted subordinates had the entire day’s sequence of events well choreographed. See Duane Lockard, *New England State Politics* (Princeton, NJ: Princeton University Press, 1959), 191-192 and Erwin L. Levine, *Theodore Francis Green, The Rhode Island Years* (Providence, RI: Brown University Press, 1963), 175-183.

232. The three commissioners, William C. Bliss, Samuel E. Hudson, and Robert F. Rodman had occupied these positions since the creation of the commission in 1912 under Republican governor Aram Pothier. See State of Rhode Island and Providence Plantations, *Twenty-Third Annual Report of the Public Utilities Commission of the State of Rhode Island for the Year Ending December 31, 1934* (Providence, RI: E. L. Freeman Company, Printers, 1935): 3 and *Twenty-Fifth Annual Report of the Division of the State of Rhode Island for the Year Ending December 31, 1936* (Providence, RI: Visitor Printing Co., 1937): 3.

constituents. In 1933 McCoy and Lamarre requested Blackstone Valley to lower its rates but their requests were rebuffed, whereupon the utility's property evaluation for taxes was increased by one million dollars. The same tactic was repeated in 1934 and would have been in 1935 but, by then, the utility president David Daly had recognized the threat and made a counter offer to appease McCoy. The Democrat rejected Daly's offer to lower commercial rates by almost two hundred thousand dollars and upped the ante, promising to sue if the company did not also end its practice of increasing the rates charged to consumers in arrears on their ledger. This the utility rejected and the matter festered until after the "Green Revolution" played out in January 1936.²³³

During the campaign of 1936, Green's Democratic platform endorsed the public ownership of utilities, much as was being accomplished in the Tennessee Valley Authority under President Roosevelt's direction. McCoy supported this and desired to build a municipally owned power plant in Pawtucket to help pressure Blackstone Valley to lower its rates. The financially stressed Manville-Jenckes mill had its own power plant and was eyed by McCoy as a possible acquisition to create a new publically owned electric utility. After Green's election, the governor had appointed McCoy as the state budget director, a position that McCoy ably filled. When Green acted to select one of his own political followers to be the state's Public Works Director, he and McCoy had a falling out as McCoy wanted Lamarre to serve in this new position. Adding to the acrimony, Green short circuited McCoy's push to establish Pawtucket's own municipal

233. Matthew J. Smith, "The Real McCoy in the Bloodless Revolution of 1935," *Rhode Island History* 32, no. 3 (August 1973): 78.

electric utility and pressured Daley, the president of the Blackstone Valley Gas and Electric Company to propose a 10% rate reduction, a tariff change that the state Public Utilities Commission rapidly accepted.²³⁴

McCoy responded by having his followers in the state legislature obstruct Green's proposed legislation. He publically attacked Green for backing away from his campaign platform for municipal ownership of the utilities and suggested Green's unethical linkage to the Republican affiliated companies. "If support measures designed to force the utility companies of Rhode Island to grant just rates to all of the people of the state is treason to the aims and purposes of this administration, then I say to Governor Green, make the most of it," McCoy charged, ironically using Green's own words from his inaugural address to make a point.²³⁵

Green was unwilling to accede to McCoy's demands and worked to diminish McCoy's political influence. With the power of patronage under his control, Green was able to buy out McCoy's base by appointing these legislators to state jobs, a method that the Republicans had taken advantage of and Green had decried in his election campaign. Green also traded patronage for Republican support on other legislation, but yielded on the Democratic Party's long desired goal to hold a constitutional convention to end the

234. See William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970), 205-209, Matthew J. Smith, "The Real McCoy in the Bloodless Revolution of 1935," *Rhode Island History* 32, no. 3 (August 1973): 79-80, and *Twenty-Fifth Annual Report of the Division of Public Utilities of the State of Rhode Island for the Year Ending December 31, 1936* (Providence, RI: Visitor Printing Co., 1937): 140-141.

235. Matthew J. Smith, "The Real McCoy in the Bloodless Revolution of 1935," *Rhode Island History* 32, no. 3 (August 1973): 82.

senate apportionment rules. By the summer of 1936 McCoy's political base had been deflated, leaving little for him to do except snipe at Green for the governor's abandonment of his principles. At the convention to select a Democratic Party candidate for the special election to fill the congressional seat recently vacated by Green's promotion of Representative Francis Condon to the State Supreme Court, McCoy and Lamarre lambasted Green, calling him under the control of the public utilities. McCoy's candidate was not selected at the convention, although a resolution pledging the candidate's endorsement of the Public Utilities Holding Company Act that had recently been passed by Congress was adopted. McCoy's last jab at Green was ineffective. With McCoy refusing to endorse the Democratic Party candidate, Antonio Prince, the Republicans managed to regain the congressional seat.²³⁶ Perhaps McCoy's only productive accomplishment was the Rhode Island legislature's passing of a law requiring "the appraisal and inventory of all electrical properties" of the electric utilities to examine their true financial status and profitability.²³⁷

With this episode, the political momentum for reform also subsided. Green went off to Washington as a Senator in 1937.²³⁸ McCoy became embroiled with charges that

236. Green's biographer is noticeably silent on these charges during the struggle with McCoy. See Erwin L. Levine, *Theodore Francis Green, The Rhode Island Years* (Providence, RI: Brown University Press, 1963), 185-189, and Matthew J. Smith, "The Real McCoy in the Bloodless Revolution of 1935," *Rhode Island History* 32, no. 3 (August 1973): 82-84.

237. *Twenty-Eighth Annual Report of the Public Utility Administrator of the Department of Business Administration for the Year Ending December 31, 1939* (Providence, RI: 1940): 10.

238. Erwin L. Levine, *Theodore Francis Green, The Rhode Island Years* (Providence, RI: Brown University Press, 1963), 194-195.

he was profiting from the proposal to build a municipal power plant in Pawtucket and that he was promoting criminal elements at the Pawtucket Horse Race Track in 1937.²³⁹ Lamarre and scores of McCoy's supporters were implicated in a voter fraud scandal in the 1938 Pawtucket elections.²⁴⁰ Interparty feuding over patronage, control of the funding streams from Washington's Depression era works programs, and ethnic bloc competition derailed many of the Democratic Party initiatives. The lobbyists for the industrial and financial concerns were able to prevent other regulatory legislation by playing these power centers off against one another. It became apparent that the citizens of the state had exchanged one party machine for another, though less disciplined, one.²⁴¹ This is not to suggest that the "Green Revolution" was unnecessary or unproductive. Green's close relationship to Roosevelt and his own political acumen led to a more democratic political organization in the state, though not necessarily a more transparent and ethical one.²⁴²

239. Now Governor, Robert E. Quinn called out the state militia in October 1937 and shut down the track, accusing McCoy of failing to do anything to suppress the "gangsters and hoodlums" there. North Kingstown militia elements were not involved. See William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970), 208.

240. See Debra A. Mulligan, "Political Rivalry in Rhode Island: William H. Vanderbilt vs. Howard McGrath: The Wiretapping Case," *Historical Journal of Massachusetts* 35, no. 1 (Winter 2007): 68, and Susan Marie Boucher, *The History of Pawtucket, 1635-1986* (Pawtucket, RI: The Pawtucket Public Library & The Pawtucket Centennial Committee, 1986), 141-148.

241. William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970), 208.

242. NEPA survived both the breakup of its parent holding company, International Paper & Power directed by federal authorities and attacks on its local rivals

It is difficult to conclude that the New England Power Association (NEPA) or its Rhode Island subsidiary the Narragansett Electric Company was very concerned by the political wrangling in Providence. Admittedly most of the local political attention was focused on the McCoy's promotion of the Blackstone Valley Gas & Electric Company, the economic consequences of the Depression were enormous, and NEPA was occupied determining the effects of the Public Utilities Holding Company Act. In 1936 NEPA bought up several smaller electric utilities in the area belying any true unease. The Bristol County Gas & Electric Company, the South County Public Service Company and the East Greenwich Electric Company were taken over in June while portions of the South Gloucester Light & Power Company were bought in October. All other requests by the firm for property swaps, mortgage adjustments and bond issuance were authorized by the Public Utilities Commission, now under secure Democratic control. The firm did lower its rates in September, but by then the furor over McCoy's proposals had diminished. The political authorities in Providence may have changed parties, but the normal business model was still being followed by the Narragansett Electric Company and its ostensible regulatory oversight body.²⁴³

The Public Utilities Commission continued its normal business during the rest of the 1930s with little indication that the political party controlling its actions had changed.

which could have easily spread over to its subsidiary Narragansett Electric. The role of Green in preventing either of these suggests further investigation is warranted.

243. The rate reduction of \$409, 200 was slightly more than 10% of the firm's Gross income for the year and appears similar to the deal struck with the Blackstone Valley Gas & Electric Company. See *Twenty-Fifth Annual Report of the Division of the State of Rhode Island for the Year Ending December 31, 1936* (Providence, RI: Visitor Printing Co., 1937): 25-26, 147-148, 166-167, 170-176, 193-195, 239, 272-276.

The commission monitored public utility financial performance, permitting some utilities to refinance their debt while not allowing others. Newport Electric Corporation's requests for bonds were disapproved in 1937, but Blackstone Valley Gas And Electric Company's request was approved in 1938.²⁴⁴ In 1939 the Public Utilities Commission was moved into the new Department of Business Administration. The new administrator requested assistance in the fields of public utility accounting as he felt this division did not have the technical expertise to adequately examine the utilities' work.²⁴⁵ That year the Public Utilities Commission ordered rate reductions by Narragansett Electric Company, Blackstone Valley Gas & Electric Company and the Newport Electric Corporation following the completion of the "appraisal and inventory" of the utilities that had been directed in 1936 by the legislature. The companies were generally willing to accede to the recommendations of these reports regarding rate reductions. Narragansett

244. In the 1930s, jitney licensing and the regulation of the railways continued to take up more energy than the electric utilities did. Since the new governor, William H. Vanderbilt was a former bus company executive; this may not have been remarkable. See Debra A. Mulligan, "Political Rivalry in Rhode Island: William H. Vanderbilt vs. Howard McGrath: The Wiretapping Case," *Historical Journal of Massachusetts* 35, no. 1 (Winter 2007): 54, and *Twenty-Sixth Annual Report of the Division of Public Utilities of the State of Rhode Island for the Year Ending December 31, 1937* (Providence, RI: Visitor Printing Co., 1938): 262-266, and *Twenty-Seventh Annual Report of the Division of Public Utilities of the State of Rhode Island for the Year Ending December 31, 1938* (Providence, RI: 1939): 274-275.

245. *Twenty-Eighth Annual Report of the Public Utility Administrator of the Department of Business Administration for the Year Ending December 31, 1939* (Providence, RI: 1940): 4.

Electric did request some relief based on the damages suffered during the 1938 hurricane that caused significant damage in the state.²⁴⁶

In 1938, the Republicans regained the governorship of the state under William H. Vanderbilt as well as a majority in both houses of the legislature. Vanderbilt was strongly opposed to the standard state corruption and graft. His administration was short lived after it was discovered he had hired a private investigator to wire tap the phones of possible election fraud suspects in Pawtucket. The Democrats recaptured control of the government in 1940 under J. Howard McGrath, an early supporter of now Senator Green.²⁴⁷

The Second World War lessened the Public Utilities Commission's interest, never that great, in electric utility regulation. The combination of the relief from the economic woes of the Depression and the exigencies of industrial warfare tended to dampen political friction with the electrical utilities. In 1942 the Public Utilities Commission did recommend a number of changes for legislation affecting the public utilities. Companies would be required to file with the commission a list of their rules and regulations

246. Newport Electric Corporation did get its bonds approved this year. See *Twenty-Eighth Annual Report of the Public Utility Administrator of the Department of Business Administration for the Year Ending December 31, 1939* (Providence, RI: 1940): 7, 10-16, 18-25, and 27-29.

247. Unsurprisingly, Thomas P. McCoy was one of the possible suspects. The future governor, J. Howard McGrath, the Federal District Attorney for Rhode Island, was more interested in furthering his own political career than exposing Democratic corruption in his home state and turned the tables from Vanderbilt's investigation on Pawtucket corruption to the corruption of unauthorized wire taps. Senator Green was happy that Vanderbilt's political reputation, as well as a possible Republican contender for his seat, was diminished. See Debra A. Mulligan, "Political Rivalry in Rhode Island: William H. Vanderbilt vs. Howard McGrath: The Wiretapping Case," *Historical Journal of Massachusetts* 35, no. 1 (Winter 2007): 54-75.

affecting their service to the public. Any changes would not be permitted unless authorized by the commission. Utilities would also be required to conduct periodic safety inspections of their facilities and would not be required to extend services into areas unless a return of twenty percent of the initial investment would be guaranteed.²⁴⁸ The request was repeated in 1943 with similar results.²⁴⁹ The Commission also noted the lack of spare parts and personnel to conduct maintenance on all of the utilities during the war though the only interruptions in electricity supply were due to “storms, hurricanes and blizzards,” all of which were rapidly repaired.²⁵⁰

The end of the war allowed the Public Utility Commission to return to peacetime operations even as the state economy was shifting. The war had propped up the anemic industries in the state but the completion of the conflict was another shock to the teetering businesses. Naval base construction had resulted in millions of dollars in assistance to the state while the Navy retained a considerable footprint in Narragansett Bay area after the war. Economically the demographic shift to the suburbs from the urban areas of the state was more important. The return of service members to the state after the war and the previously dampened demands for housing outside of Providence led to considerable

248. *Thirtieth Annual Report of the Public Utility Administrator of the Department of Business Administration for the Year Ending December 31, 1941* (Providence, RI: 1942): 307.

249. *Thirty-First Annual Report of the Public Utility Administrator of the Department of Business Administration for the Year Ending December 31, 1942* (Providence, RI: 1943): 260.

250. *Thirty-Third Annual Report of the Public Utility Administrator of the Department of Business Administration for the Year Ending December 31, 1944* (Providence, RI: 1945): 7, 10.

growth in the suburban areas of the state. Concurrently union membership remained high as the population benefited from the welfare state policies of President Harry S. Truman. The citizens continued to support Democratic governments in the state under Governors J. Howard McGrath, John O. Pastore, John S. McKiernan and then Dennis J. Roberts, but the lack of a manufacturing base hindered state economic growth. Even a shift to a more tourist based economy, as evidenced by the state's new nickname, "the Ocean State," was insufficient to stem the decline.²⁵¹

John O. Pastore became governor in 1945 when the standing governor, J. Howard McGrath, stepped down to accept a position as the United States Solicitor General in the Truman administration. Deftly playing off the various other political leaders against one another, Pastore was able to gain the Democratic Party nomination for governor in 1946 and win that election handily while McGrath returned to the state to run for a vacant Senate position, an election that he also won. As Governor, Pastore proposed issuing state bonds to bring the state's antiquated infrastructure up to date and control the pollution in Narragansett Bay, but little came of these proposals.²⁵² Pastore won reelection easily in 1948 emphasizing a continuation of Truman's economic policies. After McGrath was named as Truman's Attorney General in 1949, Pastore gained the

251. William G. McLoughlin, "Ten Turning Points in Rhode Island History," *Rhode Island History* 45, no. 2 (May 1986): 50-51.

252. Ruth S. Morgenthau, *Pride Without Prejudice, The Life of John O. Pastore* (Providence, RI: The Rhode Island Historical Society, 1989), 44-52.

Democratic nomination for the once more vacant Rhode Island Senate seat and was elected as one of the state's two senators during the 1950 general election.²⁵³

As Senator, Pastore became involved in the Senate's committees on communications and nuclear power. Pastore became a member, and later chairman, of the Joint Committee on Atomic Energy, the combined Senate and House organization founded to oversee the nation's Atomic Energy Commission (AEC). The AEC, created by the Atomic Energy Act of 1946, was responsible for the regulation and research of all atomic endeavors in the country. In the 1950s and 1960s, the emphasis was on matters pertaining to nuclear weapons, their construction, their testing in the atmosphere and the prevention of their proliferation. Pastore supported the efforts to stop nuclear weapons testing in the atmosphere that led to the Comprehensive Test Ban Treaty with the Soviet Union in 1963, but he was generally an advocate for a strong nuclear deterrent force for the nation.²⁵⁴

253. See Ruth S. Morgenthau, *Pride Without Prejudice, The Life of John O. Pastore* (Providence, RI: The Rhode Island Historical Society, 1989), 56, and William G. McLoughlin, *Rhode Island: A History* (New York: W. W. Norton & Company, 1970), 223.

254. Pastore was also interested in keeping Admiral Hyman Rickover, USN, in charge of the Navy's nuclear reactors program. Rickover apparently returned the favor having Senator Pastore's wife, Elena Pastore, christen the new USS POLLACK (SSN 603) in March 1962. See Memorandum for the President, Lee C. White to President Kennedy, March 8, 1962, Papers of John F. Kennedy. Presidential Papers. White House Staff Files of Lee C. White. General File, 1954-1964. Joint Committee on Atomic Energy (JCAE): Meeting with Senator Pastore, 1963: February-April, John F. Kennedy Presidential Library and Museum, Boston, MA and Ruth S. Morgenthau, *Pride Without Prejudice, The Life of John O. Pastore* (Providence, RI: The Rhode Island Historical Society, 1989), 81-82.

Pastore was more interested in the peaceful applications of atomic energy, though that was a small subset of the AEC's concerns.²⁵⁵ Pastore supported passage of the Atomic Energy Act of 1954, legislation that permitted the possibility of civilian ownership of nuclear power plants. Later in 1956 he backed federal funding of demonstration reactors to spread nuclear technology.²⁵⁶ Pastore's influence in nuclear issues spread back to his home state, along with federal dollars. In 1955, the General Assembly passed a bill creating the state's Atomic Energy Commission, with a five member board staffed with appointees from the Governor.²⁵⁷ As an influential senator in the nation's capital, Pastore was able to direct some of the federal government's research budget back to his home state. One of the research reactors Pastore advocated building was constructed at the Nuclear Science Center in Narragansett, RI, under the control of the University of Rhode Island and supervision of the state Atomic Energy Commission. The research reactor first went critical in 1964.²⁵⁸

255. Ruth S. Morgenthau, *Pride Without Prejudice, The Life of John O. Pastore* (Providence, RI: The Rhode Island Historical Society, 1989), 78-79.

256. Michael S. Mayer, "Pastore, John Orlando." *The Eisenhower Years, Presidential Profiles*. New York: Facts On File, Inc., 2010. American History Online. Facts On File, Inc. <http://www.fofweb.com/activelink2.asp?ItemID=WE52&iPin=TDEY373&SingleRecord=True> (accessed September 7, 2014).

257. Armand H. Cote, *Manual with Rules and Orders for the use of the General Assembly of the State of Rhode Island, 1955-1956* (1956): 310.

258. Pastore was instrumental in directing federal funding to the University of Rhode Island. In 1953 the "one million dollar Pastore Chemical Laboratory was dedicated" at URI. See August P. La France, *Manual with Rules and Orders for the use of the General Assembly of the State of Rhode Island, 1965-1966* (1966): 176, and Armand H. Cote, *Manual with Rules and Orders for the use of the General Assembly of the State of Rhode Island, 1955-1956* (1956): 160.

With both Green and Pastore in Washington and the Democratic Party in full control in Providence, party stalwarts could evince some satisfaction. Yet the party was blind to some of the fundamental changes that were straining the state's social fabric.²⁵⁹ Population migration to the suburbs increased Democratic membership and representation in the General Assembly from these locations but was not followed up with party organization of the newly acquired districts. Election victories were thus based more on the strength of the candidate than party discipline. Even the "long count" gubernatorial election of 1956, where the Democratic incumbent, Dennis J. Roberts narrowly defeated the Republican challenger Christopher Del Sesto, failed to alter the dynamics of political action. In that election, the closeness of the voting machine count required numerous inspections of the incoming absentee ballots. This took time and when it appeared that these would swing the election to Del Sesto, the Democrats challenged the constitutional validity of the ballots cast before Election Day. The State Supreme Court eventually ruled in Roberts favor but not until Inauguration Day of 1957. Nearly five thousand votes were disallowed, permitting the reelection of Roberts.²⁶⁰

As the public furor over the rejection of these ballots subsided, the seamy side of Rhode Island politics continued, with a strong bipartisan stance. The ability to use the state offices for personal or organizational advantage appeared too great a temptation for

259. Matthew J. Smith, "Rhode Island Politics 1956-1964: Party Realignment," *Rhode Island History* 35, no. 2 (May 1976): 56.

260. "Boss" Brayton would have approved of the tactics though not the result. See Matthew J. Smith, "Rhode Island Politics 1956-1964: Party Realignment," *Rhode Island History* 35, no. 2 (May 1976): 52-54 and Duane Lockard, *New England State Politics* (Princeton, NJ: Princeton University Press, 1959), 193-195, 220.

individuals, let alone political parties, to resist. “You never can tell what the companies might do. They will be around to see you,” explained one senior legislator to a less experienced General Assembly member when asked if a proposed bill’s requirements were too onerous on the regulated company.²⁶¹

There seems little evidence that rigorous supervisory practices transferred over to the regulation of the electric utilities. Bond issuance, stock sales and tariff adjustments were almost always approved by the Public Utilities Commission in the 1950s. It was not until 1957 that the Commission disapproved Narragansett Electric Company’s rate increase requests. This rejection was couched in terms of dueling engineering analyses:

In a large measure the respective judgments of the engineers who prepared and submitted studies of separations of Narragansett plant between inter and intrastate business were predicated upon their interpretation of the nature of firm versus interruptible power and the degree which Narragansett’s surplus capacity constituted a reserve of power for the entire New England Power System. In arriving at his decision in this case the Administrator has given careful consideration to all of these factors.²⁶²

The commission reprimanded the company for its poor forecasting efforts, though the commission did allow Narragansett Electric to resubmit its rate increases with a different fuel cost basis.²⁶³

261. Duane Lockard, *New England State Politics* (Princeton, NJ: Princeton University Press, 1959), 209-210.

262. State of Rhode Island and Providence Plantations, *Forty-Sixth Annual Report of the Public Utilities Commission of the Department of Business Regulation for the Year Ending December 31, 1957* (Providence, RI: William R. Brown, Co., 1958): 57.

263. Both sides amassed engineers and economic analysts to make their case. The eventual political decision was based on this calculus, without any discussion of the environmental effects of the utility’s actions. Since Narragansett Electric was relatively union friendly in this time period and Rhode Island’s Democratic government was a strong proponent of union labor, this may have limited the friction between the

Environmental Regulation in the Ocean State

Theodore F. Green's tenure as governor resulted in the reorganization of many portions of state government. In 1935 the Department of Agriculture and Conservation was created by an amalgamation of the older Department, Divisions and Commissions. The former Department of Agriculture was divided into two new Divisions, the Division of Animal Industry and Milk Control and the Division of Entomology and Plant Industry. Added to the new Department were the old Bureau of Forestry and the old Metropolitan Park Commission, now renamed as the Division of Forests, Parks and Parkways. The Commissions of Shell, Inland Fish and Game were combined into the new Division of Fish and Game.²⁶⁴

The issues the Department of Agriculture and Conservation focused on appear similar to those discussed by Aldo Leopold and later Rachel Carson in their writing. The regulatory body was interested more on the economic betterment of the state through the propagation of sound agricultural practices and the elimination of insect menaces than the long term nurturing of the environment. The suppression of the gypsy moth infestations

organizations. See The State of Rhode Island and Providence Plantation, *Forty-Sixth Annual Report of the Public Utilities Commission of the Department of Business Regulation for the Year Ending December 31, 1957* (Providence, RI: William R. Brown, Co., 1958): 88-89, and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 155-156.

264. *First Annual Report of the Department of Agriculture and Conservation of the State of Rhode Island and Providence Plantations for the Year Nineteen Hundred and Thirty-Five* (Providence, RI: Visitor Printing Co., 1936): 5.

and mosquitos were one of the department's main efforts from its inception.²⁶⁵ The subordinate components of the department had differing visions of the overall mission. Conservation, as proposed by the Division of Forests, Parks and Parkways appeared more as the careful management of the state's woodlands for stable lumber production than protection of all of the species of flora and fauna that resided there. Parks were appreciated for their ability to generate funds for the state and human recreation sites, not for their mere presence. The Division of Fish and Game was more concerned with expanding opportunities to hunt the state's land dwelling wildlife or harvest its numerous marine life; lobsters, oysters and quahaugs, then maintaining these populations for their own sake. Much like other conservation organizations, the Division cooperated with the Rhode Island Wildlife Federation and the Audubon Society of Rhode Island to promote recreation and wildlife conservation in the state.²⁶⁶

In 1939 the Department Agricultural Divisions were reshuffled into the Offices of Animal Husbandry and Dairying and the Bureau of Markets while the other Divisions were renamed as Offices. Despite the name change, the focus of the organization remained the same; the efficient economic utilization of the state's natural resources for

265. Department of Agriculture and Conservation of the State of Rhode Island and Providence Plantations, *First Annual Report of the Department of Agriculture and Conservation of the State of Rhode Island and Providence Plantations for the Year Nineteen Hundred and Thirty-Five* (Providence, RI: Visitor Printing Co., 1936): 49-51, 66-67.

266. Department of Agriculture and Conservation of the State of Rhode Island and Providence Plantations, *Second Annual Report of the Department of Agriculture and Conservation of the State of Rhode Island and Providence Plantations for the Tercentenary Year of Nineteen Hundred and Thirty-Six* (Providence, RI: H. Beck & Company, 1937): 17, 49-51, 66-67.

human consumption and enjoyment.²⁶⁷ Insects were to be battled against so “That Mankind and his works May not perish from the Earth!”²⁶⁸ An insectary was established at the University of Rhode Island for the “rearing, studying, cataloging and mounting of insects” afflicting the state.²⁶⁹ Parks were maintained to allow the citizens of the state to experience the “open air and sunshine, to exercise his muscles, and for the proper functioning of all other organs of the body.”²⁷⁰ This experience would reinforce the normal virtuous behavior that was suppressed by urban living. Even juvenile delinquency could be reduced. The state had a responsibility to thus develop and maintain a series of facilities to foster human flourishing.²⁷¹ Such conceptions of conservation were typical for the era. Conservation might well include the preservation of animals and plants, but the basis for such action was human centric. “Without the three primary elements of land, water and vegetation in a natural balance we can have neither game, wild flowers nor trees, labor nor capital, nor sustaining habitat for humans,” proclaimed Jay N. Darling, then President of the Wildlife Federation, a thought echoed by the Department of Agriculture and Conservation.²⁷²

267. Department of Agriculture and Conservation, *Fifth Annual Report of the Department of Agriculture and Conservation, January 1st, 1939 to December 31st, 1939* (Providence, RI: 1940): 6-9.

268. *Ibid.*, 56.

269. *Ibid.*, 80.

270. *Ibid.*, 85.

271. *Ibid.*, 85.

272. Jay N. Darling, President of the Wildlife Federation, quoted in Department of Agriculture and Conservation, *Fifth Annual Report of the Department of Agriculture*

Other activities of the Department were less friendly towards the attainment of such a balance. In 1941 the Office of Fish and Game authorized a bounty of three dollars for foxes taken legally within the state. The fund was rapidly exhausted by the enthusiastic hunters, just as the spring season began when farmer's children would have been ready to dig them out of their burrows. The state's starfish eradication program, designed to assist the production of oysters, was a similar program.²⁷³ The state's other efforts to maintain viable populations of game animals and fish resources appear to have been driven by the desire to sustain a steady flow of these resources to the dinner table.²⁷⁴

The Second World War curtailed the efforts of the Department of Agriculture and Conservation as well in order to support wartime production, but even these reductions were not disastrous to humans or any other species in the state. There was still sufficient food in the region to keep the population well fed. The desire to maintain stable game populations and lumber resources tempered any rush to completely subdue the earth in support of the industrial production required to win the war. Labor in the state may have been scarce, but the war against the gypsy moth and mosquito was not ended, merely reduced in magnitude. Even post-war planning was conducted in anticipation of the

and Conservation, January 1st, 1939 to December 31st, 1939 (Providence, RI: 1940): 109.

273. Department of Agriculture and Conservation, *Seventh Annual Report of the Department of Agriculture and Conservation, January 1st, 1941 to December 31st, 1941* (1942): 92-95.

274. Department of Agriculture and Conservation, *Eighth Annual Report of the Department of Agriculture and Conservation, January 1st, 1942 to December 31st, 1942* (1943): 8.

future desires and needs of a predicted population increase.²⁷⁵ Such plans also included a robust education program, allied with the Rhode Island Wildlife Federation, to instruct teachers and youth leaders on the value of conservation in the state.²⁷⁶

The Department of Agriculture and Conservation also enjoyed a rather low visibility period following the Second World War. As early as 1945 the Department recognized the declining sea food production from Narragansett Bay and suggested that pollution, or at least the effects of human activity, might be the cause. The Director of the Department, Dr. Raymond G. Bressler, proposed further investigation to determine the causes.²⁷⁷ The Department resumed its struggle against the gypsy moth, now using DDT sprayed from trucks to combat the threat.²⁷⁸ Even at this stage there was some concern of the use of this chemical, though the Department was convinced of its safety:

The Division uses DDT only after carefully weighing the good it will do by killing harmful insects against the possible destruction to wildlife. The more serious the insect pest, the more justification for its use. When DDT must be used, careful observations are made as to its effect and the application is timed to

275. Department of Agriculture and Conservation, *Ninth Annual Report of the Department of Agriculture and Conservation, January 1st, 1943 to December 31st, 1943* (1944): 5-10, 36-39, 50, 62-63.

276. Department of Agriculture and Conservation, *Tenth Annual Report of the Department of Agriculture and Conservation, January 1st, 1944 to December 31st, 1944* (1945): 571.

277. Department of Agriculture and Conservation, *Eleventh Annual Report of the Department of Agriculture and Conservation, January 1st, 1945 to December 31st, 1945* (1946): 6.

278. Department of Agriculture and Conservation, *Twelfth Annual Report of the Department of Agriculture and Conservation, January 1st, 1946 to December 31st, 1946* (1947): 32-33.

avoid as much as possible bird migrations, nesting periods, and times when honey bees could be poisoned.²⁷⁹

By 1949, the Department could look back on fifty years of gypsy moth control with some pride as the use of DDT had significantly reduced the defoliation of the state's forests by the insect.²⁸⁰ Sexual attractant traps were used but DDT remained the primary weapon in the Office of Entomology's fight against this insect.²⁸¹ The death of the Department's Director, Raymond J. Bressler, in 1949 initiated a general decline in the quality of the department's annual reports. While still clearly written, the amount of information and the subsequent director's overall perceptions on the important issues affecting his organization were not as direct or illuminating as Bressler's had been.²⁸² The 1950s also brought new ways to fight the mosquito and gypsy moth infestations in the state. The Division of Entomology used helicopters for aerial spraying of affected areas, noting that "The machine is able to penetrate areas and put down a cover spray

279. Department of Agriculture and Conservation, *Thirteenth Annual Report of the Department of Agriculture and Conservation, January 1st, 1947 to December 31st, 1947* (1948): 36.

280. Department of Agriculture and Conservation, *Fifteenth Annual Report of the Department of Agriculture and Conservation, January 1st, 1949 to December 31st, 1949* (1950): 46.

281. Department of Agriculture and Conservation, *Seventeenth Annual Report of the Department of Agriculture and Conservation, January 1st, 1951 to December 31st, 1951* (1952): 11.

282. While the Department's annual report always featured the name of the serving governor, 1952 report was the first to feature the governor's picture. As the director was a political appointee, it appears that the Department of Agriculture and Conservation was not above political pandering. See Department of Agriculture and Conservation, *Eighteenth Annual Report of the Department of Agriculture and Conservation, July 1st, 1952 to June 30th, 1953* (1953): 11.

where there is no feasible means of access.”²⁸³ The use of DDT continued throughout the decade, from almost five thousand gallons sprayed in 1950 to sixty five hundred in 1960.²⁸⁴ The Department also used other chemicals to eliminate invasive species in state ponds. The Division of Fish and Game sprayed sodium arsenite to kill weeds in ponds as well as rotenone to kill club suckers in Ashville Pond in 1956, though both efforts were unsuccessful.²⁸⁵

By the start of the 1960s some concern of the diffusion of pesticides into the cattle feed and hence into human food was noted by the Department but dismissed as media induced “consumer hysteria.”²⁸⁶ Otherwise the Department entered the decade with much the same mindset as it had when it was created. The natural resources of the state

283. Department of Agriculture and Conservation, *Twentieth Annual Report of the Department of Agriculture and Conservation, July 1st, 1954 to June 30th, 1955* (1955): 74-75.

284. The average amount was approximately 4900 gallons of DDT solution per year in the 1950s. See Department of Agriculture and Conservation, *Sixteenth Annual Report of the Department of Agriculture and Conservation, January 1st, 1950 to December 31st, 1950* (1951): 32, and Department of Agriculture and Conservation, *Twenty Sixth Annual Report of the Department of Agriculture and Conservation, July 1st, 1960 to June 30th, 1961* (1961): 35.

285. Sodium arsenite contains arsenic and is a carcinogen while rotenone, while a product of organic sources, is mildly toxic to humans. See Department of Agriculture and Conservation, *Twenty-Second Annual Report of the Department of Agriculture and Conservation, July 1st, 1956 to June 30th, 1957* (Providence, RI: 1957): 82-83, “Sodium Arsenite,” New Jersey Department of Health and Senior Services, Hazardous Substance Fact Sheet, www.nj.gov/health/eoh/rtkweb/documents/fs/1683.pdf (accessed 12 September 2014), and Kevin C. Ott, “Roteone. A Brief Review of its Chemistry, Environmental Fate, and the Toxicity of Rotenone Formulations,” <http://www.newmexicotu.org/Rotenone%20summary.pdf> (accessed September 12, 2014).

286. Department of Agriculture and Conservation, *Twenty-Fifth Annual Report of the Department of Agriculture and Conservation, July 1st, 1959 to June 30th, 1960* (Providence, RI: 1960): 13.

were to be conserved in order to provide a steady stream of products for human economic use. Forests were managed for lumber and recreation. Wildlife was protected and preserved for hunting and meeting the discerning palate of the state's population and not for its own value. Troublesome insects were to be managed through chemical attack to dampen their depredations on trees considered attractive by humans. The secondary effect of the use of different chemicals does not seem to have been investigated. The Department of Agriculture and Conservation would have seemed very familiar to readers of Rachel Carson or Aldo Leopold. It was human focused and not particularly concerned with the environment beyond its ability to be used by and for humans. With the exception of coordination with the Narragansett Electric Company to assist in the state's forest fire response plans, there also does not seem to have been any concern with how the area's electric power grid might affect the conservation of natural resources in the state.²⁸⁷

Into the 1960s

By the start of the 1960s, the generation long domination of Rhode Island politics by the Democrats was beginning to wane as the Republicans started to regain their appeal. A Republican, the Italian-American Christopher Del Sesto, won the governorship in 1958, only to be defeated in his reelection attempt in 1960 by Democrat John A. Notte, Jr. Notte's tenure was to be equally short lived as Republican John H. Chaffee displaced him following the 1962 election.²⁸⁸ Chaffee would remain in office for six years,

287. Rhode Island Forest Service, "Forest Fire Control Plan, 1943" (1943): 13.

288. Chaffee's Republican Party rival for the gubernatorial nomination came from Louis V. Jackvony, Jr., who had been the director of the Department of Business Regulation, the parent organization for the Public Utilities Commission, in the Del Sesto

winning reelection in 1964 and 1966, before losing in 1968 to Democrat Frank Licht. During this period the power of the Providence base of the Democratic Party was declining as more party members moved out into the suburbs, paralleling the erosion of party discipline within the state. Union defections or at least failure to support Democratic candidates in the 1958 and 1962 elections were also detrimental to Democratic electoral efforts. By running popular candidates such as Del Sesto and Chaffee, the Republicans were able to outflank the Democratic Party organizational strength and win statewide elections.²⁸⁹

The Public Utilities Commission spent most of the 1960s operating as it had done in the 1950s. There were six electric companies in the state. Narragansett Electric, a completely owned subsidiary of the New England Electric System (NEES) was the largest company in terms of sales and electric power production. Blackstone Valley Electric Company and the Newport Electric Corporation were the next largest, though their combined sales were much smaller than Narragansett Electric. The smallest companies, Island Light and Power Company, which provided electricity to Block Island, Prudence Island Utilities, which powered Prudence Island, and the Pascoag Fire District, which bought electric power from the Blackstone Valley Electric Company and delivered it to its customers in the Pascoag and Harrisville Fire Districts, had almost negligible

administration. See Matthew J. Smith, "Rhode Island Politics 1956-1964: Party Realignment," *Rhode Island History* 35, no. 2 (May 1976): 58.

289. Matthew J. Smith, "Rhode Island Politics 1956-1964: Party Realignment," *Rhode Island History* 35, no. 2 (May 1976): 57-60.

effects on the electric power grid compared to the larger companies. All went about their operations in a predictable manner.²⁹⁰

The surveillance of the electric utilities had by now eclipsed all of the other ones, including water, transportation and communications, in the Commission's ledger. Like the Department of Agriculture and Natural Resources, the quality of the reports of the Public Utilities Commission appeared to decline during this decade, with less information and analysis. Few attempts to shift the utilities' operations were noted. In 1962 the Commission approved Narragansett Electric Company's request to exercise the right of eminent domain to run transmission lines to the new power plant at Brayton Point in Somerset, Massachusetts as this was the most "economical" method of bringing the electric power to Rhode Island. Objections to the proposed construction were primarily directed against damages to the owner's property from the construction the power lines.²⁹¹ Island Light and Power Company experienced financial difficulties in the latter half of the decade due to fuel costs and the nature of the electric loads on Block Island, requiring a large tariff increase to remain in business.²⁹² The Newport Electric

290. For example, in 1966 Narragansett Electric had operating revenues of over \$43 million while Blackstone Valley Electric had \$16.2 million and Newport Electric had \$5 million. See State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission of the Department of Business Regulation for the Years 1965 and 1966* (Providence, RI: Wm. R. Brown, Co. Printers, 1967): IV-VI, XVIII-XX.

291. State of Rhode Island and Providence Plantations, *Fifty-First Annual Report of the Public Utilities Commission of the Department of Business Regulation for the Year Ending December 31st, 1962* (Providence, RI: 1963): 112-116.

292. State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission of the Department of Business Regulation for the Years 1967 and 1968* (Providence, RI: 1969): 240-249.

Corporation bought up the shares of the Prudence Island Utilities company in 1968, as the latter required extensive modernization that was too expensive to accomplish and remain in business.²⁹³

The Public Utilities Commission also authorized Narragansett Electric Company and Blackstone Valley Electric Company to join other Massachusetts and Vermont electric utilities in the Rhode Island-Eastern Massachusetts-Vermont Energy Control (REMVEC) organization. This structure had been established in response to the 1965 Northeast blackout in order to enhance coordination and cooperation between the regional utilities and prevent another large scale outage. REMVEC also entailed the creation of the New England Power Exchange (NEPEX) to accomplish this coordination. As this organization was a non-profit one, the Commission approved it without the normal public hearings.²⁹⁴ As the 1960s ended and the new decade began, both Narragansett Electric and Blackstone Valley Electric Companies petitioned the Public Utilities Commission to issue new mortgage bonds as well as raise the rates they were able to charge their customers. Both companies attempted to pass on their financial strains to their customers. The Public Utilities Commission approved the bond requests

293. Neither Island Light and Power or Prudence Island Utilities could accomplish the economies of scale that Newport Electric and Narragansett Electric could. Prudence Island Utilities had been run as a community service project by several of the island's year long inhabitants. See State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission of the Department of Business Regulation for the Years 1967 and 1968* (Providence, RI: 1969): 351-354.

294. The Public Utilities Commission did not comment at all regarding the 1965 outage. See State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission of the Department of Business Regulation for the Years 1967 and 1968* (Providence, RI: 1969): 509-510.

but rejected the rate increases; the companies would require better justifications to convince the Commission that the customers should accept a higher burden than the utilities' stockholders.²⁹⁵

The Department of Agriculture and Conservation no longer existed by the start of the 1970s. In 1965, under the direction of Governor John H. Chaffee, the department had been reorganized and renamed as the Department of Natural Resources. The Department consisted of a Division of Conservation, a Planning and Development Division, an Agriculture Division, a Division of Parks and Recreation, a Division of Harbors and Rivers and an Enforcement Division.²⁹⁶ The new department had a slightly updated list of duties and responsibilities. It was to “supervise and control the protection, development, planning and utilization of the natural resources of the state,” as well as coordinate with the Department of Health regarding the consequences of water pollution affecting birds, marine life and recreational activities.²⁹⁷ The Department was also tasked to work with the Department of Community Affairs in any planning effort affecting agriculture, recreation and fisheries. Finally, the reconstructed department was required

295. State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission and the Division of Public Utilities and Carriers for the Years 1969 and 1970* (Providence, RI: Wm. R. Brown Printing Co., 1971): 275-277, 343-344, 387-390, 463.

296. August P. La France, *Manual with Rules and Orders for the use of the General Assembly of the State of Rhode Island, 1965-1966* (1966): 314-315.

297. State of Rhode Island and Providence Plantations, *Manual, 1975-1976* (1976): 447.

to cooperate with the local conservation commissions that were simultaneously created.²⁹⁸

The Department also established a new Advisory Council on Natural Resources to advise the Department director. The first secretary of that council was Alfred L. Hawkes, director of the Audubon Society of Rhode Island.²⁹⁹ Later members included other important members of the conservation societies of the state, including Donald J. Zinn, a professor of zoology at the University of Rhode Island and former president of the National Wildlife Federation.³⁰⁰

Despite these outward alterations, the Department of Natural Resources lagged the changes that the blooming environmental consciousness was bringing to the nation's conservation groups. The Rhode Island Pesticide Control Act had eliminated the use of many toxic insecticides, but aerial and truck mounted spraying using less harmful chemicals continued.³⁰¹ Many of the activities of the Department appeared to continue on the trajectory of the old Department of Agriculture and Conservation, that of

298. Ibid., 447.

299. August P. La France, *Manual with Rules and Orders for the use of the General Assembly of the State of Rhode Island, 1965-1966* (1966): 314.

300. August P. La France, *Manual with Rules and Orders for the use of the General Assembly of the State of Rhode Island, 1971-1972* (1972): 322.

301. The state switched to Sevin (Carbaryl), a lethal insecticide that decayed away rapidly after it was applied. It was still a carcinogen but had less notoriety than DDT in the mid 1960s and early 1970s. See Department of Natural Resources, *Natural Resources, State of Rhode Island 1969-1970*, (1971): 4-5, Department of Natural Resources, *Natural Resources, State of Rhode Island 1970-1971*, (1972): 4-5, and "Carbaryl," New Jersey Department of Health and Senior Services, Hazardous Substance Fact Sheet, <http://nj.gov/health/eoh/rtkweb/documents/fs/0340.pdf> (accessed September 13, 2014).

maintaining the land, forests and wildlife of the state for its continued use by the human population in the future. Only the Department's new Division of Planning and Development evinced a trace of any environmental ethical consideration in its proposal to set aside forty thousand acres of open space to protect wildlife against the expected pressures of an expanding state population.³⁰² The continuing reduction of analysis in the Department's reports indicate that while such tendencies may have been taking root in the organization, the overall bureaucracy was less supportive of a new way of thinking.³⁰³

The new department was also energized by the passage of the state's "Green Acres Land Acquisition Act of 1964." Concerned that the predicted expansion of the state's population would have insufficient space to enjoy for recreation and the conservation of natural resources, the General Assembly authorized the purchase of suitable land for the purposes of preservation. The act authorized the state to work with local governments to purchase this space. The program director was tasked to discover exceptional natural areas for recreation and conservation, though the acquisition should be focused on open areas that were less expensive. Land acquired by this act could not

302. Department of Natural Resources, *Natural Resources, State of Rhode Island 1970-1971*, (1972): 20.

303. The annual reports of the Department of Agriculture and Conservation in the 1930s were typically one hundred pages long. The annual reports of the Department of Natural Resources were about twenty pages. While quality is not a function of quantity, reading the latter reports suggest that both were lacking. The Department of Agriculture and Conservation's reports were clear, concise and full of information to assess trends. The writing was done by the heads of the Department's Divisions and left little doubt as to the leadership's thinking. The Department of Natural Resource's reports are unsigned and read like the pronouncements of an unresponsive bureaucracy.

be diverted from the intended use of recreation and conservation without the approval of the program director or governor for state lands.³⁰⁴

A conflict between this aspiration to preserve land for recreation and conservation and the requirement to use land for the electric power grid soon arose. In 1971, the Blackstone Valley Electric Company petitioned the Public Utilities Commission to support a new exercise of eminent domain to run high voltage power lines. Burrillville, Rhode Island was the new location required by Blackstone Valley Electric Company to run 345 kilovolt transmission lines to connect into the larger New England power loop. This linkage would permit greater flexibility of the grid during dynamic electrical loading conditions and assist “the reliable uninterrupted transmission of the power supply.”³⁰⁵ Most of the required land had been purchased or rights of way negotiated with the owners for the company to proceed with construction. One owner, William S. Fort of North Smithfield, Rhode Island protested the use of his land by the utility. Fort did not argue with the Blackstone Valley Electric Company’s analysis of the requirements of the transmission lines to support the grid’s reliability and flexibility. Instead, Fort argued that the construction of the transmission lines across his property would “destroy its value for conservation purposes.”³⁰⁶ Building the transmission lines would disrupt the “scenic

304. Green Acres Land Acquisition Act of 1964, Rhode Island Code - Chapter 32-4 (1964), <http://law.justia.com/codes/rhode-island/2005/title32/32-4-15.html> (accessed September 14, 2014).

305. State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission and the Division of Public Utilities and Carriers for the Years 1971 and 1972* (Providence, RI: 1973): 51-55.

306. *Ibid.*, 55-56.

development of his property,” and as pristine property in the state was a diminishing resource, exercising the right of eminent domain would not be an overall benefit to the state’s citizens.³⁰⁷ After a careful examination of Fort’s property, the Commission was not convinced. While the land was being organized by Fort to support wildlife, the Commission did not think that Fort’s actions met the mark for “scenic development.”³⁰⁸

Alfred L. Hawkes, Executive Director of the Audubon Society of Rhode Island interceded for Fort. Hawkes testified that “placing of the lines would deprive children of the opportunity to appreciate nature at its purest, untouched by man or civilization.”³⁰⁹

This argument also failed to sway the Commission:

The Commission found some difficulty appreciating this position since nature in the raw was already disturbed by Mr. Fort’s vacation residence on the parcel and the Commission’s awareness that the United States Government has been spending billions of dollars to bring civilization, including power lines, to what it had considered the poor, unfortunate, benighted and backward people who but for the United States beneficence would continue to reside in areas untouched by what we consider the benefits of civilization.³¹⁰

The Commission authorized Blackstone Valley Electric Company to condemn the land and construct the power lines.³¹¹

The Blackstone Valley Electric Company decision is of note for a number of reasons. It was the first one where environmental concerns were used to help frame the

307. Ibid., 56.

308. Ibid.

309. Ibid.

310. Ibid.

311. Ibid., 59.

dimensions of the problem that was being addressed, reference frames that were not used or perhaps even understood by all of the decision makers. The utility company and the Public Utilities Commission were interested in the continuity of power, electrical and political, in determining whether to approve the construction of the high voltage transmission lines. While Fort may have been also interesting in keeping the power lines off of his property, both he and Hawkes couched their arguments in terms that an environmentalist of the early 1970s would recognize. The ears of the Commissioners were more tone deaf than indifferent to Hawkes' talking points. As time progressed the Commissioners would hear this tune again.

The state of Rhode Island entered the 1970s aware of the growing environmental movement in the state and the nation, but not particularly influenced by its precepts, at least not where the electric power grid was concerned. Senior leadership in the government in Providence and Washington were influenced or partial to the desires of the electric utility companies to provide stable and reliable electric power to the region. The regulatory body tasked to supervise those companies was supportive of meeting the requirements of the utilities and the demands of their political masters. The regulatory body that might have altered this synchronization of government and technologically focused business was only slowly divesting itself of an older philosophy of viewing nature as a resource and not as having its own inherent value. Much like Muir's loss during his struggle to prevent the damming of the Hetch-Hetchy Valley, the skirmish in Burillville between the two analytical systems was a precursor for future conflict.

Regulation, Efficiency and Momentum

Much of the state of Rhode Island's regulatory effort over this period, particularly the work of the Public Utilities Commission, seems to support the theories of both technological determinism as well as technological momentum. This is unsurprising, as the Public Utilities Commission was designed to monitor and regulate the privately owned companies that owned and operated the electric power grid. The utility companies were allowed to achieve a reasonable rate of return on their investments while maintaining their natural monopoly in return for their acceptance of the government supervision. Whether that transaction was self generated from the pull of the authoritarian megamachine, the demands for efficiency by technique, or provided by one of the "reinforcing institutions" arising from the momentum of the electric power grid may not be crucial.³¹² However, since the executives of these companies often occupied the offices of the political leadership of the state, the distinction between assisting the operation and efficiency of the advanced technology system and promoting the finances and political fortunes of the owners can be difficult to glean.

Certainly proponents of technological determinism would not be surprised at the increased government involvement with the electric power grid. As this advanced technology system became ever more vital to the normal functioning of society, it became ever more intertwined with larger numbers of the population. The continued development and application of the technology became more expensive and the corporations applying it became subsequently more powerful. The problems resulting

312. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Penguin Books, 1989), 459-460.

from this technology became larger still as the Public Utilities Commission had to balance the desires of the electric utilities against the needs of the population. Only the intervention of the state with its wealth and authority had the ability to resolve these differences.³¹³ Ellul wrote that “These problems all exceed the powers of private individuals. Technique, once developed to a certain point, poses problems that only the state can resolve, both from the point of view of finance and that of power.”³¹⁴ Only the state could determine the requirement for a large reservoir in the state and force the people living in the condemned land to leave their homes. The state had the necessary talent to carefully evaluate the electric utilities’ requests for higher electric rates or transfer of land. In this respect the actions of the state to regulate the electric utility companies’ operation of the electric power grid supports the model of technological determinism.

Curiously, the development of the state’s environmental regulatory bodies would be seen as equally necessary as the utility commission. The problems of the pollution of the air and water supplies necessitated the intervention of the state “if they are to be solved at all.”³¹⁵ On the other hand, technique would not require the elevation of the value any other species to motivate humans to take some action. These were technical problems; appeals to anything other than efficiency were of little concern.

313. Jacques Ellul, *The Technological Society*. Trans. John Wilkinson (New York: Vintage Books, 1964), 233-238.

314. *Ibid.*, 237.

315. *Ibid.*

Lewis Mumford would also have approved of the state's influence on the companies operating the electric power grid. An advocate of regional planning to meet the demands of modernity, Mumford supported "the building of appropriate structures – dwellings, industrial plants, markets, water works, dams, bridges, villages, cities – to house the activities of a community and to assist the performance of all of its needful functions in a timely and orderly fashion."³¹⁶ How much the Public Utility Commission or the Department of Agriculture and Conservation planned for the future is arguable; however the concept of government interaction with private industry was commendable to Mumford.

The regulatory agency of the Rhode Island Public Utility Commission falls precisely within Hughes' theory of technological momentum. This type of organization acted to reinforce the behavior of utility companies that operated the electric power grid. From its inception, RIPUC acted to permit the electric utilities, particularly Narragansett Electric, the NEES local electric power distributor subsidiary, to effectively exercise their monopolies within the state. Tariffs were evaluated by RIPUC and usually approved. Bond and stock sales were reviewed and authorized while property was condemned and transferred as required. One has to look hard to find instances where the commission opposed the desires of the electric utility companies.

The activities of the politicians also tended to reinforce the actions of the electric utilities to grow and build. Charles Brayton and Marsden Perry supported the

316. Lewis Mumford, *The Culture of Cities* (New York: Harcourt Brace Jovanovich, Inc., 1970), 374.

development of the electric utilities in part because they could use the utilities as a cash cow to support their political empires. T. F. Green profited from the absorption of UER and prevented the ever contrary Thomas McCoy from establishing his own power base from a publically run utility in Pawtucket. A desire to protect the monopolies of the electric utility companies was the more pressing factor in keeping electric cooperatives away from the area than increasing the reach of electric power transmission during the Great Depression. Senator Pastore's promotion of nuclear research and the development of nuclear reactors for electric power generation further reinforced the natural inclinations of the companies operating the electric power grid. Many of these actions and decisions do not appear predicated on increasing the efficiency of the electric power grid. Even after the passage of decades it is challenging to infer the motivations of these individuals behind their decisions. Perhaps the differences between personal ambition and professional actions to assist their communities were negligible, at least from their perspective. The influence of these and other individuals in the political realm who profited politically and personally from their decisions is less well presented in Hughes' analysis.³¹⁷

Hughes is less persuasive in considering the parallel development of regulatory agencies such as the Rhode Island Department of Agriculture and Conservation. Technological momentum postulates the creation of organizations that strengthen the tendencies of advanced technology systems. The theory is silent on the development of

317. Thomas P. Hughes, *Networks of Power* (1983; repr., Baltimore, MD: The Johns Hopkins University Press, 1993), 464-465.

agencies in reaction to the negative effects of that technology. While Hughes discusses the organizations that arise to profit from and assist the development of the advanced technology systems, organizations that might dampen the momentum are not considered. By the 1970s some of the effects of pollution from fossil fuel burning electric power plants had been observed, if not fully understood. Yet the emergence of organizations such as the Environmental Protection Agency or the Conservation Law Foundation that acted to reduce air or water pollution caused by industrial activity would be unexpected by adherents of this model.

From the perspective of the beginning of the 1970s, both theories of the development of advanced technology systems appear to cover past events with some accuracy. As one might expect with a general theory of this magnitude, the precise nature and correlation of every event with the models is not achieved. The overall trend and tendencies of the electric power grid seem to match with the descriptions of all of the theorists. Proceeding farther into the future should suggest which model of reality better describes the development of the electric power grid in southeastern New England in particular and advanced technology systems in general.

CHAPTER 5

ALTERED MOMENTUM: THE CHARLESTOWN NUCLEAR POWER PLANT

The more you know about nuclear power, the more sense it makes.

- Narragansett Electric Company Advertisement

I knew nothing of nuclear power but was really outraged that the federal government did not involve the general public in making a decision about their own community.

- Claudine Schneider

Over the almost ninety years of operation of the electric power grid in southeastern New England, the New England Electric System (NEES) had become fully conversant with the advantages of operating a mature technological system. With a professional cadre of committed engineers and businessmen, NEES could look backwards at generations of success solving the most challenging technical problems the construction, operation and maintenance of the grid had generated. Along the way the company had survived organizational restructuring, hostile takeovers, adverse Supreme Court decisions and even the actions of the federal government to break it asunder. For many good reasons, the organization exhibited a culture that extolled technical expertise, practical problem solving and business acumen. While the future challenges might be significant, the corporation exuded confidence in its ability to preserve and flourish. Certainly the electric utilities were not alone in this mindset. NEES and the smaller electric utilities in the area had acquired allies in the senior leadership of the Rhode

Island government, the regulatory bodies of the state bureaucracy, the local industries and unions, and perhaps most importantly, the population that used its product. These leaders and organizations had invested no small amount of financial and emotional capital in maintaining the status quo and were unwilling to entertain objections to the standard business model that had been so successful.

NEES Nuclear Plans

With its historical background of success and the underlying organizational attitude of engineering problem solving mastery, NEES believed it was ready and able to handle the future technical problems in order to promote the reliability and profitability of the electric power grid. At the start of the decade one of those technical challenges was the construction of a nuclear power plant to provide a new source of electric power for the region. NEES had acquired experience constructing and operating nuclear power plants under the direction of William Webster who had overseen much of the company's work with Yankee Atomic Energy at the Row, Massachusetts nuclear power plant. While NEES had not built its own plant, NEES had acquired financial interests in other New England utilities' nuclear power plants, allowing NEES to buy power from these plants for its own customers.¹ Some members of the NEES leadership were hesitant about building the larger scale plants being advertised by nuclear power industry despite being impressed with the promised overall economic benefits to the system. The

1. The advent of the New England Power Exchange (NEPEX) and then later the New England Power Pool (NEPOOL) in the early 1970s made this easier to accomplish. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 182.

consensus opinion was that the risks were warranted given the engineering and economic considerations.²

Rome Point in North Kingstown, Rhode Island had previously been proposed as a location for a conventional electric power plant, though friction with the state government over tariff increases had thwarted that scheme. The new NEES plan for Rome Point was more ambitious. The company planned to build two 1150 MW nuclear plants on the site, with a possibility of two additional 850 MW plants in the vicinity.³ Building two nuclear plants at the same site would save the company up to fifteen percent of the total cost of construction. Since the plants would take upwards of eight years to build, this savings was an important consideration. Located close to the major electrical loads and customers in Providence and able to use the waters of Narragansett Bay for cooling, the plants would be able to meet the expected increases in electrical demand in the area.⁴ Company officials from the NEES subsidiaries were strident regarding any outside interference with their proposals. The company rejected any need for any external ecological studies regarding the safety of their proposed nuclear plants. The president of the Narragansett Electric Company, T. Dexter Clarke, was dismissive about

2. Guy Nichols, soon to become the president of NEES, had reservations about the cutting edge designs capable of generating 1150 MW compared to the proven designs that could only generate 850 MW. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 222.

3. "Electric Co. Denies Planning of 3 Plants," *Providence Journal*, February 5, 1971.

4. Irwin Becker and Robert C. Fredericksen, "Electric Firm has 2nd Rome Pt. Plan," *Providence Journal-Bulletin*, May 18, 1971.

involving local environmental organizations such as Save the Bay in the company's planning process. Ecological concerns were undesired in the company calculus; Clark noted that "It just hasn't worked. It is like writing an ordinance by referendum."⁵ Delays in the construction of the plants would only drive up the costs and make non-nuclear plants more economically viable, even if they did produce greater air pollution. The company representatives also rejected the notion that consumer advertising to use more of their product was actually causing additional pollution.⁶

Popular reaction against the proposed nuclear power plants was tentative at first. Organizations accepted NEES's assumption that electric power demands would continue to increase and that additional capacity in the state was required to meet it. The president of Save the Bay, Irving G. Sheldon, opined that "there is a definite need for more power, but there are other avenues to be studied before Narragansett Electric decides on Rome Point as the site for a nuclear power plant."⁷ Other concerned citizens noted that the plant's design would result in a twenty degree temperature rise in water circulated from

5. While a 1932 Brown University graduate and a lawyer, Clarke sounded similar to what any electrical engineer might propose using the IEEE standards of conduct. See Irwin Becker and Robert C. Fredericksen, "Electric Firm has 2nd Rome Pt. Plan," *Providence Journal-Bulletin*, May 18, 1971.

6. The officials being interviewed, T. Dexter Clarke, president of Narragansett Electric, Lawrence E. Minnick, president of Yankee Atomic Electric, the group of construction firms that would build the plants, and John Lebourveau, manager of environmental research for NEES all promoted an attitude of certainty that the plants could be built safely and that concerns with radioactive emissions from the plant were small compared to the "other social costs of radioactivity we're exposed to." See Irwin Becker and Robert C. Fredericksen, "Electric Firm has 2nd Rome Pt. Plan," *Providence Journal-Bulletin*, May 18, 1971.

7. "Rome Point Nuclear Plant Draws Debate," *Rhode Island Audubon* (August-September 1971): 5.

Narragansett Bay through the plant's condensers. This would affect the local environment by killing off small organisms that were part of the food chain in the area.

Narragansett Electric officials downplayed these concerns:

There have been no adverse effects as far as the ecology and marine biology is concerned as yet created by the thermal discharges of either a nuclear power plant or a fossil fuel plant. This is the overall ecology of a body of water into which the discharge flows. You have to take the overall ecology. This is what we are concerned about. We're not concerned about killing these small micro-organisms as they come through the condensers, because they're part of the food chain and somewhere along the line, they'll be absorbed anyway.⁸

This point was precisely the area of concern by some citizens. Unwilling to accept the concept that the "overall ecology" would be able to handle such perturbations, citizens pointed out that the thermal effects on local marine life might be drastic. People were also concerned that the chlorine discharged to clean the plant's heat exchangers might also be harmful to wildlife in the region. Echoing the words of Barry Commoner, the Audubon Society displayed concern that even minor stresses in the local ecology might cause greater unexpected effects due to the interconnectedness of the environment. NEES's offer to clean up any ecological damage proven to have been caused by the plant's operation was not seen as well thought out.⁹

Rhode Island political reaction to the plant was muted. Democratic governor Frank Licht said that the state would not authorize construction of the plant until "it is fully satisfied that such a project will not hurt the bay or the people of Rhode Island."¹⁰

8. Ibid.

9. Ibid.

10. "Rome Point Nuclear Plant Draws Debate," *Rhode Island Audubon* (August-September 1971): 5.

Senator John O. Pastore, the Democrat Senator who was the chairman of the Joint Committee on Atomic Energy in Washington and a strong supporter of the peaceful uses of nuclear energy, withheld a final verdict on Narragansett Electric's plans. "The burden of proof is upon the industry and government, and those in responsibility, to prove that it's safe. It is not up to the public to prove that it's unsafe," Pastore warned."¹¹ Pastore said more studies were required prior to any decision being made, though also noted the nuclear industry's safety record, particularly compared to the number of oil spills at other energy facilities.¹²

NEES pressed ahead with its proposal, spending over a million dollars in preparatory work and planning by the summer of 1971.¹³ Despite NEES's previous strong words against involving recalcitrant environmental groups in its planning process, it did attempt to at least limit some of the negative reactions from this direction. In the spring of 1972 representatives from Narragansett Electric met with Alfred J. Hawkes, the executive director of the Audubon Society of Rhode Island, to discuss the biological impacts of the Rome Point plants. These talks were later expanded to include other local environmental groups such as Save the Bay, Ecology Action for Rhode Island, and

11. "Pastore Withholds Judgment On R.I. Nuclear Plans," *Providence Journal*, March 2, 1971.

12. Ibid.

13. "Utility Has Spent A Million At Rome Pt.," *The Evening Bulletin*, July 1, 1971.

Rhode Island for Safe Power in attempts to continue a “dialogue” with the organizations that were opposed to the power plant project.¹⁴

By this time the new federal organization, the Environmental Protection Agency (EPA) had become involved. Citing the newly passed amendments to the Water Pollution Act as its authority to intervene, the EPA rejected Narragansett Electric’s permit requests for plant construction. The EPA stated that Narragansett Electric was not using “the best practical control technology” in its water cooling design to minimize harm to the environment. Narragansett Electric’s design was not “consistent with maintaining a balanced, indigenous population of marine life in the West Passage of Narragansett Bay.” The proposed cooling system would cause an increase in the water temperature there, adversely affecting the “sensitive nursery area” and “beautiful breeding grounds” of the bay.¹⁵ Noting that even a fossil fueled plant using the same cooling system would be affected, Narragansett Electric officials reconsidered the Rome Point area. To build a cooling system without affecting the thermal balance of that area of Narragansett Bay area would require building alternate and more expensive cooling systems. The President of Narragansett Electric, Dexter Clarke, considered that future technology advances might make the Rome Point site economically permissible, but in

14. Edward E. Mulligan, Vice President of The Narragansett Electric Company to Alfred J. Hawkes, Executive Director of The Audubon Society of Rhode Island, April 19, 1972, Audubon Society of Rhode Island Archives, Smithfield, RI.

15. “Bay Power Plant Unlikely,” *Providence Journal*, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

the interim the plan was put on hold.¹⁶ Instead, NEES ordered several oil fired plants to be built at its sites at Brayton Point and Somerset in Massachusetts. These plants were not as large, efficient or costly as the proposed nuclear plants, but they could be constructed much more rapidly. The #4 Salem Harbor plant was operational by 1972 while the #4 Brayton Point plant came on line in 1974, each with 430 MW of electrical generating capacity.¹⁷

The Vietnam War Peace Dividend in Rhode Island

While the Rome Point location may not have been the optimal location to build nuclear power plants, NEES still believed that nuclear power was a good fit for the region and would help to lower electric costs compared to the national average. With other regional electric utilities building nuclear power plants, the cutting edge of electric generation technology, NEES was still desirous of building its own plant. All that was required was a place to build it.¹⁸ Ownership of a nuclear electricity generating facility,

16. Landry and Cruikshank suggest that delays in the licensing process, rather than the EPA's rejection, led NEES to forgo the Rome Point site. Dexter Clarke, the President of Narragansett Electric, suggested that the immense cooling towers required would be "as bad as any system can be." Thirty years later a similar system would be erected at Brayton Point. See "Bay Power Plant Unlikely," *Providence Journal*, Claudine Schneider Papers, University of Rhode Island, Kingston, RI, and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 182.

17. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 182-183.

18. *Ibid.*, 183.

while expensive, would provide greater control over their portion of the New England power grid.¹⁹

A new location fortuitously became available in Charlestown, RI, approximately twenty miles down the coast towards Connecticut. In 1970, Charlestown was a sleepy commuter town of roughly 4,800 inhabitants. The area had been occupied by the Niantic and Narragansett Indian tribes when European colonists had first arrived in the New World. These settlers had steadily encroached upon these lands, finally breaking the Indian hold during King Phillip's War (1675-1676). The refugees of the defeated tribes maintained a presence in the region, although taxes and debt forced most of the former members off of the sanctuary of the "tribal lands." Incorporated as a town in 1738, Charlestown residents had focused on agricultural activities throughout its history. While the economic forces of the American Revolutionary War negatively affected the "plantation" style farms along the coast, Charlestown was relatively untouched by the war or any other activity of the next century. Some mills were created in the area, but the town remained somnambulant to the forces of the industrial revolution taking place in the rest of the state. In the late nineteenth century, the town's beaches were developed for recreation during the summer months, even as the community farms continued to wane. The town population experienced further declines in the early decades of the twentieth century, though the increased numbers of automobiles allowed more people to travel to

19. Ibid., 223.

the town's beaches.²⁰ During the Depression, the federal Civilian Conservation Corps (CCC) constructed fire trails, thinned out the forested areas to prevent forest fires, and probably constructed the campground log cabins at Burlingame State Park.²¹

Along with Quonset Point and Newport, Charlestown, also saw extensive military construction during the war.²² The federal government purchased approximately 600 acres of land there in 1942.²³ The Navy built three runways on the property to serve as auxiliary airfields to assist in the training of Naval Aviators at the main base of Quonset Point.²⁴ The Navy also constructed barracks, hangars and fuel facilities at the base. The station was heavily engaged with training night capable air crews. By the end of the war,

20. Walter Nebiker, *Historic and Architectural Resources of Charlestown, Rhode Island: A Preliminary Report* (Providence, RI: Rhode Island Historical Preservation Commission, 1981): 5-15.

21. *Ibid.*, 17.

22. In 1938 Senator T. F. Green had convinced the Navy to build a new Naval Air Station at Quonset Point on Narragansett Bay as well as the Seabee base at Davisville, RI. The Rhode Island legislature ceded land to the federal government while Green was instrumental in passing legislation to fund land acquisition and base construction. Political allies of Green received the majority of the subsequent contracts to build the base. Green was also a driving force in getting the Navy to establish a Naval Reserve Officer Training Course at Brown University in 1940 despite the institution's tardiness in submitting all of its applications. Green was more effective with the University of Rhode Island, working with the General Assembly to apportion funds to create a Department of Marine Biology in 1936. See Erwin L. Levine, *Theodore Green, The Washington Years, 1937-1960* (Providence, RI: Brown University Press, 1971), 94-97, and Herman F. Eschenbacher, *The University of Rhode Island* (New York: Meredith Publishing Company, 1967), 253.

23. Walter Nebiker, *Historic and Architectural Resources of Charlestown, Rhode Island: A Preliminary Report* (Providence, RI: Rhode Island Historical Preservation Commission, 1981): 17.

24. U.S. Navy, Bureau of Yards and Docks, *Building the Navy's Bases in World War Two* (Washington, DC: Government Printing Office, 1947): I: 238.

the Naval Auxiliary Air Station had a complement of 246 officers and enlisted men. Demobilization of the armed forces at the end of the war reduced manning at the air station, though experimentation with electronic air navigation kept the base open until 1950. By then the facilities had become redundant and only a minimally manned crash crew was retained.²⁵

Following the war, the Charlestown resumed its beach resort focus. Growth in the area concentrated more on suburban dwellings. Winterized summer homes permitted year long residence for the retirees and other urban commuters able to take advantage of the area's improved roads.²⁶

At the start of the 1970s, Rhode Island was faced with another reduction of military bases that backstopped the region's economic activity. On April 17, 1973, the Secretary of the Navy, Elliot L. Richardson, announced that as part of the overall military drawdown following the end of the Vietnam War, the Navy's Quonset Point Naval Air Station and the Newport Naval Station would be closed by year's end. The Chief of Naval Operations, Admiral Elmo Zumwalt stated the base closures were predicated on the Navy making the most efficient use of its allocated budget while other defense

25. Paolo E. Colette, *United States Navy and Marine Corps Bases, Domestic*, ed. Paolo E. Coletta and K. Jack Bauer (Westport, CT and London: Greenwood Press, 1985), 104.

26. Walter Nebiker, *Historic and Architectural Resources of Charlestown, Rhode Island: A Preliminary Report* (Providence, RI: Rhode Island Historical Preservation Commission, 1981): 14-18.

officials proclaimed the importance of moving the ships and aircraft of the fleet to a central location in Norfolk, Virginia.²⁷

At the time, others saw raw political motives behind the move. The Navy was also closing bases in Massachusetts, the only state that had cast its electoral votes for the Democratic candidate, George McGovern, in the 1972 presidential elections, and New England politicians looked for evidence of political retribution from the Nixon administration. Rhode Island Senators Pastore and Claiborne Pell, both Democrats, exchanged verbal salvos with John H. Chaffee, the former Republican governor who had served as the Secretary of the Navy and was widely expected to run for Senator in 1976.²⁸

Regardless of the rationale, the economic effects on the state were immense. While the vast majority of the Navy's ships and facilities were moved out of Rhode Island, the Newport Naval Station was not completely closed down. The net effect of the transfer of the Navy personnel and their families eliminated three hundred million dollars

27. John B. Hattendorf, "The Decision to Close Rhode Island Bases in 1973," in *What a Difference a Bay Makes* (Providence, RI: Rhode Island Historical Society, 1993), 104-106.

28. Since the political connections between Greene and Roosevelt had been important in establishing and expanding the Rhode Island military bases, it is not surprising that politicians looked to a political calculus for their closing. While conspiracy theories and political accusations flew between the parties, the evidence is sparse. John H. Chaffee had served as the Secretary of the Navy from 1969 to 1972, and Richardson had family ties to the area (his wife's family included members of the Rhode Island General Assembly) while Senators Claiborne Pell and Pastore, both Democrats lobbied to maintain the facilities. Perhaps more interesting is that the branches of the federal government even allowed the Navy to make the decision at all. See John B. Hattendorf, "The Decision to Close Rhode Island Bases in 1973," in *What a Difference a Bay Makes* (Providence, RI: Rhode Island Historical Society, 1993), 104-106 and G. Wayne Miller, *An Uncommon Man, The Life and Times of Senator Claiborne Pell* (Hannover, NH and London: University Press of New England, 2011), 190-191.

of civilian and military salaries, Navy purchases and construction, and matching federal aid to the Rhode Island economy in the first year after the bases were shut down. Retail sales and business volume declined and the state tax revenue suffered a loss of seven to eight million dollars. Over the next few years the unemployment rate in the state would rise from six to nineteen percent, with the Aquidneck Island area seeing almost a thirty percent jobless rate by 1979.²⁹ While the Senators in Washington protested the Department of Defense's decisions, the politicians back in Providence worked with the Navy to take advantage of the soon to be vacated facilities. Efforts concentrated on methods to find jobs for the discharged civilian employees, ways to seek the maximum benefits from the locations the Navy had left, and techniques to establish new procedures and organizations to monitor the progress. Most of these actions failed, although the Rhode Island Air National Guard was relocated to the airport at Quonset Point and the Electric Boat division of General Dynamics eventually expanded its facilities there.³⁰

One of the properties that the Navy declared surplus was the Naval Auxiliary Air Field (NALF) at Charlestown.³¹ Typically, property owned by a federal entity that had been declared surplus was required to be first offered to other federal organizations for their usage with the General Services Administration acting as the broker for such

29. Glenn Kumekawa, "The Navy, The Bay, and the State of Rhode Island," in *What a Difference a Bay Makes* (Providence, RI: Rhode Island Historical Society, 1993), 106.

30. *Ibid.*, 107.

31. The Navy declared the NALF surplus to the GSA on November 9, 1973. See *Rhode Island Committee on Energy v. General Services Administration*, 397 F. Supp. 41 (1975).

property. When executives at NEES learned that this property was going to become available, they determined that this would be a superior location to build their desired nuclear power plants. The site at the Charlestown Air Station offered a low population density location adjacent to a tidal pond that offered sufficient cooling water to operate the plant. Whether NEES learned of the property's upcoming availability from Democratic Rhode Island Governor Philipp Noel or through the offices of Democratic Senator Pastore, a nuclear power advocate and former Narragansett Electric Company employee, or the former Republican Secretary of the Navy, John H. Chaffee, is debatable. Regardless of the source of the information, NEES was interested in the property.³²

With oil prices rising dramatically following the Arab Oil Embargo caused by the Yom Kippur War in the Middle East, NEES officials felt the pressure to act to safeguard the economic underpinnings of the company.³³ It appears that NEES officials interacted

32. Landry and Cruikshank state that Democratic Rhode Island Governor Philipp Noel brought the Charlestown property to the attention of NEES. This is plausible, though both Chaffee and Pastore would have also been cognizant of the base closure details. Certainly the town council of Charlestown was in contact with the General Services Administration as early as April 1973 to acquire the property, and the Rhode Island Senators and Representatives had been informed of the town's interest. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 223, and Jean M. Clarke, Town Clerk and Probate Clerk, Charlestown, RI to GSA Regional Administrator, April 24, 1973, Claudine Schneider Papers, University of Rhode Island, Kingston, RI, and "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no. 1, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

33. Oil prices rose fourfold over the next few months, from \$5.40 a barrel in mid October 1973 to over \$20 a barrel in November before leveling out at \$11.65 a barrel in December. Such volatility was a new variable in the calculations of energy dependent industries. NEES, which had converted several of its coal fired electricity generating plants in the late 1960s was adversely affected. See Daniel Yergin, *The Prize, The Epic Quest for Oil, Money & Power* (New York: Simon & Schuster, 1991), 615-626, and John

with the Charlestown town board in anticipation of the property becoming available, requesting zoning changes to permit the construction of the two nuclear power plants on the land they expected to be able to acquire at the Air Station.³⁴ Simultaneously, NEES negotiated with state and federal officials on methods to acquire ownership of the property before other federal, state or local organizations had a chance to apply for the facility.³⁵ With local, state and federal officials assisting their expansion, NEES looked optimistically towards future construction of the plants. In December of 1973, they announced their plans publically to the citizens of Charlestown, confident that the population would embrace the proposal.³⁶

Claudine Schneider and the Local Reaction

Concurrently, environmentally motivated groups were organizing to resist NEES's plans to build the nuclear power plants in Charlestown. The catalyst for their

T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 223.

34. The changes were allegedly authorized by a secret session of the town council after NEES lawyers had written the desired zoning changes. *The Advocate*, a self published newspaper in Providence, RI, used numerous documents coming from the discovery phase of the Schneider lawsuit against the GSA for this article. See "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no. 1, Claudine Schneider Papers, University of Rhode Island, Kingston, RI, and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 223.

35. See "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no. 1., and "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI, and Rhode Island Committee on Energy v. General Services Administration, 397 F. Supp. 41, (1975).

36. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 223.

actions was a newcomer to the state. Claudine Cmarada was born in Clairton, Pennsylvania in 1947.³⁷ Clairton was the site of the Clairton Coke Works, and Cmarada grew up in one of the most polluted areas in the nation.³⁸ After graduating from Windham College in Vermont with a liberal arts degree in 1969, Cmarada went to Washington, DC to take the Foreign Service exam. While waiting for the exam results, she worked for Concern, Inc., an environmental group focusing on education. She also met Eric Schneider, a prospective employee of the Environmental Protection Agency (EPA), to whom she became engaged. When Schneider accepted a job as a research scientist for the EPA at the University of Rhode Island's Center for Ocean Management Studies, she altered her career plans. In Rhode Island, Claudine Schneider was diagnosed with cancer with only a fifty percent chance of survival. Schneider beat the odds and was galvanized to achieve some important purpose in her life.³⁹

37. United States House of Representatives, "Schneider, Claudine," United States House of Representatives, History, Art & Archives, <http://history.house.gov/People/Detail/21306> (accessed 9 October 2014).

38. Schneider recalls dusting chores in her house to remove the pollution residue as well as dead fish in the nearby streams and neighbors with respiratory disease and cancer. See Claudine Schneider, telephone interview by author, Newport, RI, April 18, 2014, and Matt Stroud, "Cleaning Up One Of America's Most Polluted Cities, A Pittsburgh-Area Steel Town Fights For Clear Skies," *The Verge*, <http://www.theverge.com/2013/10/16/4748776/cleaning-up-one-of-americas-most-polluted-cities> (accessed October 9, 2014).

39. Schneider suspected that the pollution from the industrial activity in her home town might have been the cause of her cancer. See Claudine Schneider, telephone interview by author, Newport, RI, April 18, 2014, Chris Black, "A Striver Keeps on Striving and Wins," *Boston Globe*, December 28, 1980, and United States House of Representatives, "Schneider, Claudine," United States House of Representatives, History, Art & Archives, <http://history.house.gov/People/Detail/21306> (accessed October 9, 2014).

This drive for accomplishment led Schneider to assist the formation of the Rhode Island Committee on Energy (RICE) in 1973. RICE was a coalition of four other smaller environmental groups with a common objective of preventing the nuclear power plants from being constructed.⁴⁰ The RICE members were interested in the possible nuclear power plant construction but were not knowledgeable on how the assembly and operation of the facility might affect the area. Under Schneider's influence, RICE began to investigate these issues, eventually proposing that a lower energy use society would be better for the general health and welfare of the population. The accelerating use of finite energy sources was seen as being unsustainable as well as having a negative effect on the environment. To achieve some balance between human desires for economic growth and protection of the environment, RICE advocated the education of the citizens on the energy challenges of the nation, as well as greater conservation and efficiency in energy consumption. Nuclear power was seen as problematical. The possible misuse of uranium for nuclear weapons, the potential safety issues with the nuclear power plants and the health concerns from nuclear radiation and contamination all suggested that other sources of energy, such as solar or wind power, should be investigated.⁴¹ Schneider was outraged by the undemocratic decisions that the government and utility leaders were making that would affect the environment and possibly the health and safety of the

40. The groups were Ecology Action for Rhode Island, Rhode Islanders for Safe Power, Concerned Citizens of Rhode Island, and the New England Coalition on Nuclear Pollution. See Karen Ellsworth, "Four Groups United in Atom Plant Study," *Providence Journal*, October 19, 1974.

41. Rhode Island Committee on Energy, Policy Statement, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

population. Much like Rachel Carson's critical question of who was empowered to decide to use harmful chemicals without informing the citizens about the other effects of their use, Schneider thought the public should also have a voice in determining their future.⁴²

The initial efforts of RICE to sway public opinion and policy makers were not effective. The town members were not concerned by the safety and health arguments, the community leaders in Charlestown had already been coopted by the utility, the state leaders were struggling to avert an economic catastrophe due to the Navy's withdrawal from the state, and federal leadership was strongly on the side of encouraging additional sources of energy production.⁴³ In Washington, President Nixon, in the throes of the Watergate scandal, penned a policy memo to all federal departments to consider the national effort to achieve energy sufficiency in all endeavors, including the disposition of surplus federal properties.⁴⁴ With this Presidential direction, the General Services Administration (GSA) moved to sell portions of the surplus Naval Air Station to NEES,

42. Chris Black, "A Striver Keeps on Striving and Wins," *Boston Globe*, December 28, 1980.

43. Interviews with residents of Charlestown and adjacent towns indicate some support or at least ambivalence, for the nuclear power plant construction. Many residents were less appreciative on the lack of transparency of local town politics in South County. The concept of protection of the environment appears to have diffused into the consciousness of the people being interviewed. See *Yankee Ingenuity: Can the Government It Forged Survive?* (Wood River Junction, RI: Rhode Island Committee for the Humanities and Charlestown Regional High School, 1976), 13, 37-40, 55-57, 73-75, 88-90, 93-95, 104-105, 112-113, 125-127, 135-136, 165-167, 179-180, 186-187, 197-199, 207, 211, 225-228.

44. See The White House, Memorandum For Heads of Departments and Agencies, April 19, 1974, in "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no. 1, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

coordinating with the Navy and the state of Rhode Island to erect a meteorological tower on the base to collect data for future licensing by the Nuclear Regulatory Commission for the power plants. The Noel Administration in Providence announced that nuclear power was the most inexpensive way to produce electricity for the area, throwing its support to the NEES design.⁴⁵

Opening Moves in Charlestown

As the momentum to build the nuclear power plants grew, other groups that had interests in the Naval Station were quieted or kept at arms distance. The Department of the Interior, which as a federal department should have been informed of the surplus property by the GSA, only learned of the new status of the Charlestown Naval Air Station when informed by a Charlestown resident.⁴⁶ In May 1974 the Fish and Wildlife Service of the Department of the Interior put in a request for 367 acres of the over 3,000 available for a migratory bird refuge. The town of Charlestown desired to use portions of the area for recreation and mixed use, Providence College was interested in the area for ecological research, and the Narragansett Indian Tribe requested their own parcel for education and recreation purposes.⁴⁷ This caused some consternation in the state offices which were

45. See "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no. 1, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

46. *Ibid.*, 5.

47. The Department of the Interior's official request for the property was delayed by their unintentional discovery of the surplus property, this despite the fact that the GSA and Department of the Interior shared the same building in Boston. See "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no. 1., and "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI, and Rhode Island Committee on Energy v. General Services Administration

concerned with smoothing the path for NEES and was unwilling to countenance the concerns of other groups. The state continued to coordinate its efforts with GSA and NEES to prevent the Department of the Interior or the town of Charlestown from becoming the predominant force in the redistribution of the Naval Station assets.⁴⁸

Thus far NEES's actions had followed the time tested doctrine of grow and build with a strong assist from the local government officials to bypass some of the confining legal restraints. While the proposed nuclear power plants at Charlestown were very expensive, the promise of lower future operating costs and enhanced system reliability enticed the company management to promote the project.⁴⁹ NEES's subsequent actions advocating this project make it appear as an organization that lacked the ability to comprehend the dynamic environment in which they were operating. While there were compelling technical and economic reasons to build these plants, the challenge of creating a new technological edifice seems to have captured the engineers and planners running the organization. The rationale behind building more reliable and less expensive electric power generation sources to meet increasing electric power demand was trumped by the indulgence of a technological desire that could only be satiated by the construction of the nuclear power plants. The town government was too small to do much more than

48. See "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no. 1., and "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI, and *Rhode Island Committee on Energy v. General Services Administration*, 397 F. Supp. 41 (1975).

49. The proposed plants at Charlestown were estimated to cost NEES \$1.9 billion, then almost the net worth of all other components of the grid under their control. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 223.

acquiesce to the demands placed upon them by the state government and the utility, particularly when the prospect of higher tax revenues from the power plants beckoned. The state government was concerned with the current economic crisis and accustomed to allowing the utility companies to have their way. The federal government, dealing with the international energy crisis, wanted to increase energy production as well as take advantage of the costs incurred from nuclear research during the Cold War. Local businesses, manufacturers and labor unions all looked toward the construction of the plants as a means to replace the lost revenues from the Navy bases. To alter such a juggernaut of institutional and technological vested interests would have been more than these organizations were perhaps cognitively capable of considering.⁵⁰

Both NEES and the Rhode Island state government attempted to accelerate the construction of nuclear power plants at Charlestown by initially prevaricating regarding their intentions, even as NEES was negotiating with the state and the GSA to purchase the surplus property. On 8 March 1974, the GSA informed Ecology Action for Rhode Island that an Environmental Impact Statement would be required if the land was transferred to non-federal agency and promised to hold public hearings for outside

50. Hughes' writing suggests that this is not merely a Rhode Island characteristic but a national characteristic. See Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Penguin Books, 1989), 459-460.

organizations to state their concerns. Other inquiries were met with responses that suggested that no decisions had been made regarding the disposition of the property.⁵¹

In August 1974, representatives from the GSA, Department of the Interior, Federal Energy Administration and the Atomic Energy Commission met to discuss the disposition of the surplus property. The consensus from the meeting was that an Environmental Impact Statement would not be required to sell the property to NEES. The Department of the Interior's objections were overruled, and its requests for the land rejected. In October, the state met with Charlestown officials and pressured them to accept the impending sale to NEES, with the promise that the town might receive fifty acres for their own use. Other environmental and historical concerns for the significance of the property were brushed aside in the rush to grant NEES title to the property to build the nuclear power plants.⁵² Pushing hard to finalize a deal for the land, the state, NEES and the GSA eventually came to an understanding that NEES would put a deposit of \$330,000 for the surplus property, though the town of Charlestown might receive 150 acres from NEES's largesse. On October 25, 1974, NEES mailed its deposit to the GSA, thanking the Noel administration for their help in sealing the agreement.⁵³

51. See "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no. 1., and "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

52. See "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no. 1., and "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI, and *Rhode Island Committee on Energy v. General Services Administration*, 397 F. Supp. 41 (1975).

53. Such alacrity may have been to complete the agreement prior to Congress coming back into session. See "Memo to GSA: Don't Write Any!!," *The Advocate* 2, no.

Environmental Groups Respond

Such actions were not fast enough. By November less appreciative members of Congress had been apprised of the agreement and acted to stop the transaction, citing a lack of legal authority for the GSA to make such a sale to a private company.

Representative Jack Brook (D-Texas), chairman of the House Government Activities subcommittee, proclaimed that the GSA had exceeded the President's intent by promoting the sale of the land in Charlestown to NEES.⁵⁴

More importantly, the local Rhode Island environmental groups had also used this time to gain strength through organization and education, though compared to the government and electric company assets their resources were almost insignificant. A small number of new groups had been created which opposed the construction of the nuclear power plants in Charlestown. The members had diverse backgrounds, including Claudine Schneider with a liberal arts background, though many supporters had advanced scientific or legal degrees.⁵⁵ The membership of these groups had studied the details of

1., and "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

54. "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

55. For example, Samuel Seely of the Concerned Citizens of Rhode Island was an electrical engineering professor at the University of Rhode Island with a PhD in physics; Barbara Heavers had a PhD in Biological Sciences; Jeanette Bliven was a graduate of Bradford Junior College in Haverhill, MA. See Stan DeCoster, "Battling a Power Plant," *New London Day*, June 21, 1980, Rhode Island Obituary and Death Notice Archive, "Jeanette Bliven," Rhode Island Obituary and Death Notice Archive, http://www.genlookups.com/ri/webbbs_config.pl/noframes/read/7, (accessed October 14, 2014), and Charlestown Citizens Alliance, "Barbara A. Heavers - Planning Commission," Charlestown Citizens Alliance,

the construction, operation and maintenance of nuclear power plants, and had interacted with other anti-nuclear activists and organizations in the New England region. They had come to the realization that the utility and local, state and federal governments were acting in concert with little concern for environmental matters compared to the pressing issues of energy reliability and economic development. Stymied by numerous rebuffs and perceived actions by governmental fiat with little to no popular consent, Claudine Schneider looked for a law firm to help RICE oppose these activities. This proved impossible as the local law firms all had ties to the Rhode Island government that they were unwilling to strain. In the fall of 1974, Claudine Schneider attended the “Critical Mass ‘74” meeting in Boston, a conference led by Ralph Nader. There she met Myron Cherry, a lawyer from Chicago with a background in anti-nuclear litigation, who was willing to take up RICE’s legal action against the proposed sale of the surplus Naval Air Station to NEES.⁵⁶

On 4 December 1974, Claudine and Eric Schneider, acting for RICE and in affiliation with several other environmental groups, filed suit in federal court in Providence, RI to stop the sale of the land to NEES.⁵⁷ The suit alleged that the GSA had

<http://charlestowncitizens.org/2014/06/25/barbara-a-heavers/> (accessed October 14, 2014).

56. Schneider stated she was looking for a lawyer who “eats glass for breakfast and nails for lunch.” See Claudine Schneider, telephone interview by author, Newport, RI, April 18, 2014, and W. Edward Wood, “Anti-Nuclear Group Hires Top Lawyer,” *Providence Journal*, November 21, 1974.

57. The other groups were Rhode Islanders for Safe Power, American Littoral Society, New England Coalition on Nuclear Pollution, and Ecology Action for Rhode Island. See *Rhode Island Committee on Energy v. General Services Administration*, 397 F. Supp. 41 (1975).

collaborated with NEES subsidiary companies New England Power Company and Narragansett Electric to “circumvent the mandates” of the National Environmental Act of 1969. The Schneiders claimed that NEES had failed to conduct an environmental impact statement prior to sale of the property and had violated the Federal Property and Administrative Services Act of 1949 by not allowing other federal agencies access to the surplus Naval Station.⁵⁸ Judge Raymond J. Pettine heard further testimony on the case on the 11th of December, after which he issued a temporary court order staying the sale until such time as he could offer a decision.⁵⁹

With this lawsuit, the legal struggle against the construction of the Charlestown nuclear power plants began. On one side were the assembled forces of the federal, state and local governments and the utility company with extensive monetary resources and a cadre of highly trained lawyers. On the other side was a very small band of highly motivated, environmentally minded citizens but with very few resources and limited

58. The New England Power Company was the NEES subsidiary that would be in charge of constructing the nuclear plants. Narragansett Electric was the retail distributor of electric power in Rhode Island. Since both companies were wholly owned subsidiaries of the New England Electric System, the nomenclature of NEES is used to represent the activities of all of the corporation’s activities. See *Rhode Island Committee on Energy v. General Services Administration*, 397 F. Supp. 41 (1975).

59. Most of the evidence submitted came from Schneider’s acquisition of records from the GSA obtained previously under the Freedom of Information Act. See Hamilton F. Allen, “Pettine Delays Ruling on A-Site Sale Block,” *Providence Journal*, 12 December 1974, and *Rhode Island Committee on Energy v. General Services Administration*, 397 F. Supp. 41 (1975).

expertise in negotiating the legal systems supporting the electric power grid. To NEES, RICE and its affiliates appeared as minor irritants that could be easily brushed aside.⁶⁰

Judge Pettine's initial decision on the RICE lawsuit prevented an early acquisition of the Charlestown Naval Air Station land by NEES. RICE used the proffered time to generate the money, organizational contacts, grass roots interest, and political support necessary to resist the seemingly irresistible momentum of technological progress. This the leadership of RICE accomplished over an approximately four year period in a manner reminiscent of any classic insurgency aimed at subverting the power of the ruling class. The efforts were not always successful, but over time they increased the cost of NEES's actions until the utility was willing to submit to the environmental group's demands.

Schneider worked hard to educate other groups of interested citizens regarding the possible dangers of radioactive contamination from the proposed power plant. Another group, the Concerned Citizens of Rhode Island (CCRI), with a comparable outlook as RICE, was created by similarly minded residents of southern Rhode Island to oppose the nuclear power plants. Like RICE, CCRI had a small cadre of committed leaders and would eventually claim four thousand members supporting their efforts.⁶¹ The Conservation Law Foundation, with a central location in Boston, would also expand into the adjacent New England states, forming a Rhode Island branch to examine compliance with environmental rules and legislation. Focused on acting as a "public overseer for

60. Claudine Schneider, telephone interview by author, Newport, RI, April 18, 2014.

61. Some claimed that CCRI consisted of only 25 individuals who performed most of the actions. See Stan Decoster, "Battling a Power Plant," *New London Day*, June 21, 1980.

environmental and land use controversies,” the Conservation Law Foundation would provide important legal assistance to RICE in the conflict.⁶² Its Rhode Island chapter followed the original intent of the Boston branch. The membership was comprised of accomplished members of local universities and experienced lawyers. The chairman of the Rhode Island branch was Dr. Harold Ward, a Brown University professor of chemistry who also had a law degree.⁶³ In addition, the Audubon Society of Rhode Island (ASRI) would eventually work to oppose the construction of the plants. Alfred Hawkes’ leadership of ASRI would influence the membership of the Environment Council of Rhode Island (ECRI), which had recently displaced the Rhode Island Wildlife Federation as the state’s representative to the National Wildlife Federation.⁶⁴

62. See “Bylaws of the Conservation Law Foundation of Rhode Island, Inc.,” and Conservation Law Foundation of Rhode Island advertisement, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

63. Ward added technical competence to the organization. Alfred Hawkes was also a member, as would be Sister Ann Nelson, chairman of the History Department at Salve Regina College. Claudine Schneider, with a bachelor’s degree from Rosemont & Windham College was the least credentialed of the board members. A future member was Sister Arlene Violet, a Salve Regina graduate fresh out of law school. Noticeably absent are any members with an electrical engineering degree or experience with the electric power grid. See Sister Arlene Violet, telephone interview by author, Newport, RI, July 17, 2013, “Board Members of the Conservation law Foundation of Rhode Island,” and “Vitas,” Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

64. See Audubon Society of Rhode Island Press Release of May 30, 1975, Audubon Society of Rhode Island Archives, Smithfield, RI, Rhode Island Committee on Energy Working Directory, December 14, 1974, Claudine Schneider Papers, University of Rhode Island, Kingston, RI, and Guy N. Lefebvre and Rick Laferriere, “History,” Environment Council of Rhode Island, <http://environmentcouncilri.org/content/history> (accessed July 6, 2014).

All of the groups were involved in some method of educating the public on the potential safety issues of nuclear power plant construction and operation. CCRI organized petitions to send to Governor Noel opposing the plants.⁶⁵ The Schneiders gave talks at different public gatherings to generate a higher level of knowledge among the state's residents as well as opposition to NEES. The Audubon Society publically opposed the construction in its pronouncements, echoing the concerns of the other groups that the environmental degradation caused by the plants would not be justified.⁶⁶

Claudine Schneider seems to be the common denominator in many of these groups. She was a charter member of RICE and the Conservation Law Foundation of Rhode Island, and acted as the executive director at various times in all of these groups.⁶⁷ A highly energetic and organized member of the leadership element of these organizations, Schneider was tireless in guiding and coordinating activities that would enhance the effectiveness of the opposition to NEES. One of the problems that the environmental groups faced during the early years of opposition was funding. Many of the RICE and CCRI members were technically or scientifically educated, but few were lawyers. Myron Cherry, the lawyer hired by Schneider to advocate against the sale of the surplus Charlestown lands to NEES, was not inexpensive. Cherry often corresponded with Schneider to obtain reimbursement for his work, pay which was often in arrears.

65. Chairman of CCRI Fundraising to Concerned Citizens, January 1975, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

66. Audubon Society of Rhode Island Position Paper on Nuclear Powered Electric Generating Facilities, May 14, 1975, Audubon Society of Rhode Island Archives, Smithfield, RI.

67. Stan Decoster, "Battling a Power Plant," *New London Day*, June 21, 1980.

Schneider coordinated fund raising activities as well as investigated available grants from private foundations to keep the organization solvent. CCRI ran tag sales in a large tent off of Route 1 in Charlestown as well as flower and bake sales to help raise the money to fund Cherry and other activities.⁶⁸

Cherry proved to be worth his salary. In July of 1975 Judge Pettine ruled against the GSA in RICE's suit against them. While dismissing the Schneider's standing to prevent the sale of the surplus land to NEES under the Federal Property and Administrative Services Act, Pettine did hold that the GSA was required to submit an Environmental Impact Statement meeting the requirements of the National Environmental Protection Act prior to conducting any sale of the property to a non-federal agency. The legal proceedings had uncovered the fact that the GSA had never attempted to determine if other federal agencies or state or local polities were appropriate recipients of the surplus Naval Air Station. The GSA had accepted NEES's data submissions without ever conducting an independent analysis of whether the property was even suitable for a nuclear power facility. GSA assertions that an Environmental Impact Statement would be filed in the future were not accepted by the judge. Pettine was not impressed with the

utter disregard of environmental concerns by GSA despite its knowledge that the prospect of a nuclear power plant was unquestionably of environmental significance and wholly apart from the equally significant fact that a number of

68. See Cherry correspondence to Claudine Schneider, Claudine Schneider Papers, University of Rhode Island, Kingston, RI, and Stan Decoster, "Battling a Power Plant," *New London Day*, June 21, 1980.

radically different uses for the NALF had been proposed by serious contenders for the property.⁶⁹

The urgency of the energy crisis was not sufficient to circumvent the law and the GSA was enjoined from taking any further action to sell the property until a satisfactory Environmental Impact Statement had been accomplished.⁷⁰

Despite the positive results of these findings, RICE appealed the results, requesting that the GSA conduct an Environmental Impact Statement prior to any transfer of any of the surplus property to any agency, not just the non-federal ones. As the litigants battled it out in court, NEES attempted to rally the government and economic agencies that had been important allies in the past. Rhode Island Governor Philip Noel attempted to gain popular support for the nuclear power plants as well as pressure the GSA that the state supported its transfer to the electric utility.⁷¹ No fan of the environmental groups upsetting the sale of the land to NEES, Noel was more concerned with creating jobs and economic opportunities than worried about possible pollution or environmental degradation from the nuclear power plants. Noel consciously excluded the environmental groups from state plans for economic development. “The environmentalists were left out not by accident, but by design,” Noel declared.⁷² The

69. Rhode Island Committee on Energy v. General Services Administration, 397 F. Supp. 41 (1975).

70. Ibid.

71. Governor Phillip W. Noel to Albert A. Gammal, Jr., Regional Director, General Services Administration, November 24, 1976, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

72. “Noel Scores Environmentalist Spokesman,” *Providence Journal*, May 1, 1974.

state's bureaucracy acted to assist the utility in gaining the property so that the nuclear power plants could be built.⁷³

Anticipating some of the subsequent fervor over conducting a study on the environmental impact of nuclear plant construction, the Noel administration had contracted the Coastal Resources Center at the University of Rhode Island (URI) to perform one. The subsequent work was conducted over a three month period in the summer of 1974 by an interdisciplinary group of senior members of the URI faculty and graduate students from engineering, biology and ecology, physical oceanography, resource economics and wildlife management.⁷⁴ While limited in the time allowed to study and prepare the report, the group did provide an overall opinion on the challenges of construction and operation of the nuclear power plants at Charlestown, including economic, social and biological effects. The report also examined the requirements of the additional electrical distribution network that would be required to bring the electric power from Charlestown to the rest of the state and tie in to the other portions of the electric power grid in the state. The report provided an overall positive assessment of the nuclear plants, concluding that:

73. The Public Utility Commission was bypassed in this issue and failed to attempt any informal resolution with the parties as it had in past decades. The state's economic development agencies were equally complicit or at least acquiescent.

74. The report is full of charts and figures, but did not attempt to place a value on the possible damage that the plant would cause the local flora and fauna in the littoral pond where the plant would discharge its cooling water or the limits of possible damage from radioactive discharges from the plant. See The Coastal Resources Center, *An Environmental Study of a Nuclear Power Plant at Charlestown, Rhode Island*, Marine Technical Report 33, (Narragansett, RI: University of Rhode Island, 1974), Forward.

Within the scope of this study, it has been found that the proposed large scale development can be constructed and operated without causing serious ecologic damage to the Charlestown pond complex and offshore waters provided that the planning and engineering options discussed in this text are instituted by the power company.⁷⁵

Unsurprisingly, none of the litigants would find this document convincing.

Noel sent a letter to Claudine Schneider in her role as the executive director of the Conservation Law Foundation of Rhode Island, imploring her organization to recognize the potential economic gain that the nuclear power plants would provide the state in the midst of the economic stresses. “I am deeply concerned that you and the members of your organization are captives of a misguided zeal for the upholding of selected federal statutes,” Noel wrote.⁷⁶ In reality, the groups were more concerned about the environmental impact of the plants than the most recent federal statutes, but such concerns were incomprehensible to the political elite of the state.

NEES conducted its own efforts to win popular support, passing out information that the legal wrangling with the environmental groups had delayed construction of the plants and hence any economic gain in the state.⁷⁷ The company piloted its own campaign to educate the community on the benefits of nuclear power, buying commercials on the local television stations and advertisements in the newspapers. This

75. The Coastal Resources Center, *An Environmental Study of a Nuclear Power Plant at Charlestown, Rhode Island*, Marine Technical Report 33, (Narragansett, RI: University of Rhode Island, 1974), 4.

76. Governor Phillip W. Noel to Mrs. Claudine Schneider, January 14, 1976, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

77. W. Edward Wood, “Utility Blames Court for A-Plant Study Delay,” *Providence Journal*, March 19, 1975.

action generated a complaint from RICE to the state Public Utilities Commission that the costs of advocating for the nuclear plants should not be passed on to the consumer. The subsequent inquiry from the Public Utilities Commission was neatly deflected by NEES, though the commercials ended shortly thereafter.⁷⁸ NEES was also willing to use “high pressure tactics” and a liberal bank account to convince town governments and property owners to give in to the utility’s demands and sell their property for access to run the transmission lines to connect the future nuclear plants to the rest of the electric power grid.⁷⁹ The GSA’s return of the initial 330,000 dollars deposit on the land to NEES failed to generate much support for the proposal even as the Notice of Excess Property in Charlestown was reissued.⁸⁰

The Legal Front

What these actions could not do is protect the utility’s critical vulnerability in the courts that RICE had exposed in their suit against the GSA. By using the normal operating procedures of coopting local and state politicians and governments to acquire favorable business opportunities in exchange for economic development that provided jobs for constituents, NEES and the Rhode Island government had bypassed the new

78. See Ralph Weymouth, Chairman of the Steering Committee, Rhode Island Committee on Energy, to Archie Smith, Rhode Island Public Utilities Commission, February 7, 1975, and Edward E. Mulligan, President, Narragansett Electric Company, to William W. Harsh, Chairman, Public Utilities Commission, October 20, 1975, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

79. See G. Eugene Emery, Jr., “Towns Claim Power Co. is String Them Along,” *Providence Journal*, July 16, 1975, and “W. G. Hicks vs. the Power Co.,” *Pawtuxet Valley Daily Times*, October 21, 1975.

80. “An Outline of the History of the Charlestown Land Controversy,” November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

federal legal requirements of the National Environmental Policy Act of 1969. Motivated by environmental concerns and comprised of highly energized members, RICE could effectively challenge the power of the federal and state governments and the utility company in a manner that these groups were less experienced at meeting. Admittedly, the implications of the National Environmental Policy Act of 1969 were poorly understood in the early 1970s, but the governments and utility were relatively ineffectual in predicting these ramifications compared to RICE.

Meanwhile RICE was acquiring new allies in the citizens of the state from its publicity and education outreach programs.⁸¹ RICE continued to question and badger Charlestown town council members on their previous decisions to allow the construction on the nuclear power plants. A succession of voter referendums indicated dwindling support for the project in the town, and council members that had championed the construction were gradually replaced in local elections by opponents of the plants.⁸²

Contacts with local political groups and governments were important as the struggle against the construction of the nuclear power plants now diverged into two different tracks. The first involved the legal suit by RICE against the GSA on whether

81. Not all interactions were positive ones. One Charlestown resident complained that CCRI's presentations were less than "fair and unbiased" and that the organization might change its name to "Citizens Against the Nuclear Power Plant" in order to spread "fear." See Peter W. Arnold to Robert Bettinger, Chairman, "Concerned Citizens," January 21, 1974, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

82. See Associated Press, "R.I. Town Votes Against Building Nuclear Plant," Boston Globe, February 1, 1976, Karen Ellsworth, "Outlook Bleak for A-Plant, Election Results Indicate," *Providence Journal*, November 7, 1974, and "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

GSA had the authority to sell the surplus property to NEES even with the accomplishment of an Environmental Impact Study. With the updated Notice of Excess Property by the GSA, additional federal, state and local organizations all indicated that they were interested in various portions of the surplus Naval Air Station. Eighteen organizations, including the Department of the Interior, Environmental Protection Agency, State of Rhode Island (essentially holding the land for future sale to NEES), the town of Charlestown, the Narragansett Indian tribe, RICE, and others submitted proposals that would eventually require GSA adjudication. Most of the proposals had significant portions of the surplus Naval Station parceled off for wildlife preservation, while other lots were envisioned for mixed commercial and residential areas, recreation facilities or senior citizen centers. Only the Rhode Island government proposal envisioned the construction of the nuclear power plants.⁸³

As a federal agency, the Department of the Interior's request for a portion of the surplus property to use as a wildlife refuge should have received priority. The Department of the Interior's Fish and Wildlife Service failed to press its claims as it desired to first see the results of the anticipated Environmental Impact Statement, after which it would be better able to assess the compatibility of the nuclear power plants with the wildlife refuge. The GSA denied that the Department of the Interior's claims were valid, but the latter refused to join RICE's suit against the GSA citing a desire to maintain

83. "Choices Offered," *Providence Journal*, May 7, 1978.

solidarity of federal executive branch organizations.⁸⁴ In April 1976 Judge Pettine kicked the suit back to these agencies for further information before he would make any additional decisions on the validity of RICE's protests against the GSA sale to NEES. Pettine stated that he would not order the federal government to perform an Environmental Impact Statement as it might not even be required if the Fish and Wildlife Service's claims were given priority.⁸⁵ Several months later Pettine would offer that the Federal Property and Administrative Services Act (FPAS) did allow some flexibility in who the GSA determined would receive the property, but that the Environmental Impact Statement was "an appropriate pre-decision step which was consistent with the FPAS."⁸⁶ In view of the GSA's proclamation that it would produce a study, the court refused to place a permanent injunction on the sale.⁸⁷

RICE again appealed this decision. Cherry took the case to the U.S. Court of Appeals where finally on August 16, 1977, close to three years from the start of the legal procedures, Judge Levin H. Campbell placed the matter to rest. Campbell upheld the lower court's decision that the GSA did have the ability to sell the land to NEES, but it

84. Judge Pettine found the Department of the Interior's position "consistent though not necessarily logical." See *Rhode Island Committee on Energy v. General Services Administration*, 411 F. Supp. 323 (1976).

85. Judge Pettine did not seem impressed with the ability of the federal agencies to maintain "interdepartmental unity." This request for additional information would again shift the final decision on any sale to NEES that much farther in the future, further tying up resources that NEES could not apply to other projects. See *R. I. Committee on Energy v. Gen. Services Admin.* Civ. 411 F. Supp. 323 (1976).

86. *Rhode Island Committee on Energy v. General Services Administration*, 561 F.2d 397 (1977).

87. *Ibid.*

could not sell it without an Environmental Impact Statement. Other anomalies between the GSA and Department of the Interior were interesting, but not germane to the final decision.⁸⁸ The GSA subsequently hired a Boston firm, Harbridge House, to conduct the study.⁸⁹

While this legal challenge was being resolved, the licensing process by NEES with the federal Nuclear Regulatory Agency (NRC) for construction and operation of the plants was just beginning. As part of the long sequence of construction permits, NEES was required to submit a licensing request to the NRC for the nuclear power plants. NEES submitted the initial request to the NRC on 30 July 1975.⁹⁰ Interested parties were invited by the NRC to comment on the utility company's proposal.⁹¹ The grass roots work that Schneider and RICE had accomplished in the previous years paid off as she was able to assemble a coalition of concerned and energetic organizations, both local government and citizen groups, which were interested in being part of the process.

88. Campbell chided Pettine for getting involved in the Executive Branch's internal squabbles on who should receive priority for the excess property. See *Rhode Island Committee on Energy v. General Services Administration*, 561 F.2d 397 (1977).

89. This was done on August 3, 1977 apparently in anticipation of the decision. Apparently the previous URI study was not considered adequate. See "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

90. RICE later sued to prevent this action from even being conducted, only to be informed by the NRC that such requests were common place, whether the utility would eventually own the land or not. See "An Outline of the History of the Charlestown Land Controversy," November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

91. "New England Power Company, et.al. Hearing on Application for Construction Permits," *Federal Register* 41, no. 198 (12 October 1976): 44762.

Eric and Claudine Schneider's request to participate in the licensing process was perhaps the most illustrative of the numerous groups' rationale for opposing the utility's plans. Their request disputed the electric utility's calculations and assumptions on a wide range of issues. The utility was assailed on its calculations of human population density in the area, on the impact on the biological, physical and recreational aspects of the beaches from plant construction, and the social and economic effects of plant operation on the area. The Schneiders were critical of NEES's assessments of plants' cost, future requirements for electric power in the region, and the effects of transmission line construction and high voltage line operation on humans in the area.⁹²

The Schneiders were particularly concerned with the effects of low level radiation and radioactive contamination emanating from the plants. Combined with the concern over where the expended uranium fuel would be stored, the request suggested great unease with the utility's ability to manage radioactive waste without affecting the health of the nearby population. The request demanded additional analysis by NEES to compare and contrast increases in the rate of cancer and birth defects on the populations adjacent to other nuclear facilities.⁹³

Other biological effects were disputed. The effluent water temperature from the power plants' cooling water was questioned for its effect on plankton species. The use of biocides to inhibit condenser fouling was protested for its unknown effects on local

92. Eric and Claudine Schneider, *Petition for Leave to Intervene*, U.S. Nuclear Regulatory Commission, Docket No. STN 50-568, STN 50-569, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

93. *Ibid.*

wildlife. The possible requirement to build large cooling towers if the EPA would not allow the use of the tidal pond areas as a heat sink was faulted. Perhaps most galling to NEES was the questioning of the overall economic rationale of the plants. The Schneiders rebuffed the necessity for the facilities, the utility's failure to consider alternative power sources such as solar or wind power, and the costs that Rhode Island consumers would have to pay to construct the plants.⁹⁴

These statements were reminiscent of Rachel Carson's work protesting the use of pesticides. In the case of the Charlestown nuclear power plants, the long lasting agents were radioactive isotopes from the fission of uranium or from the radioactive waste generated at the sites that might be released into the environment. The Schneiders critically questioned the models that the NRC used to calculate the biological effects of such radioactivity on the environment, suggesting that their models underestimated the possible biological damage.⁹⁵ Given the history of various government and scientific agencies misjudging the effects of numerous chemical agents on the environment, such concerns seemed reasonable. The Rhode Island government had consistently allayed any fears of the use of DDT during the 1930s and 1940s; protestations that possible minor radioactive discharges would not be harmful to the public were not convincing.⁹⁶ Finally, the perception that the government and the utility were willing to risk the health of the

94. Ibid.

95. Ibid.

96. *Thirteenth Annual Report of the Department of Agriculture and Conservation, January 1st, 1947 to December 31st, 1947* (1948): 36.

population, both human and other species, without allowing any of the possible victims to have a say in the decision, offended the democratic sensibilities of the Schneiders.⁹⁷

Written submissions by local organizations to be included in the NRC licensing process paralleled the Schneider rationale. The Conservation Law Foundation of Rhode Island requested to participate based on health concerns for the local population, the environmental effects of plants' construction and operation on the marine organisms, particularly the larvae of lobsters and fish, the concerns on radioactive wastes and the economic rationale of the plants.⁹⁸ Such concerns echoed Barry Commoner's laws of ecology that everything had to go somewhere, in this case the "somewhere" being the Charlestown tidal pond.⁹⁹ Local towns wanted to participate based on concerns that the plants "may pose threats to the health safety and property" of the residents.¹⁰⁰ The

97. Claudine Schneider, telephone interview by author, Newport, RI, April 18, 2014.

98. The NRC rejected the Conservation Law Foundation of Rhode Island's first request as the paperwork had not been completed properly. See Conservation Law Foundation of Rhode Island, Petition for Leave to Intervene, U.S. Nuclear Regulatory Commission, Docket No. STN 50-568, STN 50-569, and United States Nuclear Regulatory Commission Applicants' Answer to the Petition to Intervene of the Conservation Law Foundation of Rhode Island, November 18, 1976, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

99. Another member of the Conservation Law Foundation, Arlene Violet, proposed that the actions against the utility to protect the environment were in concert with her Catholic religious order, the Sisters of Mercy, assisting the unmet needs of the population. See Sister Arlene Violet, telephone interview by author, Newport, RI, July 17, 2013, Arlene Violet, *Convictions* (New York: Random house, 1988), 79-84, and Barry Commoner, *The Closing Circle, Nature Man, and Technology* (New York: Alfred A. Knopf, 1971), 33-45.

100. Petition for the Town of Hopkinton, Rhode Island for Leave to Intervene, U.S. Nuclear Regulatory Commission, Docket No. STN 50-568, STN 50-569, November 9, 1976, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

“common ecosphere” of the south coast of the state and the town itself were liable to be adversely affected in the advent of a “minor nuclear accident (if there exists such a thing).”¹⁰¹ The town of West Greenwich requested to intervene in the process based on concerns that NEES was not being transparent in their plans for the construction of the connecting power lines through their community to the Charlestown power plants.¹⁰² Other submissions read as if they were liberally copied from the Schneiders’ request. The South Kingstown request echoed West Greenwich’s concerns of the power line construction but also included questions on the environmental impact of the plants.¹⁰³ Other groups such as the Physicians Concerned About Nuclear Power, CCRI, and the Point Judith Fisherman’s Cooperative also joined the process, all interested in various issues regarding the nuclear power plant construction.¹⁰⁴

101. Ibid.

102. Petition for the Town of West Greenwich, Rhode Island for Leave to Intervene, U.S. Nuclear Regulatory Commission, Docket No. STN 50-568, STN 50-569, November 8, 1976, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

103. Despite its proximity, the town of North Kingstown, Rhode Island was not a participant for intervention. See Petition for the Town of South Kingstown, Rhode Island for Leave to Intervene, U.S. Nuclear Regulatory Commission, Docket No. STN 50-568, STN 50-569, November 9, 1976, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

104. See Statement of Intention to Intervene Before the Nuclear Regulatory Commission of the United States of America, Physicians Concerned About Nuclear Power, November 15, 1976, and Motion to Amend the Petition to Intervene of the Concerned Citizens of Rhode Island and Point Judith Fisherman’s Cooperative, Docket No. STN 50-568, STN 50-569, February 25, 1977, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

Not all participants were opposed to the construction of the plants. The state of Rhode Island requested to participate, as did local construction unions that believed “an adequate and reliable supply of electricity is essential to the continued well-being of the residential, educational, governmental, business, and industrial communities of Rhode Island.”¹⁰⁵ Other groups interested in the economic opportunity the nuclear power plants might provide, such as the New England Council on Economic Development, or lowering their local taxes, such as the Taxpayers and Voters of Charlestown, all desired to be a part of the process.¹⁰⁶

With so many petitioners and additional environmental groups desirous of joining the opposition to the nuclear power plants’ construction, the Nuclear Regulatory Commission desired to combine many of the groups into similar concerns for ease of response.¹⁰⁷ With seven municipalities and eleven local private groups, seven of which

105. The state government’s request resulted in the state’s Atomic Energy Commission to withdraw its own request to intervene. See United States of America, Nuclear Regulatory Commission, Order Granting Petitions for Leave to Intervene, January 7, 1977, and Petition for Leave to Intervene, United Assn. of Plumbers, Pipefitters & Apprentices of America and Canada, LU 476, Docket No. STN 50-568, STN 50-569, November 16, 1976, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

106. See Motion to Amend the Petition for Leave to Intervene on Behalf of the New England Council, Docket No. STN 50-568, STN 50-569, February 22, 1977, and Taxpayers and Voters of Charlestown to Secretary of the Commission, U.S. Nuclear Regulatory Commission, November 16, 1976, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

107. For example, the NRC considered the construction questions from CCRI, the Conservation Law Foundation of Rhode Island and Save the Bay, Inc. sufficiently similar to consolidate for a common response. See United States Nuclear Regulatory Commission before the Atomic Safety and Licensing Board, In the Matter of New England Power Company, et. al. (NEP Units 1 and 2), Docket Nos. STN 50-568, STN

were motivated in some manner by environmental concerns, this appeared the most efficient and effective manner to resolve the claims.¹⁰⁸ This was not in the interest of the opposition petitioners who contested such actions as a manner to accelerate the licensing process. CCRI opposed the consolidation, suggesting that over time, normal attrition in the licensing process would limit the petitioners. Early consolidation would merely negate the information gained during the discovery process of the licensing process. The numerous groups had different objectives, and forcing premature consolidation would interfere with the relationship between the various petitioners and their counsel.¹⁰⁹ More importantly any time lost by the utility in processing the requisite license was beneficial to the opposition.¹¹⁰

50-569, Order Directing Consolidation of Intervenors, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

108. The towns of Charlestown, Exeter, Hopkinton, Richmond, South Kingstown, Westerly, and West Greenwich were recognized petitioners, while the environmental groups consisted of Aquidneck Island Ecology, Rhode Islanders for Safe Power, Eric and Claudine Schneider (RICE), CCRI, Physicians Concerned About Nuclear Power, Save the Bay, Conservation Law Foundation, and the Trustees of the Thomas Lyman Arnold Trust. See “Contention Intervenors,” Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

109. The divergent issues and objectives of the petitioners were not easily reduced to simple groupings. Schneider created her own synchronization matrix to keep the competing issues straight. See “Contention Intervenors” and United States Nuclear Regulatory Commission before the Atomic Safety and Licensing Board, In the Matter of New England Power Company, et. al. (NEP Units 1 and 2), Docket Nos. STN 50-568, STN 50-569, Opposition of CCRI et. al. to Motion of LAMP et. al. for Consolidation, December 6, 1977, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

110. While environmental concerns were certainly a motivating factor to the groups opposing the construction, the activism of the late 1960s civil rights movement had also diffused into the anti-nuclear power movement, permitting the words of community organizer and activist Saul Alinsky to influence the tactics of the opposition. See Sister Arlene Violet, telephone interview by author, Newport, RI, July 17, 2013.

NEES was not dormant during this period. The company bought several hundred acres of land near the Charlestown-Westerly border that might serve as an alternate location for its nuclear power plant construction if the Naval Air Station surplus property purchase was thwarted. NEES officials kept such purchases concealed, later protesting that the acquisitions were “insurance” as a “backup site.”¹¹¹ CCRI seized upon this to request the NRC to suspend their licensing work for the Charlestown site until such time as the actual construction site could be accurately identified. The NRC refused this request, but it was one more legal issue that had to be handled in order to continue the licensing process.¹¹² NEES continued to insist that it was still interested in the Charlestown site, stating that it would be an excellent location from which to provide electric power to the rest of the state.¹¹³

Nuclear Catastrophe and NEES Culmination

Every action to resolve the legal issues took time, and time was running out for NEES’s nuclear plans. In April 1978 the draft Environmental Impact Statement for the

111. John Kiffney and Norman J. Warner, “N.E. Power Obtains Alternate Site for N-plant in Westerly,” *Providence Journal*, October 18, 1977.

112. See United States Nuclear Regulatory Commission before the Atomic Safety and Licensing Board, In the Matter of New England Power Company, et. al. (NEP Units 1 and 2), Docket Nos. STN 50-568, STN 50-569, Memorandum of Lamp, et al., in Opposition of CCRI Motion to Suspend Proceedings, and United States Nuclear Regulatory Commission before the Atomic Safety and Licensing Board, In the Matter of New England Power Company, et. al. (NEP Units 1 and 2), Docket Nos. STN 50-568, STN 50-569, Motion for Relief to Postpone All Hearings on NEP, Units 1 and 2, September 15, 1977, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

113. F. Lee Fitzgerald, President New England Power, to Emma Sacco, President, Rhode Islanders for Safe Power, November 7, 1977, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

GSA was released. The draft reached the initial conclusion that construction and operation of a nuclear power plant in the surplus property at the Naval Station would be safe and have minimal environmental impact on the surrounding area. The report received mixed reviews, with the proponents of the nuclear power plant suggesting it was “fairly comprehensive” while opponents criticizing it as a repetition of NEES’s initial data collection and not providing “any encouragement that the final version will be well done.”¹¹⁴ The GSA was less effusive for other proposals for the land use, submitting it would take decades to achieve the mixed use facilities that RICE had recommended earlier. NEES was more circumspect but sensed that they had achieved an important goal in the campaign to achieve an important economical source of electricity to maintain the reliable supply of electric power for the grid in southeastern New England.¹¹⁵ Public hearings on the draft were held in June 1978 at Providence and Charlestown to gather feedback to the report, which would be incorporated into the final product.¹¹⁶

Other events were moving to thwart NEES’s plans. Throughout the New England area popular discontent against building new nuclear power plants was simmering and often overflowing in large scale demonstrations at the construction sites. In Seabrook, New Hampshire, a massive demonstration in May 1977 resulted in the arrest of over a

114. See James T. Kaul, “‘One Small Step’ Taken Toward an A-plant in Charlestown,” *Providence Journal*, May 7, 1978, and “An Outline of the History of the Charlestown Land Controversy,” November 5, 1978, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

115. *Ibid.*

116. Paul E. Goulding, “Decision Paper, Disposal of the Naval Auxiliary Landing Field at Charlestown, Rhode Island.” Washington, DC: General Services Administration, June 20, 1979, 8.

thousand protestors and required the use of the state National Guard to maintain order. A larger but less disruptive demonstration there in 1978 attracted 20,000 participants.¹¹⁷ Ralph Nader was leading demonstrations across the nation with support from environmental groups such as the Sierra Club.¹¹⁸ Nader showed up in Providence in February, 1977 to speak against the construction of the Charlestown nuclear plants, a speech that was interrupted by other demonstrators from local construction unions.¹¹⁹

The 1978 political election results were at most ambivalent to the utility nuclear options. Rhode Island Governor Noel was replaced by another Democrat, J. Joseph Garrahy, who also supported the nuclear construction plans. Claudine Schneider had run for Congress but had been narrowly defeated by the incumbent Democrat, Representative Edward P. Beard. Initially a Democrat, Schneider had switched to the Republican Party as that organization was “the party of alternatives and opportunities. The Democratic party seemed very entrenched and predictable and status quo.”¹²⁰ Schneider used the publicity she had gained in the fight against the nuclear power plants to make inroads

117. Steven E. Barkan, “Strategic, Tactical and Organizational Dilemmas of the Protest Movement against Nuclear Power,” *Society for the Study of Social Problems* 27, no. 1: 27-28.

118. Roger E. Kasperson, Gerald Berk, David Pijawka, Alan B. Sharaf and James Wood, “Public Opposition to Nuclear Energy; Retrospect and Prospect,” *Science, Technology, & Human Values* 5, no. 31: 13-14.

119. “Speech on Nuclear Power by Nader Brings Protest,” *New York Times*, February 13, 1977.

120. Chris Black, “A Striver Keeps on Striving and Wins,” *Boston Globe*, December 28, 1980.

with the electorate. While she lost to Beard by 9000 votes, it appeared that Beard and the Democratic Party had been seriously wounded by Schneider's campaigns.¹²¹

The beginning of 1979 appeared to be more hopeful for NEES's prospects. The final Environmental Impact Statement from the GSA was released on January 29th. The three volume report had incorporated the comments and response to the public hearings conducted the previous summer, but overall did not preclude the construction of the nuclear power plants on the surplus property. It did contain "projections which demonstrate a negative effect on the environmental values of this unique ecological resource which could perhaps not be sustained by this property without permanent damage. The increase in total environmental burden during construction and operation will not be positive."¹²² The report also suggested that the town of Charlestown was not capable of handling the support services required to safely operate the plants and building them would "adversely impact a resource which is rapidly becoming very scarce, a refuge of natural beauty, harmony and quiet."¹²³ These indications were not favorable ones, but NEES choose to interpret them positively and continue with its plans. From the utility point of view, the issuance of the GSA Environmental Impact Statement met the requirements of the previous court decisions; the surplus property could now be apportioned off to the state of Rhode Island that could be expected to approve the nuclear

121. Ibid.

122. Paul E. Goulding, "Decision Paper, Disposal of the Naval Auxiliary Landing Field at Charlestown, Rhode Island." Washington, DC: General Services Administration, June 20, 1979, 17.

123. Ibid.

power plants' construction. After a four year delay it appeared that NEES would be able to continue with its designs.

An event far away from Rhode Island and Washington would deflect this final burst of momentum by the utility. "On Wednesday, March 28, 1979, 36 seconds after the hour of 4:00 a.m., several water pumps stopped working in the Unit 2 nuclear power plant on Three Mile Island, 10 miles southeast of Harrisburg, Pennsylvania. Thus began the accident at Three Mile Island."¹²⁴ The subsequent combination of equipment failure and operator error resulted in serious damage to that nuclear power plant's reactor core and a small release of radioactive isotopes into the surrounding area.¹²⁵

The nuclear power plant accident at Three Mile Island was well publicized and further reinforced the concerns of a large segment of the population regarding the use of nuclear power as a safe means to generate electric power. As the extent of the accident became more fully known, additional demonstrations erupted around New England. Protestors rallied outside the Vermont Yankee nuclear plant at Vernon, VT, at the nuclear plant in Plymouth, MA, and on the Boston Commons.¹²⁶ In Providence, two hundred

124. John G. Kemeny, Chairman, "The President's Commission On The Accident at TMI" (Washington, DC: Government Printing Office, 1979), 81.

125. With the exception of a number of plant operators responding to the accident, the additional radiation dose received by the local population was insignificant. The speculative publicity during the accident appears to have been more harmful than the actual radiation. "The major health effect of the accident appears to have been on the mental health of the people living in the region of Three Mile Island and of the workers at TMI." This was not an optimistic note. See John G. Kemeny, Chairman, "The President's Commission On The Accident at TMI" (Washington, DC: Government Printing Office, 1979), 30-34.

126. Associated Press, "Nuclear Protests Held Across U.S.," *Los Angeles Times*, April 2, 1979.

people gathered at the Rhode Island State House to demand a “total ban on all nuclear plant construction.”¹²⁷ While a NEES spokesman cautioned “restraint” by government officials until the accident was better understood, local politicians were more proactive. Governor Garrahy in Rhode Island stated he would act to block any nuclear power plant in Charlestown, RI, until “safety” could be demonstrated.¹²⁸ Representative Beard, who had just survived an election scare from Claudine Schneider, altered his position and stated he would no longer support the proposed nuclear power plants in Charlestown.¹²⁹

Before the furor over the additional safety concerns could decay away, the GSA placed a final obstacle in the path of NEES. On 20 June 1979 the Acting Administrator of General Services, Paul E. Goulding, issued his final decision on the disposal of the surplus property at the Naval Auxiliary Landing Field at Charlestown. Weighing the competing “socio-economic and environmental benefits to be derived from any of its potential uses,” Goulding rejected the majority of the proposals for the use of the land, including the state of Rhode Island’s for possible future resale to NEES for the nuclear power plants.¹³⁰ The GSA transferred 307 acres to the Fish and Wildlife Service of the Department of the Interior for inclusion as part of the National Wildlife Refuge System, noting that the land was situated in a “unique ecological area with a long history of

127. “Accident Sparks Debate and Protest in N.E.,” *Boston Globe*, April 3, 1979.

128. Ibid

129. “Congressman Shifts on Plant,” *New York Times*, April 2, 1979.

130. Paul E. Goulding, “Decision Paper, Disposal of the Naval Auxiliary Landing Field at Charlestown, Rhode Island.” Washington, DC: General Services Administration, 20 June 1979, 9-10.

migratory waterfowl use on the East Coast flyway.”¹³¹ The EPA received sixty acres to use for its Environmental Research Laboratory, while the town of Charlestown received the remaining 237 acres for recreational and wildlife protection.¹³²

Goulding considered the possibilities of nuclear power plant construction on the site but ultimately rejected them despite the desire for greater regional energy production. Instead, the disadvantages of negating the popular will of the local residents who had opposed the plants and the attendant challenges of nuclear waste disposal proved more convincing. With this decision the possibility of NEES acquiring the surplus land was dashed.¹³³

NEES officials stated they were “disappointed” with the decision but would review the decision with the company lawyers. “Our current plans are obviously to continue with nuclear power. Where that will happen, who knows?” stated a company spokesman.¹³⁴ The company subsequently sued the GSA in August requesting an injunction against the disposal of the property as allocated by Goulding.¹³⁵ This request was rejected by the court, and on 4 December the suit was decided against NEES.¹³⁶ This

131. Ibid.

132. Ibid., 11-13.

133. Ibid., 15-17.

134. “R.I. Nuclear Plant Site to be Wildlife Preserve,” *Boston Globe*, June 21, 1979.

135. Environmental Law Reporter, *New England Power Co. v. Goulding*, Environmental Law Reporter <https://elr.info/sites/default/files/litigation/9.20685.htm> (accessed November 19, 2014).

136. *New England Power Co. v. Goulding*, 486 F. Supp. 18 (D.C. 1979).

proved to be the breaking point for the utility. On 18 December NEES announced that it was cancelling its plans to build the nuclear power plants in Charlestown due to its inability to gain title to the property. After spending thirty million dollars and five years to turn its nuclear dreams into reality, the leadership of NEES made a business decision and turned off the project. Nuclear power in Rhode Island for the generation of electricity was dead.¹³⁷

Root Cause Analysis of the Failure of NEES

The reasons for the failure of NEES to achieve its technological dream of building a nuclear power plant were varied. The ability of the environmental groups to delay the construction of the project for years added additional costs that NEES was unwilling to stomach. Guy Nichols, now the chief executive officer of NEES, was less committed to stretching the technological boundaries of electric power generation than he was at improving the financial performance of the company. When the nuclear construction project seemed to drag on with no endpoint in sight, especially after the GSA disapproved the sale of the surplus land at Charlestown to the utility, he was willing to end the efforts and concentrate on other problems.¹³⁸

137. "New England Power Says Plans Canceled for Nuclear Facility," *Wall Street Journal*, December 18, 1979.

138. While the head of NEES, Nichols did not have an electrical engineering degree. After serving in the Army in World War II, Nichols had received a B.S. in Civil Engineering from the University of Vermont and a master's degree in business administration from the Massachusetts Institute of Technology's Sloan Program. See "In Memoriam: Guy Nichols," Woods Hole Oceanographic Institute (last modified 20 June 2014), <http://www.whoi.edu/main/obituaries?tid=3622&cid=195869>, and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 202, 223-224, 284-285.

While the economic rationale for quitting the very expensive project is compelling, it does not seem sufficient. NEES would later lose far more money in its limited investments in other regional nuclear power plants. Suffering through the economic downturns of the 1970s and the energy crisis that saw oil prices increase dramatically, NEES might still have tried to persevere and attain the coveted nuclear facility and profited from the economic generation of electricity for the electric power grid. The length of time that the process had taken also saw the slow but steady decay of political support in Rhode Island for the project. While Governor Noel had backed the utility's efforts to acquire the property, from the point of view of NEES, this was insufficient to overcome the dogged resistance of RICE, CCRI and other environmental organizations. The accident at Three Mile Island does seem to have catalyzed governmental support against NEES's plans. The subsequent GSA decision, the public disquiet with the project, and the loss of political support seemed insurmountable at corporate headquarters.¹³⁹

Somewhat ironically, NEES probably was left in better financial condition by failing to construct the plants. Nuclear power plant construction during the period was fraught with delays, above and beyond those resulting from the legal challenges of disproving environmental organizations. The accident at Three Mile Island caused the NRC to shift portions of its personnel that had been supporting plant licensing to accident

139. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 202, 223-224, 284-285.

investigation, interrupting the already lengthy procedure.¹⁴⁰ With the other technical problems arising from the production of similar nuclear power plants, it is likely that the construction of the power plants at Charlestown would have been delayed. Rhode Island had also resisted shifting any of the cost overruns associated with an expanding construction schedule to the consumers. With the other problems that NEES was handling during the 1970s, including a lengthy strike by its line workers in 1975, declining stock prices, increasing interest rates and unstable fuel costs, NEES was fortunate to avoid the potentially destabilizing losses of its own nuclear power plants. Indeed, the partial shares that NEES owned in other regional nuclear facilities were costly enough. NEES incurred losses of 100 million dollars on its small portion of the Seabrook number 2 nuclear power plant. While the electric power grid in southeastern New England would have survived, NEES as an independent company might not have.¹⁴¹

Technological Momentum Exemplified

The prevention of the nuclear power plant construction at Charlestown stands in stark contrast to what the theories of technological autonomy might suggest should have happened. At the time the large scale nuclear power plants as envisioned by NEES were seen as the most efficient method in generating electricity for the electric power grid.

140. See Memorandum from Robert L. Baer to H. Rood, Project Manager, Summary of Meeting to Discuss Casework Schedules, July 2, 1979, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

141. NEES officials would later publically thank then Representative Claudine Schneider during her Senate campaign in 1990 for preventing them from building the plant, an accolade she found gratifying. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 199, 204-212, 285 and Claudine Schneider, telephone interview by author, Newport, RI, April 18, 2014.

The plants were capable of maintaining a near constant output immune to many of vagaries of plant operation that affected hydroelectric power plants and were less susceptible to the dynamic fuel price shifts that cut into the profit margins of conventionally powered plants. Once started up, the plants could run for long periods of time to meet the steady state power requirements of the electric power grid, with operators only running the other more expensive plants to meet transient loading throughout the day.¹⁴² Particularly during the nation's first energy crisis in the midst of an economic downturn, one would have expected that the demands of efficiency might even be magnified. With the additional political forces of a Presidential memo insisting on all federal agencies making efforts to improve the nation's energy sources, a governor trying to prevent an economic catastrophe in his state, and the state and local agencies accustomed to meeting the electric utility companies' demands, it appears that the nuclear power plants should have been built. That they were not appears to fly in the face of Jacques Ellul's postulate for technique, that of efficiency trumping all other factors in society. "Technique has only one principle; efficient ordering," Ellul enjoined.¹⁴³ If Ellul's precepts had been valid, four reactors would have been constructed at Charlestown, not merely the two initially planned for, as well as a plutonium breeder reactor next door to provide the fissile material to run them.

142. James J. Duderstadt and Chihiro Kikuchi, *Nuclear Power, Technology on Trial* (Ann Arbor, MI: The University of Michigan Press, 1979), 89-91.

143. Jacques Ellul, *The Technological Society*. Trans. John Wilkinson (New York: Vintage Books, 1964), 110.

Not only was this drive for efficiency deflected, it was denied its victory by groups organized behind emerging ethical concerns, in this case, for the environment. This defeat suggests problems with Ellul's characterization of technique, "its refusal to tolerate moral judgments. It is absolutely independent of them and eliminates them from its domain."¹⁴⁴ Groups such as the Concerned Citizens of Rhode Island and the Conservation Law Foundation had numerous reasons to oppose the construction of the nuclear power plants in Charlestown, but chief among them were concerns that the construction and operation of the plants would harm the environment and numerous other species, not merely humans, that inhabited it. This apprehension was similar to Rachel Carson's discussion of the effects of DDT on the environment. While Carson was more descriptive than prescriptive, her "plea for restraint rests on the triple foundation of human health considerations, the moral considerability of nonhuman beings, and the value to humans of preserving wild nature."¹⁴⁵ Following in the steady progression of the earlier conservationists and environmentalists, the members of the Rhode Island environmental groups exhibited aspects of all of these concerns. They were not only interested in the possible side effects of exposure to radiation and contamination from the plants on humans. They also protested the construction of the plants based on the effects they might have on local wildlife, from the larvae of marine invertebrates forced through the condensers of the plants to the effects on aquatic life in Ninigret Pond adjacent to the

144. Ibid., 97.

145. Philip Cafaro, "Thoreau, Leopold, and Carson: Towards an Environmental Virtue Ethics," *Environmental Ethics* 22 (Spring 2001): 10.

Charlestown construction site.¹⁴⁶ Setting up a new electricity generation source was not an adequate trade off when balanced against the environmental damage the plants would cause.

If Ellul's theory of technique seems ill suited to explain the events in Rhode Island in the 1970s, Lewis Mumford's discussion on the progress of the megamachine also appears flawed. The electric power grid seems well suited as one of the components, if not the most important, of the megamachine of modern society. Such a centrally controlled technological system based on power appears as the quintessential megamachine:

The results is that a monotecnics, based on scientific intelligence and quantitative production, directed mainly towards economic expansion, material repletion and military superiority, has taken the place of polytechnics, based primarily, as in agriculture, on the needs, aptitudes, interests of living organisms, above all on man himself.¹⁴⁷

NEES executives would be unlikely to use such vocabulary, but their actions certainly supported Mumford's theory.

While the construction of a new power source may fit in well with Mumford's propositions, the opposition to it was also envisioned. Mumford allowed that the technology of a culture was potentially shaped by the society's values, and not simply the

146. Eric and Claudine Schneider, Petition for Leave to Intervene, U.S. Nuclear Regulatory Commission, Docket No. STN 50-568, STN 50-569, Claudine Schneider Papers, University of Rhode Island, Kingston, RI.

147. Lewis Mumford, *The Pentagon of Power, The Myth of the Machine Volume Two* (New York: Harcourt Brace Jovanovich, 1964, 1970), 155.

ultimate drive for efficiency.¹⁴⁸ Changing values could lead to altering the operation of the megamachine. Even as early as 1970 Mumford was attuned to the possibilities of segments of the population not overawed by the benefits of the “power complex” of the megamachine:

There already are many indications, though scattered, faint, and often contradictory, that a fresh cultural transformation is in the making . . . Whether this change is as yet sufficient to arrest further disintegration, still more whether it can successfully dismantle the nuclear megamachine before it brings on a total human catastrophe, are matters that may long remain in doubt.¹⁴⁹

Mumford was less prescient on what these indications might be. He did see that modernity had led to the greater power of the megamachine, such that it was now able to affect the environment in ways that were previously impossible:

Thus while Mumford could observe that the modern megamachine did affect the environment in ways that preindustrial ones did or could not, he did not comprehend the growing environmental movement as a reaction to the damage that technology might inflict. Values might change, but the conservation and environmental concerns were more opaque to Mumford. Principled opposition to actions that might harm non-human species was not part of Mumford’s narrative.¹⁵⁰

148. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Penguin Books, 1989), 450.

149. Lewis Mumford, *The Pentagon of Power, The Myth of the Machine Volume Two* (New York: Harcourt Brace Jovanovich, 1964, 1970), 429.

150. As the volumes of the *Myth of the Machine* were published in 1967 and 1970, Mumford might be forgiven for missing this emerging trend. As an advocate of planning to take advantage of the available natural resources, Mumford might have been more attuned to other aspects of human culture (art and religion) than nature for nature’s sake alone. See Richard White, *The Organic Machine* (New York: Hill and Wang, 1995), 64-69.

The inability of NEES to gain its own nuclear power plant at Charlestown may not have been a “turning point in the history of the system,” but it certainly appears as an inflection point in the technological momentum of the electric power grid in the region.¹⁵¹ This inflection point provides particular credence for the concept of technological momentum. All three of Thomas P. Hughes’ possible system altering influences could be detected during this episode. A shift in economic forces, a system catastrophe, and a change in the belief system of the population using the technology were evident in the prevention of the power plants’ construction. The convergence of the world wide energy crisis following the Yom Kippur War in 1973 with the economic crisis in Rhode Island as the Navy departed the area as part of the Vietnam War drawdown placed immense stress on the normal mode of system operation for the electric power grid. Fuel prices increased rapidly and became much more dynamic, characteristics that prevented the system managers from slowly adapting the existing system to these new economic inputs. Concurrently the top management and technical experts of the company had become accustomed to steady technical progress of increasing efficiency in power generation equipment as well as constant and predictable increases in the demand for electric power. The divergence of the expected (and comfortable) problems associated with this model of reality and reality itself inserted additional friction in the system.

Far more important in the case of the nuclear power plants at Charlestown was the change in values of the population regarding the benefits of the system compared to its

151. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 285.

inherent disadvantages. The growth and spread of an environmental ethic had paralleled the growth and evolution of the electric power grid in the area. Initially the small groups had been focused on the conservation of natural resources for the future enjoyment by successive human generations. Protecting non-human species based on their own inherent value appeared evident to only a few idealists. Later, as conservation practitioners examined some of the contradictions of this mindset and the pollution of the environment from modern technological society, a new value system began to emerge. Here the subjugation of the earth for the benefits of humans was not sufficient, particularly if the decisions to extirpate lower ordered organisms were poorly analyzed and led to results that could also harm the humans in the same area. A more practical and more democratic doctrine was required that both protected the environment and all of the species in it.

In Rhode Island this evolution from a conservation to an environmental mindset was hardly punctuated by constant success. Opposition to the industries that caused the greatest environmental damage was often brushed aside by the exigencies of commercial progress, particularly in a state that was struggling economically. This was especially apparent when groups opposed the electric power utilities, enterprises that had a history of close cooperation with the state and federal governments. Only in the early 1970s when federal legislation required all commercial and governing bodies to consider the environmental effects of their actions did a means arise for the environmental groups to successfully restrict the electric power utilities' actions. Hence, when Rhode Islanders for Clean Energy sued the General Services Administration in court to prevent the sale of surplus federal property in Charlestown to the New England Electric System for the

construction of nuclear power plants, one can note the effects of changing value systems on the operation of the immense technological systems, or the megamachine in Mumford's terms. The actions of the groups of dedicated individuals may not have been completely indicative of the thoughts of majority of the population as the organizations were small.¹⁵² The leadership was very motivated however, in no small amount by the nascent environmental ethic that was still being shaped by the thinkers, writers and practitioners of the time. By constantly opposing the actions of the federal, state and local governments acting in concert with NEES, the environmental groups were able to significantly delay the construction of the plants in the utility's desired site and ultimately to prevent it completely.

One can argue whether the technological catastrophe at the Three Mile Island nuclear power plant in March, 1979, was the final nail in the coffin preventing the construction of the plants, or whether the previous actions of the environmental groups were sufficient to prevent this by themselves. The timeline for construction had been pushed back by years by the numerous court suits and hearings as the GSA researched the Environmental Impact Statement necessary to conduct the sale of the property. With the reactor meltdown in Pennsylvania, political support for nuclear power in Rhode Island experienced a prompt drop. Politicians, wary of public outcries against possible nuclear dangers, withdrew their support for the project. The population may have been

152. CCRI had perhaps three to four thousand members in the late 1970s though the group's detractors suggested that only a handful of these performed any function. See Stan DeCoster, "Battling a Power Plant," *New London Day*, June 21, 1980.

less filled with concern for the environment than the reality of nuclear contamination affecting their own health, but that mindset might develop in time.

While Hughes' premise of technological momentum does appear more pertinent to the Charlestown nuclear power plants study in showing how numerous forces might alter the trajectory of the electric power grid, one data point does not confirm a theory. Other forces were acting simultaneously and it is difficult to separate out their components to determine which was the largest. It is by no means apparent that this decade of struggle over one element of the electric power grid, in this case a means of power generation, was important compared to the overall operation of the system. Perhaps this time period is too small a sample size to promote technological momentum or discard technological determinism. To determine which theory has greater application one must examine the next steps in the evolution of environmental ethics and how it affected the electric power grid.

CHAPTER 6

ALTERED TRAJECTORIES

The rat has to smell the cheese.

- John Rowe, President, New England Electric System

Immense technological systems such as the electric power grid have considerable institutional impetus. The numerous electric utilities making up the electric power grid in southeastern New England had evolved over the course of their existence from their beginnings as small companies leveraging the strength of a new and desirable technology. Over almost one hundred years of operation the companies had solved frequent problems to ensure the reliable and economic production of electricity for their consumers. The companies had required a dedicated cadre of professional engineers, businessmen and other creative individuals to ensure the effectiveness and efficiency of the electric power grid. These individuals generated their own ethical code of conduct to guide their actions. Other agents and organizations had assisted in this progress. Colleges and universities educated new system operators on the theoretical underpinnings of the technology comprising the electric power grid. Government regulators attempted to resolve the stresses arising from the operation of the electric power grid. Other businesses profited from the electric power grid's easily accessible energy. The subsequent goals and objectives of the electric utilities, the companies that operated the machinery, strung the transmission cables and connected the homes and factories to the

grid, provided the main direction for the momentum of this advanced technology system.¹⁵³

The relationship between the electric utilities and the Rhode Island government was typically close during this period. The government acted to assist the various utilities, especially the New England Electric System (NEES), to provide safe and reliable electric power to the population, even as the government attempted to maintain safe and secure political power over the state. Having attained a critical velocity the technology spread throughout the region affected by external forces such as the requirements of wartime production and the costs of fuel from foreign shores. As the electric power grid became larger and more intertwined with the rest of society, greater interaction with the political and financial powers were necessary to resolve problems and maintain system operations at the desired levels of efficiency and effectiveness. Longer lead times were required to construct larger and more complex system components to drive the electric power grid, construct interconnecting power lines and acquire the local authorizations to make the entire system profitable.¹⁵⁴ This in turn placed a greater emphasis on planning for these long term projects, with the careful determination of all of the factors that might affect the construction of the ever more costly ventures. Typically the population was not involved in this planning process and showed little inclination to participate as long as their electric rates were low and the new

153. Thomas P. Hughes, *Networks of Power* (1983; repr., Baltimore, MD: The Johns Hopkins University Press, 1993), 14-15.

154. *Ibid.*, 15-16.

electric powered appliances were available to improve their standard of living.¹⁵⁵ The “build and grow” doctrine for system development, pioneered by Samuel Insull, worked well for the utilities in southeastern New England as well as the political parties, government regulators, businesses and consumers for almost one hundred years. Only the resultant forces of technical overreach from inadequate equipment research and design, rising fuel prices from foreign sources, poor modeling of the business environment and the new environmental consciousness of the citizenry acted to alter the trajectory of the advanced technology system. Some of these forces might have been anticipated by more perceptive critical thinkers in the industry and the government, but the combination of issues in a relatively short period proved more than the operators of the electric power grid could surmount. These trials were not unique to the New England area as utilities across the nation struggled to come up with actions to cope with the more dynamic challenges after the tried doctrines proved insufficient.¹⁵⁶

These contingent forces of technological stasis, rising fuel costs and poor business acumen in a more dynamic situation might easily be viewed as the primary causes for the

155. Lewis Mumford, concerned with the scientific planning of urban areas, suggested that this skill was crucial in the continued development of technological society. Yet this skill was not dramatic. “Planning is an exercise in power, and in a modern state much real power is suffused with boredom. The agents of planning are usually boring; the planning process is boring; the implementation of plans is always boring. In a democracy planning works for bureaucracies and corporations as smell works for a skunk. It keeps danger away. Power does not have to be exercised behind the scenes. It can be open. The audience is asleep. The modern world is forged amidst our inattention.” See Richard White, *The Organic Machine* (New York: Hill and Wang, 1995), 64.

156. Richard F. Hirsh. *Technology and Transformation in the American Electric Utility Industry*. (1989. Reprint, Cambridge, UK: Cambridge University Press, 2002), 176-180.

utility travails in the 1970s, particularly in southeastern New England. Under the pressures of all of these forces the electric utilities had shown tremendous progress, even during some very challenging periods. The stresses of the 1970s were certainly difficult, though not as severe as the Great Depression. Against such a history, the failure of NEES to build its nuclear power plant at Charlestown, Rhode Island could be regarded as a minor setback that could be waved off as a single example of poor timing and bad luck by the organization. The willingness of NEES management under Guy Nichols to cut the firm's losses and not waste additional resources chasing the mirage of technical desires could provide some satisfaction to the stockholders and grid managers. Still, business empires are not created by such victories and NEES would have been well advised to more carefully examine how the growing environmental ethic and the environmental groups would affect its future operations. The increased national and regional environmental consciousness would lead to greater political influence for the environmental groups, allowing them to add additional resistance to the electric utilities' actions and the operation of the electric power grid. No longer would the operators, managers and regulators of this advanced technology system be able to make decisions outside of the visibility of other interested parties. The interactions of these environmental groups with the electric utilities tended to impede the momentum of the electric power grid in ways that none of the groups would probably have anticipated. The net result of all of these forces was that the nominal managers of the electric power grid,

industrial and political, began to lose control of the backbone of modern technological society and the momentum of the advanced technology system began to change.¹⁵⁷

PURPA and its Effects

One of the first new stresses introduced to the standard way of operating the electric power grid became evident even as the final throes of the Charlestown nuclear power plant were being litigated. In 1977 President Jimmy Carter had submitted legislation to Congress to improve the conservation of energy use in the nation, particularly by reducing the burning of imported oil. Despite some Congressional, energy industry and public resistance, the Democratic majority in the House and Senate addressed the President's requests. Industry officials were against the emphasis on conservation and the additional regulatory power that federal utility regulators would accrue and extensively lobbied Congress to dilute the legislation. The different portions of the President's proposal were disaggregated by the Senate, though the House, under Speaker Thomas "Tip" O'Neil (D-Massachusetts) retained Carter's construction. While the bill was decried as being the most substantial federal intrusion into the electric utility industry since the Public Utility Holding Company Act of 1935, little of the Congressional drama from that legislation appears to have been evident. Eventually the two houses of Congress were able to meet agreement on the legislation, though not until significant portions of the bill had been eliminated.¹⁵⁸ When finally passed in October of

157. *Ibid.*, 70-71.

158. While "intense political maneuvering" was required to pass the legislation, both Rhode Island Representatives Edward Beard and Fernand St. Germain voted for the bill as did Senator Claiborne Pell. Senator John Chaffee, the only Republican of the

1978, the National Energy Act contained the Natural Gas Policy Act, the Powerplant and Industrial Fuel Use Act, the National Energy Conservation Policy Act, the Energy Tax Act, and the Public Utility Regulatory Policies Act (PURPA).¹⁵⁹

Lost in the excitement of passing new legislation designed to increase domestic fuel production and limit energy consumption through conservation in the country were some important details regarding electric power generation by “cogeneration and small power” production facilities.¹⁶⁰ Section 210 of PURPA required the Federal Energy Regulatory Commission (FERC) to create rules regarding the sale and purchase of electric power from such sites.¹⁶¹ A cogenerator facility used the waste steam produced for one industrial activity (typically to heat up some material) and instead of exhausting it into the atmosphere, used it to generate electricity. This had been common in the early

Rhode Island Congressional delegation, voted against the bill. See Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 80, Govtrack.us, “To Order The Previous Question On H. Res. 1434, The Resolution Providing For The Consideration En Bloc Of The Conference Reports On H.R. 4018, H.R. 5146, H.R. 5037, H.R. 5289 And H.R. 5263. These Five Energy Conference Reports Deal With Energy Taxes, Utility Rate Reform, Natural Gas Pricing, Coal Conversion, And Other Related Issues Of Energy Conservation And Reform,” govtrack.us, <https://www.govtrack.us/congress/votes/95-1978/h1512> (accessed December 27, 2014), and Govtrack.us, “To Agree To The Conference Report On H.R. 4018, The Bill Suspending The Duty On Certain Doxorubicin Hydrochloride Antibiotics And Encouraging Energy Conservation In Utility Systems,” govtrack.us, <https://www.govtrack.us/congress/votes/95-1978/s1102> (accessed December 27, 2014).

159. Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 77-80.

160. *Public Utility 1978 Regulatory Policies Act of 1978*, Public Law 95-617, U.S. Statutes at Large 92 (1978): 3144-3147.

161. *Ibid.*

part of the 20th century but as the efficiency of specially designed electric power plants had improved and the cost of electricity had decreased, most factories had given up this activity. For example, the Cranston Print Works in Cranston, RI, had operated a small steam engine for the direct mechanical drive of its machinery as well as to generate electricity.¹⁶² PURPA added new authorizations for electric power production by “small power production facilities” which “included smaller hydroelectric dams or any other method of producing electrical power.”¹⁶³ This section of the new law also required the electric utilities to both buy and sell power to these types of facilities at prices based on what the utility would have to pay “which, but for the purchase from such cogenerator or small power producer, such utility would generate or purchase from another source.”¹⁶⁴

162. Gary Kulik and Julia Bonham, *Rhode Island, An Inventory of Historic Engineering and Industrial Sites* (Washington, DC: Government Printing Office, 1978), 59-60.

163. Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 81.

164. In other words the utility had to pay the going rate for the power, and not what they could strong arm the smaller producer into accepting. Typically the smaller producer could not compete with the larger and more efficient electric utility and had to accept the utilities’ offer. This was often below the going rate when selling to the electrical utility and above it when buying. The larger utilities did not desire the smaller power producers from participating as this tended to lower their own profits. As a challenge to the larger utility’s monopoly, the smaller power producers could not be as easily controlled by the grid operators. This had been a good business model for the electric utility industry, though not necessarily for anyone else, and the entrenched utilities were not excited about changing their mode of operation. See Public Utility 1978 Regulatory Policies Act of 1978, Public Law 95-617, U.S. Statutes at Large 92 (1978): 3144-3147 and Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 81-84.

This small portion of the larger bill would in time help crack the natural monopoly of the electric utility companies in their operation of the electric power grid. In the future any qualifying organization producing electric power would be allowed to sell power for transmission and eventual distribution. It would not matter who or how the power was produced, only that it was available for use. This feature would require some technical problem solving to allow other sources to plug in to supply power as well as new types of regulatory actions, but the opening was now available for other organizations to participate. The policy of “grow and build” as proposed by Samuel Insull was now under a new assault.¹⁶⁵

The end of the 1970s had not been favorable to the major operators of the electric power grid in southeastern New England. NEES, as the largest owner and operator of the electric power grid in the area, had the greatest technical requirements to meet the demands of being an efficient custodian of the system. The combination of rising fuel costs, labor unrest, increasing federal regulation of the electric utility industry and the failure to build the nuclear power plant in Charlestown all placed strain on the utility’s profits and general stress on the company. During the height of the energy crisis in 1973-

165. It does not appear that Section 210 of PURPA was well understood by anyone when the law was passed by Congress in 1978. As the ramifications became more understood, numerous legal challenges were offered, requiring Supreme Court adjudication to resolve. This was not resolved until May 1983 when the statute was finally upheld. One suspects that if the electrical utility managers and other industrial and political affiliates had comprehended the unforeseen consequences they would have more strenuously worked against the legislation. It is also a telling lesson learned that seemingly minor perturbations of large complex systems using legislation may have interesting results. See Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 88-92.

1974, backup oil supplies had to be delivered to NEES by the federal government to keep all of the electric power plants in operation.¹⁶⁶ Guy Nichols had led the efforts to convert the company's coal-fired power plants to burn oil in the 1960s. Now as the Chief Executive Officer of NEES, Nichols had to reconsider and directed the restoration of the plants to their earlier configuration.¹⁶⁷ Brown-outs occurred when the temperamental Brayton Point Plant suffered one of its numerous shutdowns during the peak power requirement period in the summer, while regulators complained about the pollution from its smoke stacks when it was operating.¹⁶⁸ The smaller utilities were also affected. The Block Island Power Company was so strained by the fuel shortage that it applied to the Rhode Island Public Utilities Commission to deny service to any new customers, a request that was rejected.¹⁶⁹

The electric utility officials attempted to pass the rapidly rising fuel costs from the Middle East oil embargo down to the consumer. Initial efforts hit road blocks as the state public utilities commissions rejected many of the requests for raising the price structure for electric power. The Rhode Island Public Utilities Commission often overruled the

166. Martin F. Nolan, "Simon Diverts Emergency Fuel to New England Power Plants," *Boston Globe*, December 28, 1973.

167. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 200.

168. See Ken Botwright, "Less Steam for Sultry New England," *Boston Globe* 26 August 1972, and Associated Press, "N.E. Power Co. Accused of Being Air Polluter," *Boston Globe*, September 9, 1973.

169. State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission and the Division of Public Utilities and Carriers for the Years 1973 and 1974* (Providence, RI: 1975): 132-133.

increased tariff requests as it did not concur with the financial analysis of the utility companies, though it would later mandate smaller rate hikes after some negotiations with the utilities.¹⁷⁰ This disrupted the ability of the utilities to plan out their own cash flow to meet the fuel increases and other dynamic costs. The federal regulators typically authorized the electric utilities to charge higher rates. Since NEES was an interstate producer and distributor of electric power, it fell under federal authority in terms of the profits it could legally attain. Narragansett Electric, the NEES subsidiary, subsequently sued the Rhode Island Public Utilities Commission to permit the higher rates. The Rhode Island State Supreme Court sided with the electric utility whereupon the Public Utility Commission appealed. The appeals were all denied by higher level courts, though the process reached the U.S. Supreme Court before the suit was upheld.¹⁷¹

The subsequent “Narragansett Doctrine,” was important for a number of reasons. The Rhode Island Supreme Court stated that the Public Utilities Commission “may choose to adjust Narragansett's existing retail rates to reflect the changed cost of interstate

170. All of the Rhode Island electric utilities attempted to gain tariff rate increases. The Public Utilities Commission was generally dismissive of their claims, noting in one in 1974 that Narragansett Electric “has not sustained its burden of proof to show that a situation exists which justifies the Commission or the Administrator in exercising emergency powers to grant temporary rate relief.” See State of Rhode Island and Providence Plantations, *Biennial Report of the Public Utilities Commission and the Division of Public Utilities and Carriers for the Years 1973 and 1974* (Providence, RI: 1971): 60-80, 82-99, 101-116, 125-128, 159-168, Part II, 26-27, 37-42, 46-56, 72-73, 80-84.

171. This harkens back to the initial Supreme Court decision in 1927 regarding such matters. See *The Narragansett Electric Company v. Edward F. Burke et al.*, 381 A.2d 1358 (1977) and John T. Landry and Jeffrey L. Cruikshank, *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 204.

power, but it need not do so.”¹⁷² Instead the Public Utilities Commission could “investigate the overall financial structure of Narragansett to determine whether the company has experienced savings in other areas which might offset the increased price for power.”¹⁷³ Fuel price increases by themselves were not sufficient reason to require automatic rate increases. The state regulators could tighten their estimates of electric utility efficiency to reject attempts to pad the accounts by the company.¹⁷⁴ On the other hand, the Rhode Island Supreme Court decision and subsequent cases in other states established the primacy of federal regulation of electric power interstate commerce and that public utility commissions should not interfere in the federal domain.¹⁷⁵ Federal regulation, both from the Environmental Protection Agency (EPA) and from FERC under PURPA was soon to dominate the price structuring of electric power, a shift in authority to which the states and electric utilities would have adjust.¹⁷⁶

NEESPLAN and Conservation

While the utilities attempted to stabilize the perceived short term transient costs due to the energy crisis, it was the consumer that had to ultimately absorb most of the

172. See *The Narragansett Electric Company v. Edward F. Burke et al.*, 381 A.2d 1358 (1977).

173. *Ibid.*

174. *Ibid.*

175. Andrea J. Ercolano and Peter C. Lesch, *Narragansett Update: From Washington Gas Light to Nantahala*, *Energy Law Journal* 7, no. 2. (1986): 341.

176. Ari Peskoe, “A Challenge for Federalism: Achieving National Goals in the Electricity Industry,” *Missouri Environmental Law & Policy Review* 18, no. 2: 222, 224-228.

price increases. NEES attempted to educate their customers why the additional environmental regulations, new federal power pricing rules, and most importantly, the increased price of fuel, had resulted in the dramatic increases in electricity bills. Advertising campaigns, information on the monthly electric bills and numerous interactions between company executives and media outlets failed to sway public opinion. Having been regularly informed that the engineers and company leaders of the electric utilities understood the technical requirements of the electric power grid better than anyone else, the population reacted negatively toward perceived excuses by this same group of executives. A NEES public affairs director later summarized that perception as “customers were saying ‘Stop whining and do something!’”¹⁷⁷

Other contingent financial and technical challenges affected NEES during this period. In the late 1970s interest rates had almost tripled, eventually reaching a high of 21.5 percent in 1982.¹⁷⁸ At these rates it became more difficult to justify the construction of costly new electric power plants, particularly when the newer plants took longer to build due to the time it took to meet the evolving federal environmental impact and pollution abatement regulations. Yet, the electric utilities could no longer depend on the increased efficiency of newer machines to overcome the construction costs. The most

177. John T. Landry and Jeffrey L. Cruikshank, *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 214-218.

178. The Federal Reserve Prime rate varied between 5 to 6 percent during the early 1970s, rising to 15.5 percent by the end of the decade. See FedPrimeRate.com, “Prime Interest Rate History,” FedPrimeRate.com, The US Prime Rate Lending Site, http://www.fedprimerate.com/wall_street_journal_prime_rate_history.htm (accessed December 16, 2014), and Daniel Yergin, *The Prize, The Epic Quest for Oil, Money & Power* (New York: Simon & Schuster, 1991), 717.

recently built plants suffered from poor reliability compared to the older ones. The steam turbines in the latest constructed facilities operated at higher pressures and temperatures than the previous ones. Unfortunately the turbine designs in the new plants were beyond the ability of the manufacturers to build and the larger turbine generators often failed to meet the advertised performance.¹⁷⁹

At the same time environmental groups throughout the nation were pressuring regulatory bodies to limit the construction of new electric power plants. Nuclear power plants engendered the greatest negative feedback similar to the reaction against the proposed Charlestown plant. However different environmental groups opposed conventionally powered plants as well. In California, the Environmental Defense Fund (EDF) had contested the planning assumptions that the state's public utilities commission and the regional electric utility, Pacific Gas & Electric (PG&E), were making to estimate future power requirements. Often showing greater technical comprehension of how the electric power grid operated in the region than the PG&E operators, EDF had argued with the state regulators to prevent the construction of any new power plants. The EDF contended that conservation and the use of renewable energy sources such as wind and solar power would not only be better for the environment, but would actually be sounder financially for the company and consumers.¹⁸⁰ Similarly, other national environmental

179. Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 55-58.

180. PG&E eventually decided not to build any nuclear plants and its requests for rate increases were continually questioned by EDF. See David Roe, *Dynamos and Virgins* (New York: Random House, 1984), 58, and Richard F. Hirsh, *Power Loss, The*

groups such as the Sierra Club were active, lobbying federal and state officials to minimize nuclear plant construction.¹⁸¹

These trends spread to New England, where both the electric utilities and the environmental groups had noted the arguments and efforts of the other companies and advocacy organizations. The electric utilities had already begun to experiment with other methods of generating electricity using wind and solar power but these early attempts were not very successful. NEES conducted a solar hot water heating demonstration in 1975 with one hundred households in its retail area, determining that the technology was not sufficiently mature to operate effectively during the often inclement New England weather.¹⁸² On Block Island, the National Aeronautics and Space Administration (NASA) built a 110 foot tall wind turbine to generate electric power for the island residents. Designed to power thirty five homes, the turbine suffered from lightning strikes, cracked turbine blades, and interfered with the island's television reception. It was torn down after three years of operation and sold for scrap.¹⁸³ Such efforts gained the utilities some positive good will, but little compared to the irritation caused by the rising prices of electricity. Indeed, the utilities had to fight off an attempt in

Origins of Deregulation and Restructuring in the American Electric Utility System (Cambridge, MA: The MIT Press, 1999), 67-68.

181. Tom Turner, *Sierra Club, 100 Years of Protecting Nature* (New York: Harry N. Abrams, Inc., 1991), 204-207.

182. John T. Landry and Jeffrey L. Cruikshank, *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 221.

183. Paul Davis, "Wind Power, 'Jet age' Windmills Gain Acceptance as a Competitive Source of Energy," *Providence Journal*, September 29, 1992.

Massachusetts to establish a state owned and operated electric utility in 1976, though the voters optioned for the “graft at the bottom” once more and rejected the proposition.¹⁸⁴

NEES required a more effective method to lower its costs and still meet expected electric power demands in a period where the new construction of power plants was going to be very expensive, if even possible. Guy Nichols assigned four capable engineers and managers from the company’s primary departments to reexamine the assumptions on which the company operated, particularly that of load management of the electric power grid. Finding a way to reduce the utility’s peak power requirements could reduce some of the problems the company faced due to the abandonment of the proposed nuclear power plant construction. The “Gang of Four” considered the current operating conditions of high fuel costs and technological stasis as the entering assumptions for future operations of the electric power grid. The planners rejected the traditional method of suggesting new construction of more efficient power plants as a solution to the long term challenge of maintaining a safe, reliable and economical supply of electricity. Instead, efforts to limit the growth of electric power demand would be pursued.¹⁸⁵

184. The political charge to take over the electric utilities seems to recur every generation. See Charles H. Porter, “A Comparison of Public and Private Electric Utilities in Massachusetts,” *The Journal of Land & Public Utility Economics* 7, no. 4 (Nov. 1931): 394, 437-438 and John T. Landry and Jeffrey L. Cruikshank, *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 221 and Michael Harrington, “Who Should Own Massachusetts Power Facilities?,” *Boston Globe*, March 23, 1975.

185. Robert Bigelow, a member of the “Gang of Four” penned the group’s analysis for the IEEE. See John T. Landry and Jeffrey L. Cruikshank, *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 226-229, David Roe, *Dynamos and Virgins* (New York: Random House, 1984), 200-202, and R. O. Bigelow and J. T. Foryman, “NEESPLAN,

Looking forward fifteen years, the NEES planners wanted to avoid building any new electric generation plants, other than those that had been already been paid for, and to reduce the use of foreign produced oil as a fuel. To accomplish these objectives, NEES considered converting its oil-burning plants to burn coal, supporting the search for domestic oil and gas sources and developing alternative sources of electric power generation. More promising to the company's profit margins was the idea of cutting costs by limiting the consumption of electric power. The firm should expend a greater amount of time and vigor on electric power load management and conservation, to drive down the need for additional power plants to support peak electrical loading requirements.¹⁸⁶ Energy conservation actions included the education of consumers regarding attic insulation, efforts to improve electric appliance efficiency, and housing energy audit programs. The load management issue appeared more vexing as it required other organizations to participate. NEES preferred to reduce the overall electric power demand on the utility by prescribing against the use of electric heating in new residences and using other energy sources to reduce the electric power demand for residential air conditioning and heating of water. NEES desired the use of renewable energy sources, including the construction and operation of "small hydroelectric facilities, wood-fired

Long Range Corporate Strategy for a New England Utility," *IEEE Transactions on Power Apparatus and Systems* 101, no. (8 August 1982): 2950.

186. R. O. Bigelow and J. T. Foryman, "NEESPLAN, Long Range Corporate Strategy for a New England Utility," *IEEE Transactions on Power Apparatus and Systems* 101, no. (8 August 1982): 2951-2954.

generators, solid waste-fired generators and wind generators,” but only if the devices incurred no additional costs for the consumers.¹⁸⁷

The shift back to coal as a fuel source was perhaps the largest variable in the proposal. NEES planners were concerned as “Backfitting to meet environmental requirements represents the single largest area of uncertainty and capital cost exposure.”¹⁸⁸ While the Massachusetts Department of Environmental Quality Engineering and the Environmental Protection Agency had initially authorized the conversion of the Salem Harbor and Brayton Point plants back to burning coal, NEES’s Rhode Island power plants still required further analysis by state and federal authorities. To bring the additional coal required to run the plants, NEES should authorize the construction of a specially configured collier to supplant the normal rail lines bringing the fuel to the plants. NEES also needed to monitor the performance of this proposal using the company’s new computer modeling capabilities and a state of the art communications system which was able to converse between major electric power sources. By adopting these recommendations, which came to be known as NEESPLAN, NEES determined that it could avoid costly plant construction and the associated interest payments. The net cost avoidance would save consumers 1.3 billion dollars and reduce capital expenditures by 2.6 billion dollars, making the company more financially secure even as the safety and reliability of the electric power grid was maintained.¹⁸⁹

187. *Ibid.*, 2950-2951.

188. *Ibid.*, 2953.

189. *Ibid.*, 2954-2958.

Not all organizations were satisfied with the utility's concepts. By eschewing the construction of new plants with greater capacity, NEES appeared to be abrogating its duties as a member of the New England Power Pool (NEPOOL) to provide electric power reserves in times of exceptional demand and conduct common planning and operations to increase system reliability and efficiency.¹⁹⁰ Other utilities questioned NEES's planning assumptions and resented the larger company's actions that made them appear behind the times.¹⁹¹ In Rhode Island, the Public Utility Commission was already pushing its own conservation program for the state's electric utilities that was in line with NEES's, so little additional friction was generated.¹⁹²

NEESPLAN was announced approximately one year after PURPA was passed by Congress. Portions of NEESPLAN's promotion of alternate sources of electric power appeared to be in consonance with Section 210 of PURPA, though NEES would have difficulty in promoting renewable energy sources in the near term. While NEESPLAN envisioned the production of one million megawatt hours (MWH) of electric power by

190. ISO New England, "Our History," ISO New England, <http://www.iso-ne.com/about/what-we-do/history> (accessed December 23, 2014).

191. See David Roe, *Dynamos and Virgins* (New York: Random House, 1984), 201-202, and Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 155-156.

192. Much of the Rhode Island Public Utility Commission's proposals for conservation and renewable energy sources anticipated similar ones in NEESPLAN. The methods for system evaluation and financial performance were unique to NEES. See State of Rhode Island & Providence Plantation, *Rhode Island Utility Conservation Program, U-Conserve, Preliminary* (Providence, RI: Division of Public Utilities & Carriers, 1976).

1996, efforts to economically generate this were problematical.¹⁹³ A wind turbine farm in New Hampshire failed to provide reliable power, small scale garbage incineration to make steam declined when trash recycling became more intensive, and small scale hydroelectric dams were limited by location.¹⁹⁴ With the technology of the time, it was probably unreasonable to expect that small scale producers of electric power would be able to seamlessly plug into the existing electric power grid architecture. The large scale plants such as the four units at Brayton Point each produced over 500 MW of power. The independent producers were orders of magnitude smaller than this and did not produce power at the voltage and frequency standards that the grid required.¹⁹⁵ Nor were electrical utility operators excited about incorporating these independent operators into the system and reducing their own share of the benefits and profits from the control of the

193. R. O. Bigelow and J. T. Foryman, "NEESPLAN, Long Range Corporate Strategy for a New England Utility," *IEEE Transactions on Power Apparatus and Systems* 101, no. (8 August 1982): 2954.

194. On the other hand, a home owner installed a small scale "windplant" in Little Compton, RI that was successful, if not inexpensive. The owner sold some of the excess electric power back to Narragansett Electric despite the utility company's initial misgivings on the configuration of the system. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 238, 288-289, and Dana R. Rowe, "Rowland Morgan Says: 'You Too, May Be Able To Sell Power To The Electric Company!,'" *Mother Earth News* no. 49 (January/February 1978).

195. For example the Block Island wind turbine constructed in this time period could generate approximately 350 kilowatt hours of electrical energy in a year. One of the Brayton Point stations was generating more than a thousand times that every hour. Smaller wind turbines could not stand the wear and tear of New England weather. See Paul Davis, "Wind Power, 'Jet Age' Windmills Gain Acceptance As A Competitive Source Of Energy," *Providence Journal*, September 29, 1992.

electric power grid.¹⁹⁶ In this instance legislation was ahead of the technological ability of the system to deliver.

Even as the federal government was gaining new authority to regulate electric power distribution and sales, the state government of Rhode Island was in the midst of its own reorganization. In 1977 the General Assembly passed legislation combining the Department of Natural Resources with the sections of the Department of Health that had focused on environmental health services.¹⁹⁷ The resultant union was renamed the Department of Environmental Management (DEM). Much like its predecessor, the DEM contained an advisory Council on Environmental Affairs while also creating an Environmental Standards Board.¹⁹⁸ The duties and responsibilities of the director of the new agency stressed protection of the state's natural resources as well as their utilization. By emphasizing the human health aspects of environmental issues, such as water and air pollution, the department continued to use the approach of Rachel Carson and not act as a bulwark to support the rights and privileges of other non-human species.¹⁹⁹ The DEM

196. John W. Rowe, "Making Conservation Pay: The NEES Experience," *The Electricity Journal* 3, no. 10 (December 1990): 20.

197. New Release, State of Rhode Island, Department of Environmental Management "Department of Environmental Management, Clean Water Act Celebrate Milestone Anniversaries in October," State of Rhode Island, Department of Environmental Management, <http://www.dem.ri.gov/news/2002/pr/1007021.htm> (accessed December 28, 2014).

198. RI.gov, "Records Relating to Department of Environmental Management," RI.gov, <http://sos.ri.gov/archon/?p=collections/classifications&id=351> (accessed December 28, 2014).

199. State of Rhode Island General Laws, Title 42-17.1, Department of Environmental Management, Section 42-17.1-2, Powers and Duties (1977).

was not specifically tasked to monitor the operation of the electric power grid in the state. However, since numerous electric power plants burned fossil fuels and exhausted waste products into the air or used the waters of the state as a heat sink, the department acquired powers to scrutinize the electric utilities' operations. The DEM also possessed its own enforcement division that it could use to arrest individuals suspected of violating the state's environmental ordinances. These officers had been more focused towards the protection of the state's fish and wildlife but were now available to investigate and help bring to trial violators of the state's environmental laws.²⁰⁰

The Department of Environmental Management's establishment in Rhode Island occurred in parallel with amendments to the Clean Air Act being enacted in Washington. The changes to the law made the car exhaust emission standards more stringent, extended the deadlines for the states to attain the previous federally mandated requirements for air quality standards, and created a new program, the Prevention of Significant Deterioration, to protect atmosphere that was already at a higher quality than the designated values. This last program established specifications for exhaust particulate and sulfur dioxide SO₂, issues that would be of particular concern from the burning of coal to generate electricity.²⁰¹

200. Ibid.

201. David M. Bearden, et. al., *Environmental Laws: Summaries of Major Statutes Administered by the Environmental Protection Agency* (Washington, DC: Congressional Research Service, 2013): 12-13.

A New Wave of Environmental Thinkers: Arne Ness and Deep Ecology

This period produced a number of environmental writers who proposed novel ways of thinking about the environment and how the electric power grid might affect it. The older environmentalists had not disappeared; for example Barry Commoner was busy decrying President Carter's Energy Plan and denouncing the designs for any nuclear power plants.²⁰² This new crop of thinkers profited from the work of earlier environmentalists and offered novel perspectives on how humans fit into the world. These authors would in time affect the manner in which the electric power grid was conceived, operated and maintained, though not necessarily in the same way as the previous critics.

Arne Naess was a Norwegian philosopher who was born in 1912. At the age of twenty seven he was appointed to the Chair of Philosophy at the University of Oslo, a position that he occupied for the next thirty years. During the Second World War he nonviolently resisted the German occupation yet survived to continue similar protests against postwar economic developments in Norway that degraded the environment. In 1972 following his early retirement he gave a speech at the third World Future Research Conference in Bucharest, Rumania, where he first publically postulated his theory on ecological

202. Commoner would run for President in 1980 against Carter as the Citizens' Party candidate. He fared poorly in this election, won by Ronald Reagan, picking up only 234,294 votes from thirty states. See Michael Egan, *Barry Commoner and the Science of Survival* (Cambridge, MA: The MIT Press, 2007), 168-169, and Barry Commoner, *The Politics of Energy* (New York: Alfred A. Knopf, 1979), 66-82.

philosophy. Later in 1973 the contents of his remarks were published as “The Shallow and the Deep, Long-Range Ecology Movement: A Summary.”²⁰³

Naess built on the work of Barry Commoner, Paul Ehrlich, Jacque Ellul and others, but he rejected the use of human scientific reason to suggest a new view of the world and the human place in it. For Naess, “Shallow Ecology,” based on the protection of human life and the prevention of natural resource depletion in the developed world was an insufficient perspective despite its then current popularity. Instead, a new movement, “Deep Ecology,” was required to address the more salient global concerns of diversity, complexity, autonomy, and decentralization.²⁰⁴ In Naess’ five page missive, he proposed seven new objectives for the next step in the environmental movement. Firstly, humans were not to be considered as distinct independent elements in a separate environment, but as part of the entire mixture of organisms on the planet. Neither humans nor other elements could be considered discretely or only in relation to one other element. All the elements were in play. In this regard, though Naess realized that some interspecies dominance was inevitable, “*the equal right to live and blossom* (italics in the original)” was an entitlement to every form of life. Anthropocentrism was rejected as it was harmful to human flourishing as well as deleterious to other life forms. Naess explained that “This quality depends in part upon the deep pleasure and satisfaction we receive from close partnership with other forms of life. The attempt to ignore our

203. Alan Drengson and Yuichi Inoue, eds., *The Deep Ecology Movement, An Introductory Anthology* (Berkeley, CA: North Atlantic Books, 1995), xvii-xviii.

204. Arne Naess, “The Shallow and the Deep, Long Range Ecology Movement. A Summary.” *Inquiry* 16, no. 1: 95.

dependence and to establish a master-slave role has contributed to the alienation of humans from themselves.²⁰⁵ The concept of mutually assured survival, Naess further suggested, was more appropriate than a predator-prey relationship with humans at the top of the food chain. Such recognition of non-human species would in turn foster an acceptance of other human cultures as coequals and not belligerents. This acknowledgement of the diversity of life and human culture would tend to break up the class exploitation within a culture, while the ecological precepts acted to display prudence and caution against any overweening plans.²⁰⁶

Ecologists were cautioned that mere resistance to pollution or conservation of resources was insufficient. In Naess' mind, ecologists should be the gadflies of society, publicizing environmental concerns other than the stresses that only affected humans. The environment was far too complex for simple solutions given the level of human ignorance on the character of interactions between all the members of the environment. Hard technological projects such as large scale electric power plants were seen as a poor choice for the future. New technologies to support environmentally responsible policies would be required; ones not currently funded by the research and development organs of the nation state. In that respect, while such concentration of power of the state might assist technological innovation, decentralization was required to focus on the problems at

205. *Ibid.*, 95-96.

206. *Ibid.*, 96-97.

hand. Too large a centralized bureaucracy insulated the problems from the decision makers, who often would not make an environmentally suitable judgment.²⁰⁷

Taken together, these new objectives suggested alternative manners of thinking about how humans should interact in the environment and with one another. It suggested new norms of behavior that transcended simple cost benefit analysis. Naess acknowledged this, proposing that such a new philosophy centered on ecology, or “ecosophy,” would be necessary to establish the norms required for global harmony. Regional procedures might be more important in the near term, but a global approach was essential.²⁰⁸

Naess’ proposal was nothing less than striking in that he attempted to create a new perspective on ecological comprehension that was informed by ecological science but not limited by it. It proposed ethical equality amongst all life forms, not only the ones humans found convenient at that particular moment in time, and it clearly stated that the practical nature of previous writers was immature. By creating a new “ecosophy,” Naess attempted to circumvent the older languages of conservation and preservation that he felt were inadequate to address the pressing issues.²⁰⁹ A new philosophy to match the

207. Ibid., 97-98.

208. Ibid., 98-100.

209. This is similar to American philosopher Richard Rorty’s concept of a “final vocabulary.” Rorty suggested that much like the Copernican Revolution described by Thomas Kuhn, where European cultures changed as the people in Europe eventually accepted the connected premises of the astronomers and mathematicians, other cultures could be altered by the acceptance of a different more desirable thesis. In this respect Naess was setting an early marker on what such a language might be, only one for viewing life from an ecological versus astronomical perspective. See Richard Rorty,

concept to Deep Ecology, ecosophy was Naess' guide for human actions in the modern world.

Naess wrote his article in the early 1970s but it did not gain much attention in America until the next decade when other authors began to explore the ramifications of his thoughts.²¹⁰ George Sessions and Bill Devall would later push Naess' biological equality to its limits, proposing that humans do not have some greater privilege to take more from the environment than is required for survival. Traditional conservation was flawed in that it retained the concept of human stewardship and mastery over nature. Human self interest to maintain natural resources for future generations was decried as being insufficient to protect the environment. The rights of all species and habitats were as important as any human ones. This more radical calling was not necessarily as popular as the more traditional conservation canon, which may have limited its transmission into the mainstream of environmental movement.²¹¹

Contingency, Irony and Solidarity (Cambridge, UK: Cambridge University Press, 1989), 6-7, 73-74.

210. Alan Drengson and Yuichi Inoue, eds., *The Deep Ecology Movement, An Introductory Anthology* (Berkeley, CA: North Atlantic Books, 1995), xviii-xxiv.

211. De Steiguer suggests that many of the more radical environmental groups took their lead from the political activism encouraged by Naess. Other environmentalists suggested Naess was insufficiently radical. See J. E. de Steiguer, *The Origins of Modern Environmental Thought* (Tucson, AZ: The University of Arizona Press, 2006), 190-196, Steven Stoll, *U.S. Environmentalism Since 1945* (Boston, MA: Bedford/St. Martin's, 2007), 89-92 and Roderick Frazier Nash, *The Rights of Nature, A History of Environmental Ethics* (Madison, WI: The University of Wisconsin Press, Ltd., 1989), 146-151.

Amory Lovins and the Strategy of Energy

Amory B. Lovins was another environmental thinker who considered the effect of the electric power grid. Lovins, an American who was educated at Harvard and Oxford Universities, had left academia when he lost interest in pursuing his doctorate in physics. After a stint with a British environmental group, the Friends of Earth, Lovins began to specialize in energy policy, writing two books, *World Energy Strategies* and *Non-Nuclear Futures, The Case for an Ethical Energy Strategy*.²¹² In the latter book, Lovins suggested that the choice of using nuclear power to generate electricity should not be determined only by technical specifications, but that the ethical concerns of the population were also important.²¹³

In 1976 Lovins penned a new article that focused some of his thoughts. His magazine article “Energy Strategy: A Path Not Taken?” looked at the recent conundrum of the escalation of energy costs and suggested that the current problem solving methodology was insufficient. The official policy of expanding domestic energy resources while minimizing the importation of oil was self defeating:

Conservation, usually induced by price rather than by policy, is conceded to be necessary but it is given a priority more rhetorical than real. Unconventional" energy supply is relegated to a minor role, its significant contribution postponed until past 2000. Emphasis is overwhelmingly on the short term. Long-term sustainability is vaguely assumed to be ensured by some eventual combination of fission breeders, fusion breeders, and solar electricity. Meanwhile, aggressive subsidies and regulations are used to hold down energy prices well below

212. Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 141-142.

213. Amory B. Lovins and John H. Price, *Non-Nuclear Futures, The Case for an Ethical Energy Strategy* (New York: Harper Colophon Books, 1975), xxiv-xxvi, 49-50.

economic and prevailing international levels so that growth will not be seriously constrained.²¹⁴

Using these energy sources to generate electricity in large scale plants was risky as the technology for such endeavors was vulnerable to failure, with incalculable social, economic and environmental costs. Building the larger and more complex electric generation plants also distorted the social relationships where the plants were constructed:

Moreover, the money and talent invested in an electrical program tend to give it disproportionate influence in the counsels of government, often directly through staff-swapping between policy and mission-oriented agencies. This incestuous position, now well developed in most industrial countries, distorts both social and energy priorities in a lasting way that resists political remedy.²¹⁵

Such large scale plants were also inherently wasteful. Heating water to thousands of degrees to make steam only to lose two thirds of the input energy to waste heat seemed a poor method to generate electricity. Other remedies, such as conservation and renewable energy production were not pursued due to a lack of interest amongst the operators of the electric power grid or arcane policies that encouraged consumption and waste.²¹⁶

All told, such a “hard path” towards energy sufficiency was not sustainable. Instead, Lovins proposed a “soft path” for electric energy generation. Rather than building larger and more complex power plants, smaller, less technically demanding devices should be constructed, particularly those that produced electricity from solar or

214. Armory B. Lovins, “Energy Strategy: The Road Not Taken.” *Foreign Affairs* 55 (October 1976): 66.

215. *Ibid.*, 93.

216. *Ibid.*, 74.

wind power. These smaller scale systems would reduce the overhead required by larger scale plants, lower the construction costs for large distribution systems, minimize transmission losses by being closer to the sites requiring the power and be more easily maintained than the more complex power plants.²¹⁷

A more important issue was reducing energy waste. Lovins argued that consumers did not want electricity per se; they wanted spaces that were well lighted and warm. How this was attained was immaterial and ways to reach this goal that were not energy excessive were readily attainable. Moreover many of the technologies to fix such problems were readily available and relatively inexpensive. Greater insulation for living spaces, increased automobile engine effectiveness, and solar powered home heating could provide an almost immediate return on energy savings without breaking anyone's budget. Improving the public's ability to attain these products, either through education or subsidies while limiting the capital expended for larger scale electric power generation would accelerate the "soft path" energy strategy as well as limit the possible environmental damage that the "hard path" technologies might create:

The hard path entails serious environmental risks, many of which are poorly understood and some of which have probably not yet been thought of. Perhaps the most awkward risk is that late in this century, when it is too late to do much about it, we may well find climatic constraints on coal combustion about to become acute in a few more decades: for it now takes us only that long, not centuries or millennia, to approach such outer limits. The soft path, by minimizing all fossil-fuel combustion, hedges our bets. Its environmental impacts are relatively small, tractable and reversible.²¹⁸

217. Ibid., 78-80.

218. Ibid., 88.

While Lovins admitted that either approach produced social and technological stresses, he stated that the soft path approach alleviated some of the social ones by minimizing the concentration of power required to operate and maintain the complex electric energy systems. Regardless of the concern of the proliferation of nuclear weapons, nuclear power was a poor choice to alleviate those stresses while the soft path was more in concert with local values and concerns.²¹⁹ Lovins believed that this switch from the hard to a soft path of energy production would take a generation to accomplish, but could be attained if the United States devoted the resources and motivation to this goal. Bridge technologies would be required, such as more efficient automobiles and better home insulation material to minimize energy wastage, but these were still a preferred solution to the excessive support for the hard path technologies.²²⁰

Unlike Naess whose work took some time to diffuse across the Atlantic, Lovins' ideas received more immediate praise and criticism. Not unexpectedly, advocates of the "hard path" decried Lovins' ideas as being out of touch with the real world of electric power generation and transmission, though other bureaucrats and politicians were more impressed with his ideas.²²¹ While it does not appear that Lovins' ideas influenced

219. Amory B. Lovins, "Energy Strategy: The Road Not Taken." *Foreign Affairs* 55 (October 1976): 93-96, and Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 142-143.

220. Lovins thought the increased use of coal would be necessary though he was concerned regarding the pollution it would cause. He was more prescient on the possibilities of the new gas turbine technology. See Amory B. Lovins, "Energy Strategy: The Road Not Taken." *Foreign Affairs* 55 (October 1976): 75-77, 84-87.

221. Lovins' responses to his detractors were published in book form. "The article was catapulted into prominence by the people who loathed it." See Amory Lovins

federal energy legislation, his thoughts certainly paralleled some of PURPA's allowances for energy generation, particularly the concept of allowing new sources of electric power generation to plug into the grid. Lovins' work was another blow to the Insull strategy of centralization and increased effectiveness through ever larger and more efficient power plants. Instead Lovins was a proponent of a greater number of power sources that would not be as efficient as a fossil fueled plant, even if the overall system would be once transmission losses were accounted for. More importantly, such plants would not produce the environmental damage that the larger plants did with respect to both air and water pollution. Decentralization of electricity generation, and forswearing nuclear power earned him accolades amongst the environmental movement and others. A clear and cogent writer and an energizing speaker, Lovins gained greater acclaim than might have been expected for a public intellectual of his background.²²²

New and Veteran Environmental Groups in the Ocean State

When all of these contingent events were placed in context, they helped establish a particularly fertile setting for the creation of a new cohort of environmentally minded organizations in southeastern New England. The older conservation and nascent environmental thinkers had shown why public action was required to protect the

& His Critics, *The Energy Controversy, Soft Path Questions & Answers*, ed. Hugh Nash (San Francisco, Friends of the Earth, 1979), 1, and Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 143-144.

222. Lovins was only 28 when his article was published in *Foreign Affairs* and was educated as a physicist. See Steven Stoll, *U.S. Environmentalism Since 1945*. (Boston, MA: Bedford/St. Martin's, 2007), 114, and Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 142.

environment. The newer environmentally focused thinkers proposed fresh ways to assess human activity in the world and how that might affect all life, not merely human health. The process of preventing the construction of the nuclear power plant at Charlestown, Rhode Island had shown how these groups might affect public policy. Coincident with the passage of new legislation such as the Clean Air Act and PURPA, the number of citizen organizations grew in response to public concerns regarding the environment and the opportunity to change activities that negatively affected it.

In the next decades a relative explosion in the number and influence of Rhode Island environmental groups was seen. This eruption of environmentally focused civic mindedness followed no single theme except perhaps an American characteristic of forming groups to promote their interests in civil society. In the 1970s fourteen new environmentally focused groups were formed, with approximately three new ones per annum in the successive years.²²³ The early 1980s saw a surge in groups associated with land preservation with groups such as the South Kingstown Land Trust (1983), the Block Island Land Trust (1986) and the Cumberland Land Trust (1989) being established. The missions of these groups were similar; “to conserve and protect the natural resources and

223. This is a difficult number to pin down. Nichols estimates that 27 new groups were formed in the 1980s, 30 in the 1990s and 30 more in the first decade of the new century. With the ebb and decay of these smaller organizations, Nichols suggests that many could have been missed. For example, she did not locate RICE or CCRI in her research. Compared to the seven that had been created up to 1970, this is still a considerable increase in public interest in environmental issues. See Kelly Maree Nichols, “From Climate Justice to Green Business: A Rhode Island Case Study of Current Trends in the Environmental Movement” (Environmental Studies thesis, Brown University, 2009), 32-33, 39-42.

open spaces of our town for the enduring benefit of our community.”²²⁴ Other groups were concerned with watershed protection such as the Narragansett Bay Estuary Program (1986) and The Committee for the Great Salt Pond (1987). The latter’s mission statement again struck a common chord; “To protect and enhance the environmental quality of the Great Salt Pond and its Watershed, including its shoreline and wetlands, and to promote appropriate and productive uses of the Pond’s resources by residents, visitors and local businesses.”²²⁵

While these groups sounded more in concert with older, conservation themes, associations emphasizing environmental justice also began to arise. Organizations such as Ocean State Action (1988) began to push for new achievements above and beyond preservation of property for future generations. Ocean State Action was a “proudly progressive coalition of community organizations, environmental groups, professional associations, and labor unions working together to win public policy and political victories for economic, social and environmental justice.”²²⁶

More important than the increasing number of smaller groups which were typically focused on one particular environmental issue (and arguably a conservation one at that), was the maturation of the Environment Council of Rhode Island (ECRI) as the coordinator of these diverse organizations for action at the state level. Having displaced

224. South Kingstown Land Trust, “Mission,” South Kingstown Land Trust, <http://sklt.org/who-we-are/mission/> (accessed January 4, 2015).

225. The Committee for the Great Salt Pond, “About Us,” The Committee for the Great Salt Pond, <http://www.cgspblockisland.org/about-us/> (accessed January 4, 2015).

226. USAction, “Ocean State Action,” USAction, <http://usaction.org/ri/> (accessed January 4, 2015).

the Rhode Island Wildlife Foundation to become the Rhode Island affiliate of the National Wildlife Foundation, ECRI was institutionally well positioned to act as a champion for many of these smaller groups in their dealings with the state government. With Alfred Hawkes as the guiding light of ECRI in the late 1970s, ECRI was also connected with the new Department of Environmental Management due to Hawkes' previous work with the Department of Natural Resources and as the head of the Audubon Society of Rhode Island. In the late 1970s ECRI was able to influence state policy regarding waste water treatment and invigorating the upkeep of the state's parks and beaches. In the 1980s the organization continued to work with the DEM on water treatment, recycling and protection of the state's wetlands.²²⁷

ECRI was not the only environmental group to grow during this period. The larger environmental organizations in the area, such as the Audubon Society of Rhode Island (ASRI), the Conservation Law Foundation (CLF), and Save the Bay were also strengthened. These organizations became more professional with consistent funding streams and salaried employees with expert credentials well versed in both federal and state environmental legislation. They were connected to other similarly minded organizations that shared all or portions of their vision to protect the environment.²²⁸ Having successfully prevented NEES from building a nuclear power plant in Charlestown, the organizations realized that passionate amateurs were hard pressed to

227. Guy N. Lefebvre and Rick Laferriere, "History," Environment Council of Rhode Island, <http://environmentcouncilri.org/content/history> (accessed July 6, 2014).

228. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 112-114.

maintain the diligence required to carry out the protracted legal challenges that had been necessary to prevail.²²⁹ This increased professionalism was not inexpensive so the organizations had to devote time and energy for fund raising activities. These were aimed at the local population and businesses as well as national foundations to provide revenue streams to support their operations.²³⁰ Rising membership and budgets allowed the groups to achieve some additional successes even if the deeper pocketed electric utility companies were better connected politically and funded. Networking with other similarly environmentally minded organizations to protest nuclear plants being constructed in Seabrook, New Hampshire, Waterford, Connecticut (Millstone) and the existing ones at Plymouth, Massachusetts (Pilgrim) and Vernon, Vermont (Vermont Yankee) the Ocean State organizations gained experience if not additional victories.²³¹ While the groups spent most of their effort on issues only tangentially affecting the

229. Tom Turner, *Sierra Club, 100 Years of Protecting Nature* (New York: Harry N. Abrams, Inc., 1991), 190-191.

230. In this respect it appears that Save the Bay and the Conservation Law Foundation were over the decades able to raise more money from the foundations while the Audubon Society was more supported by the grass roots contributions. See “Annual Reports” for Save the Bay (2011), Audubon Society of Rhode Island (2009) and Conservation Law Foundation (2009).

231. Demonstrations against the Seabrook nuclear power plant would prevent the construction of the envisioned second reactor plant. It did drive up costs and delay completion, eventually causing the lead owner, Public Services of New Hampshire, to go bankrupt. NEES with a ten percent ownership share, refused to throw good money after bad, preferring to allow the project to go under rather than incur greater financial risk. This did generate political ill will from the NH politicians but Nichols, the NEES President, was unwilling to risk penury on this issue. See Conservation Law Foundation, *CLF 40 Years, Protecting New England’s Environment* (Boston, MA: Conservation Law Foundation, 2006): 14-15, and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 233-234.

electric power grid (for example, the CLF sued in Federal Court to prevent offshore oil drilling along the coast of Massachusetts), the organizations continued to develop influence with the local governments and industries.²³²

This new sway became more apparent when the Conservation Law Foundation began to contract for its own studies on the technical requirements of the electric power grid in New England. Partnering with professional engineering consultants, the group questioned many of the assumptions that the electric utilities had used for their future planning and operations of the region's electric power system. In 1987, the group published "Power to Spare, A Plan For Increasing New England's Competitiveness Through Energy Efficiency." The report proposed that investment in energy efficiency would obviate the need to build expensive new plants that added to industrial pollution and damaged the environment. CLF noted in the report that a dearth of information on recent technological advances in energy conservation and generation limited utility and consumer actions, while a lack of capital to invest in these developments prevented the smaller consumer or business from taking advantage of these benefits. The conservative utilities failed to see the advantage from such actions as their managers would rather build new power plants than invest in energy efficiency. CLF advocated for additional investment in energy efficiency by the utilities to help decrease the region's peak energy demands. State regulatory bodies should additionally help the utilities see the benefits from such actions, including requirements for the utilities to engage in "least-cost"

232. See Conservation Law Foundation, *CLF 40 Years, Protecting New England's Environment* (Boston, MA: Conservation Law Foundation, 2006): 7.

planning, changing building codes to improve energy efficiency and reconsider electric power grid operations on a regional basis.²³³ While the report emphasized the economic advantages of such actions, the environmental benefits were not forsaken, as “Virtually every form of electricity generation – oil, coal, wood, nuclear, hydroelectric, wind – requires some trade-off of our air, water, or scenic resources. Efficiency improvements entail no such sacrifices.”²³⁴

Further studies enhanced the organization’s reputation of providing rigorous technical analysis of the electric power grid, though with the intent to limit the environmental damage resulting from the electric power generation, transmission and distribution. In August of 1989, “Rhode Island’s Options for Electric Generation” was issued by the Rhode Island Energy Coordinating Council, a coalition of state agencies (including the Department of Environmental Management and the Public Utilities Commission) and members of the public, local business and the legislature, to emphasize these values. The document indicated that energy efficiency should be the “energy option of the first resort,” with a reduction of peak demand of twenty percent envisioned by 2000. “Renewable fuel” use was the next priority, while the report simultaneously

233. Least cost planning required the utilities to use the least expensive and most efficient power sources first, as opposed to the most profitable ones. Produced with the assistance of the Energy Systems Research Group (nee Tellus) the report uses the methodology similar to one any electrical utility might produce to support new construction. See New England Energy Policy Council, “Power to Spare, A Plan For Increasing New England’ Competitiveness Through Energy Efficiency” (Boston, MA: New England Energy Policy Council, 1987): Executive Summary.

234. New England Energy Policy Council, “Power to Spare, A Plan For Increasing New England’ Competitiveness Through Energy Efficiency” (Boston, MA: New England Energy Policy Council, 1987), 16.

called for any regional electric power needs be met in a “timely, economical and environmentally sound manner.”²³⁵ The report also promoted the use of a wide range of fuels and the use of a siting board for any power plant exceeding 40 MW of electric power generation. The council was equally interested in preventing environmental damage from any new facility. In order to limit any injury to the environment, new generation sources should “minimize the solid waste stream; minimize emissions which contribute to acid rain; minimize emissions of carbon dioxide . . . do not use substantial amounts of high quality water . . . [and] minimize waste water discharge.”²³⁶ The Council believed that Ocean State residents were willing to pay an additional price above and beyond that of the cost of power generation and utility profit to meet these environmental goals.²³⁷

The 1990s were much less dynamic for the Ocean State’s environmental groups, though not any less successful even if the intense confrontations of the Charlestown nuclear power plant were absent. Smaller less dramatic events occurred that showed that the local environmental groups could influence state policy. Prodded by these

235. The authors of the study did not believe these factors were mutually exclusive. See Rhode Island Energy Coordinating Council, *Rhode Island’s Options for Electric Generation*” (Rhode Island Energy Coordinating Council, August, 1989), 41-42, quoted in Armond Cohen, “Retail Wheeling and Rhode Island’s Energy Future: Issues, Problems and Lessons From Europe,” (Boston, MA: Conservation Law Foundation, 1990), 1-2.

236. Rhode Island Energy Coordinating Council, *Rhode Island’s Options for Electric Generation*” (Rhode Island Energy Coordinating Council, August, 1989), 41-42, quoted in Armond Cohen, “Retail Wheeling and Rhode Island’s Energy Future: Issues, Problems and Lessons From Europe,” (Boston, MA: Conservation Law Foundation, 1990), 1-2.

237. *Ibid.*

organizations, Rhode Island instituted a recycling program to help reduce the accumulation of waste in the state's landfills, the Department of Environmental Management banded together with the conservation groups to purchase land important for the region's environment, and fresh water supplies for the state were protected against industrial pollution or were cleaned up.²³⁸ In 1994 a proposal to build three coal-fired power plants in Rhode Island and Massachusetts failed to get past the initial announcement after public protests (with the support of environmental groups such as the Conservation Law Foundation) aborted the scheme. A rising environmental consciousness and the desire to avoid having these pollution sources in their towns motivated the protestors.²³⁹ Plans to construct a new fresh water reservoir in West Greenwich and Coventry were squashed due to poor economic forecasting by Rhode Island combined with federal concerns that the project would harm sensitive wetlands in the state. Save the Bay also cajoled the state to invest over 100 million dollars in the early 1990s to study and then take measures to remedy some of the worst pollution sources feeding into the Narragansett Bay, efforts that significantly lowered the toxins entering the watershed. Conservation actions also resulted in rising deer and fish populations in the state, although some bird and fish species proved resistant to human attempts to increase their numbers.²⁴⁰

238. "The Green Decade A Scorecard: How We're Doing On 10 Key Issues," *Providence Journal*, April 23, 1995.

239. See Conservation Law Foundation, *CLF 40 Years, Protecting New England's Environment* (Boston, MA: Conservation Law Foundation, 2006): 16.

240. "The Green Decade A Scorecard: How We're Doing On 10 Key Issues," *Providence Journal*, 23 April 1995.

Backing for these initiatives in the state budget was not persistent. Governor Bruce Sundlun, the Democratic governor of the state from 1991 to 1995, disregarded a study on reorganizing the Department of Environmental Management and reduced the funding for the organization in 1994. The director of the DEM, Louise Durfee, protested these actions and was replaced. Other environmental proposals were set aside due to reduced financial support.²⁴¹

Land conservation policies continued to attract attention amongst the Rhode Island environmental groups during this period. Over one third of the new environmental groups created in the 1990s in Rhode Island were focused on local land conservation. These groups, often acting in concert with one another and the state Department of Environmental Management, attempted to preserve portions of their communities for the current and subsequent generations of inhabitants. The land trusts often concentrated on areas to maintain the rural nature of their communities, focusing on “open space, streams, ponds, working farms, wetlands, significant historical properties, scenic, and natural sites.”²⁴² For example, in 1996, the Audubon Society of Rhode island, on its way to becoming the state’s largest private property owner, placed 235 acres out of the reach of

241. ECRI suggested Durfee was fired, though other sources state she resigned in protest. See Guy N. Lefebvre and Rick Laferriere, “History,” Environment Council of Rhode Island <http://environmentcouncilri.org/content/history> (accessed July 6, 2014), and “The Green Decade A Scorecard: How We're Doing On 10 Key Issues,” Providence Journal, April 23, 1995.

242. While protection of these areas from any development is noted, there is no particular focus on any feature of the electric power grid is noted. The Town of Foster, RI, Land Trust is illustrative of the common mission statement and goals of state land trusts. See Town of Foster, RI, “Land Trust,” Town of Foster, RI, <http://www.townoffoster.com/landtrust.htm> (accessed April 3, 2015).

future development in the Florence Sutherland Fort & Richard Knight Fort Nature Refuge in Smithfield.²⁴³

The larger environmental groups in the state continued to focus on environmental education for the school age population as well as their teachers. The Audubon Society of Rhode Island instructed 15,000 children in its various programs in the late 1990s.²⁴⁴ Save the Bay worked across all levels of the state education system. The organization worked with University of Rhode Island's Graduate School of Oceanography to plant eelgrass as a method to protect the other species living in the estuaries of Narragansett Bay. The group published educational literature to pass out to the schools, set up its own website for more current material, provided instructor training and curriculum for the schools, and even set up its own summer camp for children. The group was instructing 10,000 people annually towards the end of the decade.²⁴⁵ The main points of such education were in line with Rachel Carson's admonitions of protecting the local environment, though the larger area of the Narragansett Bay required a more expansive perspective. Kayaking and snorkeling in the bay as well as planting eelgrass in the

243. Audubon Society of Rhode Island, "A Brief History," Audubon Society of Rhode Island, <http://www.asri.org/history/history-of-audubon-society-of-rhdoe-island.html> (accessed June 25, 2014).

244. Ibid.

245. Save the Bay, "Our History, 1970," Save the Bay, <http://www.savebay.org/history> (accessed August 9, 2014).

moonlight were more attractive to Save the Bay's members than calculating the subsequent addition to their electric bill.²⁴⁶

The environmental groups continued to make inroads with the state's Department of Environmental Management, which often funded the groups' instructional programs. In 1993, the department established the Alfred L. Hawkes Award for Conservation and Environmental Accomplishment. This accolade was used to note people who had "immeasurably advanced the preservation, protection, and enhancement of the natural resources of our state."²⁴⁷ Other actions with various government agencies appear limited, particularly the Public Utilities Commission. With the utilities acting in concert with many of the Conservation Law Foundation's principles, the smaller environmental

246. Save the Bay was interested in all streams of pollutants entering Narragansett Bay and not merely the pollutants already there. Thus the group acted to limit or eliminate drainage from the worst polluters in the state, protect fish larvae from the suction of the Brayton Point power plants, limit sewer sludge streams, etc. See Save the Bay, "Our History, 1970," Save the Bay, <http://www.savebay.org/history> (accessed August 9, 2014).

247. Award winners in the 1990s included such luminaries as "Al Hawkes, former Executive Director of the Audubon Society of Rhode Island; The Champlin Foundations; the late Senator John Chafee; Louise Durfee, former DEM Director; the late John Lawrence, former Chief of DEM's Division of Agriculture and Resource Marketing; Jane Sherman, Director of the Woonasquatucket River Greenway Project, and John T. Campanini, Jr., Providence city forester and chairman and founding director of the Rhode Island Tree Council." The inclusion of Louise Durfee is interesting given the manner in which she left her position as the Director of the Department of Environmental Management. See State of Rhode Island, Department of Environmental Management, "DEM To Honor Peter Merritt With Alfred L. Hawkes Environmental Award," News Release, RI Department of Environmental Management, 23 May 2000, <http://www.dem.ri.gov/news/2000/pr/0523003.htm>, (accessed April 4, 2015), Save the Bay, "Our History, 1970," Save the Bay, <http://www.savebay.org/history> (accessed August 9, 2014), and Guy N. Lefebvre and Rick Laferriere, "History," Environment Council of Rhode Island, <http://environmentcouncilri.org/content/history> (accessed July 6, 2014).

groups may not have seen this as an important effort compared to other areas of concern and acquiesced to CLF's suggestions regarding the electric power grid.²⁴⁸

Balance of Power in Rhode Island: NEES and the Environmental Groups

NEES was willing to consider these ideas and pressures from the environmental groups despite its previous struggles with these organizations. Having surmounted the challenges of the 1970's energy crisis, the sluggish economy of southeastern New England, labor strife and the ending of its technological dream to own and operate a nuclear power plant, NEES had emerged with some vigor in the later part of the 1980s. Company earnings during the 1980s were usually solid, based on its proactive efforts to lower its costs using less expensive coal as a fuel and conservation efforts resulting from NEESPLAN.²⁴⁹ Its core leadership was accomplished and appeared to have learned from the conflict in Charlestown, RI. NEES leadership was no longer wedded to the old mantra of "build and grow," though old habits were hard to remove from the collective thought of the organization.

NEES was still able to persuade the political organizations in the areas where it provided electric power, though its influence was not as pronounced as it had been in previous periods. At times the company had to balance the concerns of different portions

248. Certainly NEES had reached some level of *modus vivendi* with the Conservation Law Foundation with the various NEESPLANs, thus limiting the slings and arrows it might otherwise have had to absorb. The smaller environmental groups were more interested in local affairs, while the Rhode Island government members were concerned with economic issues, statewide and personal.

249. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 232-233.

of the Rhode Island government. The state had taken longer to recover from the economic slow down in the 1970s, due in no small part to the Navy's departure from the bases along Narragansett Bay. NEES's attempts in the 1980s to promote business growth by offering rate discounts to new industries and discounts to unemployed residential customers were less effective, as was permitting customers to cut down trees on NEES property for firewood. While the Rhode Island Public Utilities Commission approved these plans, other groups in the state bureaucracy were concerned that the utility's "Narragansett Plan" would unduly affect the poor and the conservation of NEES lands.²⁵⁰ The state Attorney General filed suit against the NEES subsidiary, Narragansett Electric, alleging "that there is a complete lack of any competent evidence that would indicate that the plan, even considering it as a two-year experiment, was in the public interest or cost justified."²⁵¹ The Rhode Island Supreme court rejected this plea and NEES continued with its design, though not before time and energy was expended to deal with the state's concerns.²⁵²

As the regional economy improved in the 1980s, the demand for electric power increased with it. This placed the electric utilities in a bind. Having cut their losses by abandoning nuclear power plant construction projects and passed those costs on to the

250. *Ibid.*, 250.

251. The suit was filed during the Joseph Garrahy administration with Dennis J. Roberts as the state's Attorney General. When the suit came for adjudication by the Rhode Island Supreme Court, Arlene Violet, formerly of the Conservation Law Foundation but now the state's Attorney General, argued against the electric company. See *Violet v. Narragansett Elec. Co.*, 505 A.2d 1149 (1986).

252. *Violet v. Narragansett Elec. Co.*, 505 A.2d 1149 (1986).

consumers, NEES was now faced with the dilemma of how to provide the required electric power without building new power plants to generate it.²⁵³ NEES attempted to alleviate these looming shortfalls in a number of ways. The regional electric utility in the province of Quebec, Canada, HydroQuebec, had a surplus of power that it was willing to sell. This required the construction of extensive transmission lines between Canada and New England, mainly through Vermont and New Hampshire, to bring the power south. Surprisingly there was little resistance to the construction of these transmission lines to connect the Canadian power plants to the NEEPOOL electric power grid, permitting NEES to yearly obtain upwards of three billion kWh of energy starting in 1986.²⁵⁴

Conservation and power generation from alternate energy sources appeared as another method to limit the potential power supply deficiency. As part of NEESPLAN, NEES had pledged to buy 200 MW of power generated by alternate means while supporting efforts to conserve energy waste.²⁵⁵ In the mid 1980s the new president of

253. As the Rhode Island Attorney General, Arlene Violet had filed suit against the Federal Energy Regulatory Commission (FERC) to prevent the utilities recovering their costs of the nuclear plants (in this case the Pilgrim II plant in Massachusetts) that had not been constructed on the back of the consumer. The U.S. Court of Appeals rejected this argument saying the companies' decisions appeared prudent based on the information that was known at the time. Sheldon Whitehouse, a future Rhode Island Senator, assisted on the case. See Arlene Violet, Attorney General of the State of Rhode Island and the Rhode Island Division of Public Utilities and Carriers, Petitioners, v. Federal Energy Regulatory Commission, Respondent, New England Power Company, Intervenor, 800 F.2d 280 (1986).

254. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 235-38.

255. R. O. Bigelow and J. T. Foryman, "NEESPLAN, Long Range Corporate Strategy for a New England Utility," *IEEE Transactions on Power Apparatus and Systems* 101, no. (8 August 1982): 2954.

NEES, Samuel Huntington, issued an updated strategy to accentuate these actions.²⁵⁶ NEESPLAN II was developed with input from the Conservation Law Foundation to continue cost avoidance through electric power conservation while continuing to emphasize electric power production from cogeneration, small scale hydro electric plants, wind turbines and other sources. The economic viability of these small scale power plants was always tenuous. The declining fuel costs of the early 1980s made many of these plants too costly to operate, yet NEES had to bid for their services when the economy began to expand in the late 1980s.²⁵⁷

In some ways the actions by NEES were counterproductive. By 1989 the budget for Conservation and Load Management (C&LM) at NEES had risen to 40 million dollars and was threatening to limit the company's profits. The President of NEES, now John W. Rowe, coordinated with CLF to propose an increase in the company's efforts, but with the proviso of the company being able to recoup a greater portion of the savings as future profits.²⁵⁸ Despite previous friction regarding the construction of nuclear

256. Huntington, a lawyer by education, had ascended to the position following Nichols retirement in 1984 to become the Chairman of the Board of the Woods Hole Oceanographic Institute. Huntington had been on the team that had defended the Rhode Island State Supreme Court's decision supporting the state Public Utilities Commission to the U.S. Supreme Court in 1977. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 237, 281, and Obituary of Guy A. Nichols, *Boston Globe*, June 22, 2014.

257. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 238.

258. Huntington had died in 1988 when he was hit by lightning while hiking in Colorado. He had been "attending the annual energy policy forum at the Aspen Institute for Humanistic Studies." Rowe was a lawyer that had been selected to become the

power plants in New England, the combined position of the electric utility and the environmental group was convincing to state regulators. The Rhode Island Public Utilities Commission stated that the NEES plan was “innovative, comprehensive and bold in its expectations in reducing energy consumption and consequently avoiding or deferring the need for new generation facilities. The Commission reiterates its support for C&LM programs. . .”²⁵⁹ Massachusetts and New Hampshire regulators concurred and NEES planned to double its spending on conservation and load management to 85 million dollars, leading to up to 150 million dollars in expected savings by 1993.²⁶⁰

While these actions did serve to limit the need for new power plants that would pollute the environment, and, hence, were a positive feature for both environmentalists and regulators, such actions were not without risks and upfront costs. They tended to raise electricity costs for all consumers, limited opportunities for businesses to exploit, reduced revenues for the utilities and subsequently the tax streams to the state and local

President by a board of NEES executives. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 225, 239, Obituary of Samuel Huntington, “Executive for Utility,” *New York Times*, July 28, 1988, and Exelon, “Exelon's John Rowe Receives EEI's First-Ever 'Distinguished Leadership Award' for 25 Years' Service,” Exelon, http://www.exeloncorp.com/Newsroom/pr_20090107a.aspx (accessed January 23, 2015).

259. R. I. Pub. Util. Comm., Report and Docket No. 1939, 16 May 1990, quoted in John W. Rowe, “Making Conservation Pay: The NEES Experience,” *The Electricity Journal* 3, no. 10 (December 1990): 19.

260. John W. Rowe, “Making Conservation Pay: The NEES Experience,” *The Electricity Journal* 3, no. 10 (December 1990): 19.

governments, and were difficult to explain to stockholders if they were not profitable.²⁶¹ In order for conservation to work it had to be profitable for the electric utility; “the rat has to smell the cheese” as the NEES president, John Rowe, liked to state.²⁶² The utility had to be able to plan for a set profit percentage based on these avoided costs from conservation, or it would not be worth the effort.²⁶³ Without such incentives, neither the utility nor the consumer of electricity would be motivated to try and achieve some greater good, no matter how noble. Rowe cautioned that “A utility with an opportunity to earn is far more effective – particularly in novel areas – than one wincing under new interpretations of the duty to serve.”²⁶⁴ Only if incentives were properly focused and proportionate to the public gain and utility risk could new social policies be implemented.²⁶⁵

State utility regulators were uneven in their response to Rowe’s notices. While supporting NEES conservation actions, Rhode Island required that half of the electric utility actions be taken without any profit before any incentives would take effect. Massachusetts and New Hampshire were more uneven, limiting NEES’s ability to take

261. Rowe also suggested that “Few businesses or bureaucracies wish to shrink their opportunities. (Yes Virginia, it is really is un-American.)” See John W. Rowe, “Making Conservation Pay: The NEES Experience,” *The Electricity Journal* 3, no. 10 (December 1990): 19.

262. Ibid.

263. Ibid., 22.

264. Ibid., 25.

265. Ibid.

full advantage of the proposed savings.²⁶⁶ Regardless of the regulatory response to the NEES and CLF proposal, the electric utility still had to efficiently operate the existing electric generation stations in order to meet the new conservation and demand goals. This proved more difficult than any organization could envision as the confluent stresses of technological stasis, action by environmental organizations, economic uncertainty and regulatory changes prevented a long lasting solution to the problem. With the assumption of NEESPLAN II that replacing conventional power plants with newer designs would be cost prohibitive, keeping the older plants running became vital.²⁶⁷

The Travails of Brayton Point

The units at Brayton Point should have been the easier part of the solution to maintain the electric power grid in southeastern New England running with high reliability and efficiency. There were four separate plants at the site in Somerset, Massachusetts that had been built in the 1960s and 1970s. The plants were designed to provide a total of 1500 MW of electric power to the states of Rhode Island and Massachusetts. Units 1 and 2 had been constructed to burn coal as their energy source while unit 3, constructed in the 1974, was initially built as an oil burning power plant. Unit 4 could burn either oil or natural gas. In the 1960s units 1 and 2 had been converted to burn oil when the price of that fuel was low.²⁶⁸ In the 1970s when oil prices had

266. Ibid., 23.

267. John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 238.

268. See 1993 New England Electric System Securities and Exchange Commission Report, Washington, DC, Securities and Exchange Commission, March 28,

increased rapidly and unexpectedly, plans to convert units 1, 2 and 3 to burn less expensive coal were incorporated as part of NEESPLAN.²⁶⁹ During the first years of the 1970s the plants did burn coal but ceased in 1974 after the end of the Arab oil embargo and NEES was fined by the EPA for numerous pollution violations.²⁷⁰ Finding some method to burn inexpensive coal while meeting federal and state air quality standards to keep the plants running at their optimum efficiency became a long running challenge of immense difficulty for the NEES directorate to solve.

This proved much more challenging than expected for a number of reasons. The actual conversion of the plants was relatively easy. Units 1 and 2 had burned coal before; all that was required was to bring the boilers back into service using updated coal feed systems. This conversion did require more coal to be supplied to Brayton Point. Bringing coal to the location was possible using rail or sea transport, and NEES contracted the construction of a new collier, the *SS Energy Independence*, to bring this fuel to the site.²⁷¹

1994, and John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 180.

269. R. O. Bigelow and J. T. Foryman, "NEESPLAN, Long Range Corporate Strategy for a New England Utility," *IEEE Transactions on Power Apparatus and Systems* 101, no. (8 August 1982): 2951-2954.

270. Jerry Ackerman, "Easing of Pollution Standards is Urged," *Boston Globe*, February 13, 1979.

271. The ship, launched in Quincy, MA, in 1983, was christened by Mildred (Miller) O'Neill, the wife of the US House Speaker Thomas P. O'Neill Jr., a Democratic Representative from Massachusetts. See Paul Langner, "Coal_Powered Ship Launched in Quincy," *Boston Globe*, July 10, 1983.

The transportation of fuel and conversion of the plants were complicated problems but well within the business and engineering expertise of the utility to solve. Getting the required regulatory permissions to burn a different fuel was more difficult, particularly with the new pollution requirements of the Clean Air and Clean Water Acts and the EPA's enforcement of these regulations. The state regulatory bodies, the Department of Environmental Management (DEM) in Rhode Island and the Department of Environmental Protection in Massachusetts were also concerned with how the electric utility planned to burn coal.²⁷² NEES would spend much of the next decades in conflict with federal, state and local government agencies and local environmental groups over the allowable levels of air pollution from Brayton Point while attempting to ensure the continuity and reliability of the electric power grid.

Depending upon the state of the economy and which administration was in power in Washington, the EPA could weigh in for either side of the engagement. In the mid 1970s NEES gained waivers to Massachusetts' regulations on emissions standards to burn coal at the Brayton Point plants, though not for the duration requested.²⁷³ Later the Massachusetts Division of Air Quality Control set up sensors around the coal burning plants in the state to monitor sulfur emissions. When the sensors detected out of specification readings, the electric utilities had to switch to lower sulfur content fuels.

272. Thomas Oliphant, "NE Utilities' Shift to Coal Not as Simple as Federal Officials Had Hoped," *Boston Globe*, 10 February 1974.

273. NEES wanted a five year waiver but this was denied. The Massachusetts Public Health Council and Environmental Protection Agency also disproved the request to burn coal at the NEES plants in Salem, MA, though would acquiesce later. See "N.E. Power Gets Nod To Burn Coal At 1 Plant," *Boston Globe*, May 17, 1974.

Brayton Point was not permitted to burn the less expensive higher sulfur content fuels, which affected the NEES bottom line.²⁷⁴ With the arrival of the Carter administration in 1977, the Federal Energy Administration advocated the use of coal to help reduce some of the nation's dependence on foreign oil. This was proposed even with the knowledge that coal would cause greater air pollution when burned and stress the air quality of the region. Federal authorities looked to the electric utilities to pay for the additional pollution abatement devices and the alterations necessary for the power plants to burn lower sulfur content (and less polluting) coal.

The utilities were not averse to such matters, but disagreed with the federal cost estimates, arguing that being ordered to burn coal instead of oil was not economical. "We want to be flexible, and right now, it doesn't seem to us that environmental considerations would allow economic use of coal," argued one NEES official.²⁷⁵ On the other hand, the EPA declared the air quality around the Fall River, MA area to be a hazard to public health, a decision which precluded the use of coal and also undercut the other federal agencies' desire to burn coal as a domestic fuel.²⁷⁶ The two federal agencies struggled to find a solution to this impasse for two years. While local residents complained that ash from the plants damaged their property and utility officials lobbied

274. Jerry Ackerman, "High Sulfur Fuel Monitored Constantly, Saving Energy Dollars – At a Price," *Boston Globe*, May 16, 1976.

275. See Associated Press, "Administration Urges Coal Use," *Boston Globe*, 22 march 1977, and Jerry Ackerman, "The Coal Conundrum: To Save On Oil And Gas, N.E. Power Plants Could Get OK To Burn Dirtier Fuel," *Boston Globe*, October 15, 1976.

276. Jerry Ackerman, "Law Forcing Hazard Rating for Air in SE Mass.," *Boston Globe*, April 13, 1977.

for less stringent air pollution standards, the federal and state bureaucrats tried to come to some compromise that would allow the units at Brayton Point to use coal as a fuel. In 1979, federal and state authorities came to the conclusion that NEES would be permitted to burn coal at the Brayton Point plants if the utility would install electronic precipitators on the smokestacks to remove ash from the smoke and alter the plant boilers to limit air pollution. NEES also agreed to only burn low sulfur coal to limit pollution, precluding the requirement to install 100 million dollar “scrubbers” on the smokestacks.²⁷⁷

This agreement should have been sufficient for NEES to attain the most efficient alterations to the Brayton Point power plants to meet the air quality requirements of the EPA and still be able to use the most economical fuel source. However, not everyone was satisfied with the agreement. Some environmental groups were concerned that the creation of carbon dioxide gas from the plant would accelerate the “green house” effect on the world. Others were worried that the lack of sulfur-dioxide abatement equipment at the plants was as poor an idea as burning coal. Massachusetts Senator Paul Tsongas wrote that "Given what we know about the short- and long-term environmental impacts of coal, that option should be avoided."²⁷⁸ When NEES attempted to attain a waiver to burn coal at its Salem plants, the Conservation Law Foundation threatened to sue, stating

277. Units 1, 2 and 3 were converted. Unit 4 was “technically unsuited” to burn coal and continued to burn oil or natural gas. See Jerry Ackerman, “The Economy: Brayton Point Gets Coal OK,” *Boston Globe*, March 3, 1979.

278. Bruce A. Mohl, “New England Power Seeks a Clean Way to Use Coal,” *Boston Globe*, July 22, 1980.

that the application was “totally contrary to the intent of the law.”²⁷⁹ Eventually both Rhode Island and Massachusetts rejected NEES proposals to burn coal in its other power plants, as the federal decision to permit coal burning at Brayton Point did not cover the utility’s other facilities.²⁸⁰ Even the use of higher sulfur content coal at Brayton Point was challenged by CLF in 1981 after the plant had violated air quality specifications.²⁸¹

NEES could manage the litigation against Brayton Point while maintaining efficient and effective operation of the electric power grid as long as the power plants were operating. This was also a problem during the 1980s as several of the power plants required extensive modification or repair, apart from the alterations to burn the least expensive fuel. In 1983, the turbine blades in the high pressure turbine generator at unit 3 broke off, causing significant damage to the generator. This took six months to repair amidst recriminations between NEES, the turbine manufacturer, the Westinghouse Corporation, and the public utility commissions of Rhode Island and Massachusetts. In the meantime, NEES had to spend almost 20 million dollars to buy electric power from other NEPOOL members to make up the difference, with the consumers paying for the repairs.²⁸² A coal silo accident shut down unit 3 in 1985 for another six months, costing

279. Gary McMillan, “Suit to Block Utility Coal-Burning Planned,” *Boston Globe*, November 27, 1980.

280. Jerry Ackerman, “King Rejects Utility Request to Use Salem Coal,” *Boston Globe*, February 2, 1981.

281. “New England News Briefs; Environmentalists File Suit,” *Boston Globe*, July 16, 1981.

282. Rhode Island and Massachusetts taxpayers also paid the legal fees for the suits the states filed against NEES for negligent behavior. See Bob Wyss, “Mistake,

slightly less than 2 million in substitute energy payments while the silo was examined and repaired.²⁸³ Then in 1986 the turbine generator in unit 3 had to be secured once again after the huge machine began making “unusual noises.”²⁸⁴ Even the sea lines of communications required for the coal supply to Brayton Point proved tenuous. In 1983, one supply ship sunk in transit to the site and the SS *Energy Independence*, NEES’s custom built collier, broke down in port in 1984 requiring extensive repairs.²⁸⁵

As these shutdowns occurred primarily in the summer months when peak electric power demand was stressing the electric power grid, the loss of ten percent of NEES’s generating capacity was difficult to replace. Heat waves stressed the system as customers turned on their home air conditioners, causing voltage reduction “brown outs” when demand exceeded the electric power grid capacity.²⁸⁶ Since the expected nuclear power plants had not been built and the remaining older plants suffered dependability problems, this was a difficult problem to solve. NEES engineers and contractors attempted to keep Brayton Point unit 3 running, but “Breakdown Point” reliability was problematical.

Coverup At Brayton Point Cost Customers \$19.8 Million, R.I., Mass. Officials Say," *Providence Journal*, April 21, 1985.

283. "Electricity Prices Frozen by PUC for Next 3 Months Narra. Electric to Begin Recovering Losses from Accident," *Providence Journal*, January 4, 1986

284. "Turbine Breaks Again At Brayton Point Plant Previous Down Time Has Caused Higher Electric Bills," *Providence Journal*, August 29, 1986.

285. William P. Coughlin, "Coal Ship Broken Down; One-Year-Old Collier Served Two N.E. Power Plants," *Boston Globe*, September 12, 1984.

286. See Associated Press, "Power Shortages in Heat Wave Ruled Just Coincidences State Says Utilities Should Act to Avoid Recurring Shutdowns," *Providence Journal*, 4 August 1987, and William J. Donovan, "Region's Power System Stays Cool in Heat Wave," *Providence Journal*, 28 July 1989.

Eventually, NEES had to completely redesign the plant, institute new maintenance and training standards and even operate the unit at a lower capacity to keep it running.²⁸⁷ NEES still was profitable during this time period due to the conservation efforts of NEESPLAN and lowering fuel costs from burning coal and smart business practices. The company was not able to produce new sources of electric power in the manner it preferred, that of building newer and more efficient power plants. This was a concern for NEES officials as the company management believed that electric power demands would continue to expand in southeastern New England without a method for NEES to meet them. With power plant construction taking a decade or longer, new plants had to be planned for and started soon to meet expected demands.²⁸⁸

Preventing the Next Energy Crisis

A number of factors prevented this looming “crisis” from occurring. The first was a technological development. The 1980s saw the maturation of gas combustion turbine technology applied for use as electric power generators. Gas turbines had previously been used as a means for propulsion both in aircraft and ships. Government and industrial research led to technical advances that increased turbine efficiency and overall generator capacity. Combining natural gas burning turbines with steam plants

287. Unit 3 was operated at 580 MW instead of the design capacity of 650 MW. Running at a lower capacity reduced the number of shutdowns due to equipment malfunctioning, though it further reduced NEES’s contribution to the electric power grid. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 238-240, 289.

288. See Peter Navarro, “The Coming Electric Crisis,” *Wall Street Journal*, 17 October 1984 and Bob Wyss, “NEES President Says Demand May Spur Need for a New Power Plant,” *Providence Journal*, April 24, 1985.

allowed designers to reuse the exhaust gases of the gas turbine to heat steam and power another steam driven turbine in a “combined cycle” unit. Injecting some of the steam into the exhaust gas of the gas turbine caused the unit to produce fewer nitrogen oxides, limiting the pollution from the plant and making it easier to meet the EPA standards.²⁸⁹ Such cogeneration plants were easier to construct, but high natural gas fuel costs limited construction until the late 1980s. Combined with the relaxations from PURPA for cogenerators, this technology now seemed poised to be used as a method to supplant the aging electric power plants in the northeast.²⁹⁰

NEES was not the first company to exploit this possibility. In 1987, a new company, Ocean State Power, began negotiations with the town of Burrillville, Rhode Island, to build a 250 MW cogeneration plant.²⁹¹ Far away from the Narragansett Bay watershed, this design did not require the waters of the bay to cool the exhaust of the plant, a convenient heat sump that had been used extensively by other power plants with subsequent environmental damage to the bay. Designers would later double the size of the plant’s generating capacity by adding an additional gas turbine steam plant

289. By 1990 General Electric Corporation gas turbines had reached 50% energy conversion efficiency while the combined gas turbine steam turbine plants were operating at over 60%. See Vaclav Smil, *Transforming the Twentieth Century*, (New York: Oxford University Press, 2006), 75-79.

290. Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 105-108.

291. Thomas S. Brown, “Hearing Set On Plan To Limit Power Plant Taxes \$21.7 Million Proposal Would Stretch Over 10 Years For Energy Project,” *Providence Journal*, November 16, 1987.

cogeneration unit.²⁹² NEES took notice of Ocean State Power's activities, later buying a 20% interest in the company.²⁹³

NEES also looked at the opportunities from gas turbine technology to meet the need for new power plants to replace the aging, less efficient and more polluting plants it did own. Previous attempts by NEES to identify sites for new electric power plants had not been encouraging. Numerous pollution problems at its existing plants had resulted in negative reactions by state government and environmental groups. The Rhode Island Department of Environmental Management had cited NEES for violating pollution standards at both of its electric power plants in Providence.²⁹⁴ The Audubon Society of Rhode Island had resisted NEES efforts for long term waivers to burn high sulfur content oil at these plants, concerned that the emissions would further contribute to acid rain pollution in the region.²⁹⁵ New construction proposals, including several coal burning power plants, had languished as the state leadership in the regulatory bodies demanded additional assurances that the new plants would not be harmful to the environment.

292. Ocean State Power, "Facility Highlights," Ocean State Power, http://www.transcanada.com/docs/Our_Businesses/Ocean_State_Power_Plant_Fact_Sheet.pdf (accessed February 2, 2015).

293. "New England Electric System," Securities and Exchange Commission Report, Washington, DC, Securities and Exchange Commission, March 28, 1994, 25.

294. Peter Lord, "Pollution Of Waters In R.I. Attributed To Lazy Enforcement," *Providence Journal*, January 15, 1985.

295. Scott Mackay, "Narragansett Electric wants to keep burning high-sulfur oil at plant," *Providence Journal*, April 22, 1986.

NEES continued to examine the possibilities, looking at four potential sites in its distribution region to build new plants to meet the rising power demand.²⁹⁶

In 1988 NEES had concluded its analysis and applied to construct a “new” electric generation plant in Providence, Rhode Island. In this case, the utility planned to build a new plant at one of its oldest sites. The Manchester Street station in Providence had been used to generate electric power for over seventy years, initially powering the trolley cars of the city for the United Electric Railways (UER). NEES had selected the site based on governing factors of “limited environmental and social impact, access to sufficient water supplies and good transportation, proximity to transmission line corridors, ability to use multiple types of fuel supplies, and cost effectiveness.”²⁹⁷ NEES proposed shutting down the plant’s older steam powered turbines and replacing them with three combination steam/gas turbine plants similar to the ones being constructed in Burrillville. The reconfiguration would increase the site’s capacity by a factor of three. The new plants burned cleaner natural gas though they would also be able to burn oil as well in the case of an emergency. The site required additional cooling water from the Scituate reservoir as well as new transmission lines to handle the greater plant output.

296. Demand had been predicted at 1.3 % per year but had risen by 4-5% despite the efforts to conserve power use. See Bob Wyss, “Utility Company Eying Plant Sites New England Power Wants 2 More Stations To Help Meet Demand,” *Providence Journal*, June 3, 1987.

297. “More Electrical Capacity For An Expanding Economy,” *Providence Journal*, April 7, 1988.

The engineers and managers of NEES estimated the plant could begin construction by 1992 with a completion date in 1995.²⁹⁸

Rhode Island political leadership was enthusiastic with this proposal. The governor, Republican Edward D. DiPrete and the mayor of Providence, Democrat Joseph Paolino, both proclaimed that the new plant would assist economic growth in the state as well as support the tax revenue of the city.²⁹⁹ Many complicated construction issues took time to resolve. NEES officials worked with state and city officials to alleviate community concerns regarding the construction of larger natural gas lines to power the plant. The Environmental Protection Agency investigation of exhaust pollution from plant stacks had to be conducted. A new law to permit the electric utility to fill in some of the shoreline near the plant for construction, finding water sources to cool the plant, or dealing with the rise in temperature in the Providence River from the cooling water all occupied the planners' timetable for resolution.³⁰⁰ The Conservation Law Foundation

298. The Manchester Street station had a maximum output of approximately 140 MW while the nearby South Street station could generate another 110 MW. The plants used 200,000 gallons of cooling water per day from the reservoir and would require 600,000 as the water from nearby Narragansett Bay was considered unsuitable. See Bob Wyss, "Utility to Propose Constructing New Electric Generating Plant in Providence," *Providence Journal*, April 5, 1988, Bob Wyss, "Despite Hurdles, Key Officials Are In Favor Of Power Plant Plan," *Providence Journal*, April 6, 1988, "More Electrical Capacity For An Expanding Economy," *Providence Journal*, April 7, 1988, and 1993 New England Electric System Securities and Exchange Commission Report, Washington, DC, Securities and Exchange Commission, 28 March 1994, 20, 39-40.

299. Bob Wyss, "Despite Hurdles, Key Officials Are In Favor Of Power Plant Plan," *Providence Journal*, April 6, 1988.

300. See Ken Mingis, "State Law May Delay Proposed Power Plant," *Providence Journal*, April 28, 1992, and Bob Wyss, "Plan to Build Gas Pipeline Stirs Debate," *Providence Journal*, April 22, 1989, "Plant's Impact Outlined in Plan," *Providence*

worked with NEES for conservation efforts, including the utility's partnership with the Rhode Island government to install energy efficient lighting systems to reduce the overall load on the grid.³⁰¹ Opposition to the plant licensing over the next four years before construction began was very limited. Unlike the proposed Charlestown nuclear power plant, no coalition of the community opposition and veteran legal firms rose to oppose the construction. NEES was able to satisfy all of the state and federal agencies that their new plant would meet or exceed all environmental regulations. Construction of the new Manchester Street power plant began in 1992 and was completed in 1995. Once the gas turbines at the plant came on line, they were more efficient and powerful than their design specifications while putting fewer pollutants into the environment.³⁰²

With the similar combined cycle power plant coming on line in Burrillville, over 1000 MW of new generating capacity was added to the electric power grid in Rhode Island, sufficient to keep up with expected power demands to the late 1990s.³⁰³ At the

Journal, December 3, 1989, and "Utility Wants Unrestricted Use Of Oil As Backup," *Providence Journal*, June 25, 1990.

301. Bob Wyss, "Utility, Activists Plan Ahead Proposal would Save Up to 300 Megawatts by '91," *Providence Journal*, January 24, 1989.

302. The adjacent South Street Station was decommissioned in the process. See Joanna M. Doherty, and Matthew A. Kierstead, "South Street Station," National Register of Historic Places, National Park Service, United States Department of the Interior, July 2004 / August 2005, and Taylor Moore, "Repowering As A Competitive Strategy," *EPRI Journal* (Sept/Oct 1995): 6-13, and Power Engineering, "V84.2 Turbines Exceed Guarantees," *Power Engineering*, 1 November 1996, <http://www.power-eng.com/articles/print/volume-100/issue-11/field-notes/v842-turbines-exceed-guarantees.html> (accessed February 15, 2015),.

303. Additional power from Hydro Quebec and other nuclear power plants coming on line assisted this power surplus. See William J. Donovan, "Power Supply 'Adequate' Until '95," *Providence Journal*, March 7, 1990.

same time that these large scale electric power plants were coming on line, Energy Management, a Massachusetts firm, also took advantage of the “cogeneration and small power” production facilities allowances from PURPA to construct a new facility. In 1988 the firm announced plans to build a natural gas fired 55 MW plant in Pawtucket that would generate electricity as well as provide steam to Colfax Inc., a company that produced cooking oil.³⁰⁴ The firm gained its permits from the Department of Environmental Management as well as a contract to sell its electricity to New England Electric System.³⁰⁵ The Public Utility Commission supported the plant due to its high efficiency.³⁰⁶ The company did require additional water mains to be built to supply the cooling water for the plant condensers, but that feature was approved by the state agencies as well.³⁰⁷ There appears to have been little opposition from any of the state environmental groups, perhaps again because the plant was located away from Narragansett Bay. When the plant was completed in 1990, it was able to provide power for up to 30,000 homes. Since the plant burned natural gas, it was much less harmful to the atmosphere than the larger coal-fired plants.³⁰⁸

304. Dean Starkman, “Bay State Company Plans Power Plant With \$50 Million Price Tag In Pawtucket,” *Providence Journal*, February 4, 1988.

305. Gerald M. Carbone, “Gas-Fired Power Plant Sails Toward Approval In Manufacturing Zone,” *Providence Journal*, January 26, 1989.

306. Suzanne Espinosa, “Zoners Clear Way For Gas-Fired Plant,” *Providence Journal*, February 8, 1989.

307. Scott Freeman, “Plant That Will Generate Electricity, Churn Out Steam Is Half Complete,” *Providence Journal*, May 4, 1990.

308. Thomas McCoy would have been pleased that Pawtucket finally got its own power plant, particularly since the facility was designated as not being an electric utility

Disturbing the Equilibrium

The period of the late 1980s and early 1990s saw a large number of power plants being proposed for construction in the Ocean State. These applications varied from the tried coal burning steam powered plants, to trash burning facilities, wood chip fired boilers and combined gas turbine steam plants generating from less than 10 MW to over 500 MW.³⁰⁹ "Why these are all appearing in Rhode Island is a question that I don't have any direct answer for, but I can tell you it is not, in any shape or form, because Rhode Island has lower standards or is an easier place to get sited," stated the Rhode Island Public Utility Commissioner, James J. Malachowski.³¹⁰ Within the boundaries of the PURPA regulations, any company could now propose new electric generating facilities and still connect into the electric power grid. These facilities were often more efficient and less polluting than the ones they replaced, allowing the utilities and the environmental groups to find common ground. The less expensive electricity assisted other economic activity in the state and the subsequent tax revenue increases dear to the political realm. Most of the proposed power plants were not constructed (only three of

by the RI Public Utilities Commission. Without a monopoly status, the parent company escaped some of the regulatory oversight of the state. See Scott Freeman, "Plant That Will Generate Electricity, Churn Out Steam Is Half Complete," *Providence Journal*, May 4, 1990, and Christopher Beall, "Power Plant Ruled Not Public Utility PUC Won't Judge No-Coal Ordinance," *Providence Journal*, June 30, 1989.

309. See U.S. Energy Information Administration, "Rhode Island, State Profile and Energy Estimates," U.S. Energy Information Administration, <http://www.eia.gov/state/?sid=RI#tabs-4> (accessed February 16, 2015), and Bob Wyss, "A Surge in Power-Plant Plans for R.I. Electricity Shortage Spurs Developers; Communities Wary," *Providence Journal*, May 28, 1989.

310. Bob Wyss, "A Surge in Power-Plant Plans for R.I. Electricity Shortage Spurs Developers; Communities Wary," *Providence Journal*, May 28, 1989.

the seventeen being considered in 1989 were ever built though several existing facilities were upgraded) but it appeared as if a new equilibrium between the electric utility companies, the state government and the environmental organizations was being established. The utilities learned to interact with the professional environmental groups that could recite industrial requirements and environmental regulations as well as the electrical engineers in the electric utilities. Environmental standards were viewed as simply another set of regulations to be met by the utilities, and not a calling from a higher moral authority. Conservation could even be profitable, as long as the “rat” did get its “cheese.”

Other contingent aspects of the period, particularly the political leadership of the state, should be considered regarding the relative lack of friction between the three groups. Republican Edward D. DiPrete replaced J. Joseph Garrahy as the state governor following the 1984 election. DiPrete was viewed as being more favorably inclined to assist the siting and construction of new electric power plants. Along with the state legislature, DiPrete established a new Energy Facility Siting Board in 1985 to expedite the licensing of electric power plants with a greater than 80 MW capacity. Together with the Energy Coordinating Council that had been created in 1979 by Garrahy, the Rhode Island government bureaucracy was able to do the necessary work to accredit the construction of the new power plant in Burrillville and the refurbished one in Providence.³¹¹ DiPrete was able to get the Public Utility Commission, the electric

311. Not all proposals were successful. A design for a 300 MW plant in East Providence was eventually scrapped after a lengthy licensing process that failed to convince the state’s Coastal Resources Management Council that it could be operated

utilities and the environmental organizations to meet the environmental expectations of the communities as well as the state and federal environmental regulations to ensure the continued reliable operation of the electric power grid.³¹²

This new equilibrium was not to last as the state inclination for corruption intruded. DiPrete was routed in the 1990 gubernatorial election by Democrat Bruce Sundlun after a series of fraudulent occurrences came to light. DiPrete was eventually charged with bribery, racketeering and extortion while awarding state contracts for the construction of the Jamestown Bridge and for work at the Olney Pond in Lincoln Woods State Park.³¹³ In Providence, Democrat Mayor Paolino had been replaced by Republican turned Independent candidate Vincent Albert "Buddy" Cianci, Jr. in 1991.³¹⁴ Cianci's

without significant environmental impact. See "Who Needs the CRMC?," *Providence Journal*, December 8, 1991.

312. Neighboring Massachusetts Governor Dukakis was viewed less favorably. Based on Dukakis' resistance to the Seabrook nuclear power plant, he was "somewhat on record as being anti-power." See Bob Wyss, "Official: Plants could Multiply Power Sevenfold." *Providence Journal*, March 28, 1989, and "A Surge in Power-Plant Plans for R.I. Electricity Shortage Spurs Developers; Communities Wary," *Providence Journal*, May 28, 1989.

313. Garrahy had been slighted as being "in the pocket of Narragansett Electric Co.," after vetoing an earlier attempt to create the Energy facility Siting Board. While DiPrete was not formally charged until after his term, the news wrecked his reelection attempts. DiPrete later pled guilty to accepting \$250,000 in bribes for state contracts. See Bob Wyss, "A Surge in Power-Plant Plans for R.I. Electricity Shortage Spurs Developers; Communities Wary," *Providence Journal*, May 28, 1989, and Edward D. DiPrete v. Richard W. Morsilli et al., 635 A.2d 1155 (1994).

314. Cianci's first period of being the Mayor of Providence, from 1974 to 1984 had ended following his resignation after his conviction of felony assault of a Providence businessman. After some years in the Rhode Island political wilderness, Cianci had returned to politics as an independent and won the mayoralty again. The Mayor's office was widely believed to be for sale during both of his terms in office. See Mike Stanton, *The Prince of Providence* (New York: Random House, 2003, 2004), 168-186.

vision of rejuvenating downtown Providence required cash infusions to the city's coffers and the refurbished Manchester Street Station was an important part of his plans.³¹⁵ Cianci was not above pressuring his "friend" Edward Mulligan, the President of the Narragansett Electric Company to accomplish his objectives during this period.³¹⁶ Investigations of DiPrete, the Governor, and Cianci, the Mayor of Providence, led to their convictions and departure from public office. Additionally, the Chief Justice of the state Supreme Court, Thomas Fay, and the Mayor of Pawtucket, Brian J. Sarault, were convicted of corruption charges in the late 1980s and early 1990s. It seems unlikely that the successful electric power plant construction projects were immune from the effects of the corruption swirling around the highest levels of state government.³¹⁷

Updating PURPA: The Energy Policy Act of 1992

The leadership in Providence was not the only factor that was changing. In Washington, the federal regulatory agencies were rethinking the assumed natural monopoly model of the electric utilities operating the electric power grid. The Public Utility Regulatory Policies Act (PURPA) of 1978 had cracked the surface of this model by permitting independent operators to connect to the grid and sell the electricity they

315. Ken Mingis, "Cianci Defends Building Projects Critics Fear City May Not Get Grants," *Providence Journal*, March 16, 1992.

316. See Mike Stanton, *The Prince of Providence* (New York: Random House, 2003, 2004), 212 and Vincent "Buddy" Cianci, Jr., *Politics and Pasta* (New York: Thomas Dunne Books, 2011), 248-249.

317. GoLocalProv News, "Rhode Island's Biggest Political Corruption in Modern History," GoLocalProv News, March 22, 2014, <http://www.golocalprov.com/news/rhode-islands-biggest-political-corruption-in-modern-history>, (accessed February 16, 2015).

generated. In the years since PURPA had been passed, Congressional and industry leadership became concerned with some of the problems associated with that law, as well as previous federal code concerning the electric power grid. Technology appeared to be changing more rapidly than the ability of the regulators to provide meaningful operating procedures while older legislation no longer seemed relevant.³¹⁸ In the 1980s and early 1990s, under the direction of federal bureaucrats, new legislation was envisioned to address some of the perceived shortcomings of the older regulations. The authors of this legislation assumed that the United States would continue to be dependent on foreign energy supplies for the near future and the possible disruptions to that supply required a national level effort to balance the economic effects of any price fluctuation. Introduced in 1991 in the wake of the American military intervention in Kuwait, the proposed legislation also included President George H. Bush's priority for letting free market forces instead of government regulation promote the reliability and efficiency in the electric power grid. This was particularly evident in the Bush Administration's willingness to amend the Public Utility Holding Company Act of 1935, a cornerstone of electric utility regulatory policy. Increased access for new electric power generation

318. In particular the efficiency of long range power transmission had increased allowing electric power generation sites to be located farther away from the consumer of the power. See Severin Borenstein and James Bushnell, "Electricity Restructuring: Deregulation or Reregulation?," *Regulation* 23, no. 2: 46-47.

companies to the grid would additionally encourage competition and drive down the cost to consumers, as well as promote efficiency.³¹⁹

With the exception of a rapidly discarded proviso authorizing drilling for oil in the Alaskan National Wildlife Refuge, the proposed law failed to excite notable resistance compared to PURPA or the Public Utility Holding Company Act.³²⁰ However, the bill failed to make it out of committee in the Senate in 1991, necessitating its reintroduction in 1992. The new proposal deleted any mention of oil exploration in Alaska and added provisions for increased access to the electric power grid for new power generating companies as well as a small subsidy for wind generated electricity. Structured in this manner, the legislation passed both houses with strong bipartisan support and was signed into law in October 1992 by President Bush as the Energy Policy Act of 1992.³²¹

319. Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 240-241.

320. While many electric utilities, associated companies and think tanks, such as the influential Edison Electric Institute, did not support the new legislation, NEES did. This appears somewhat surprising given the company's survival and flourishing under the regulations of the Public Utility Holding Company Act of 1935. See Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 245, 386.

321. All of the members of the Rhode Island congressional delegation voted for the law. See U.S. House of Representatives, "Final Vote Results For Roll Call 144," Office of the Clerk, U.S. House of Representatives, <http://clerk.house.gov/evs/1992/roll144.xml#Y> (accessed February 22, 2015), and U.S. Senate, "On the Passage of Bill (H.R. 776 as Amended), U.S. Senate Roll Call Votes 102nd Congress, 2nd Session," http://www.senate.gov/legislative/LIS/roll_call_lists/roll_call_vote_cfm.cfm?congress=102&session=2&vote=00163 (accessed February 22, 2015), and Richard F. Hirsh, *Power*

The Energy Policy Act of 1992 introduced important new changes to the regulation of the electric power grid, modifications that were rapidly transmitted to Rhode Island. Firstly the statute made a major change in how new electric power producing companies could operate. These new facilities, the Exempt Wholesale Generators (EWG) as they were defined in the law, could now sell power to the rest of the electric power grid regardless of their plant's efficiency, a factor that had been important in PURPA. Public utilities could own these new facilities, regardless of their location, and sell their power to domestic or foreign consumers. Utilities were also authorized, contingent upon state regulatory approval, to sell power to consumers through other company's transmission lines.³²² Some disadvantages were noted in the new regulations. The electric utilities feared that opening up the electric power grid to these new electric power generation sources might lower overall system reliability and stability.³²³ The loss of monopoly control of the system that the Public Utility Holding Company Act of 1935 had codified was also seen as problematic. State regulatory bodies were still empowered to make siting decisions and enforce environmental standards

Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System (Cambridge, MA: The MIT Press, 1999), 242-243.

322. See Kenneth W. Costello et al., "A Synopsis Of The Energy Policy Act Of 1992: New Tasks For State Public Utility Commissions," (Columbus, OH: The National Regulatory Research Institute, Ohio State University, 1993), 1-9, and Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 243-247.

323. Kenneth W. Costello et al., "A Synopsis Of The Energy Policy Act Of 1992: New Tasks For State Public Utility Commissions," (Columbus, OH: The National Regulatory Research Institute, Ohio State University, 1993), 23-35, and Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 243-247.

associated with electric power generation and transmission, even if their policies might interfere with the overall efficiency of the system.³²⁴

Finally, the Energy Policy Act of 1992 enjoined energy producers and consumers to conserve this resource not only for economic and national security reasons, but also from a desire to expand environmental protection for the nation and the world. The Act contained directives for regulatory bodies to include the direct and indirect effects of pollution in their decision making process. The Department of Energy was tasked to “reduce the air, water, and other environmental impacts (including emissions of greenhouse gases) of energy production, distribution, transportation, and utilization, through the development of an environmentally sustainable energy system.”³²⁵ The department was also required to set standards for greater efficiency in appliances such as hot waters heaters with the thought that any increased efficiency would reduce the overall need for electric power generation and its associated pollution. Reductions in the production of CO₂ from fossil fueled plants would limit the buildup of this green house gas in the atmosphere. This was a growing concern in the environmental movement as it was feared that a potentially catastrophic change in the planet’s climate due to the increased concentration of green house gases in the atmosphere was probable. Subsidies for generating electricity by “solar, wind, biomass, or geothermal energy” were also

324. Kenneth W. Costello et al., “A Synopsis Of The Energy Policy Act Of 1992: New Tasks For State Public Utility Commissions,” (Columbus, OH: The National Regulatory Research Institute, Ohio State University, 1993), 25.

325. While this comment refers to the goal of the U.S. to perform new “energy supply and energy conservation research and development,” similar concerns are expressed in the legislation. See *Energy Policy Act of 1992*, Public Law 102-48, 102nd Cong., 2nd sess. (October 24, 1992), section 2001.

included in the desire to both limit the creation of additional green house gases and limit the nation's dependence on foreign fuels.³²⁶

The Energy Policy Act of 1992 was thus important for a number of reasons. It enlarged many of the opportunities from the Public Utility Regulatory Policies Act of 1978 and further expanded access to the electric power grid to additional classes of electric power generation facilities and companies. By reducing the strictures of the Public Utility Holding Company Act of 1935, it also permitted the selling of electric power by non-contiguous entities, something that had previously been prohibited. These changes were often made for the purpose of improving the efficiency of the grid, yet the environmental concerns were also evident in the new regulations. In this respect, the Energy Act was not just focused on local concerns of concentrated pollution from a particular energy source, but was willing to take action based on the environmental well being of the entire planet. This was a large step in federal regulatory policy for the electric power grid, and coincident with the strands of environmental thought that had developed since Rachel Carson. This mindset appeared attentive to Barry Commoner's general guidelines that everything was connected to everything else and thus action to prevent damage to the environment everywhere on the earth was necessary. Similar to Arne Naess' concerns over the global environment, the Energy Policy Act of 1992 looked

326. See Kenneth W. Costello et al., "A Synopsis Of The Energy Policy Act Of 1992: New Tasks For State Public Utility Commissions," (Columbus, OH: The National Regulatory Research Institute, Ohio State University, 1993), 65-68, and *Energy Policy Act of 1992*, Public Law 102-48, 102nd Cong., 2nd sess. (October 24, 1992), section 1212.

at least one aspect of environmental damage, the production of green house gases, with a worldwide perspective. Even Amory Lovins might applaud the proviso to increase the subsidy for sustainable energy generation. Thus while efficiency might be extolled as a virtue, the indirect forces of preventing environmental harm from electric power generation were not absent.

Rhode Island Reaction to the Energy Policy Act of 1992

Just as NEES had taken the lead for conserving electrical energy as a means to promote efficiency, reliability and profitability in the 1980s, the company also worked to take advantage of the new opportunities that the Energy Policy Act of 1992 provided. Coordinating with other interested parties of the Rhode Island Electric Industry Restructuring Collaborative, NEES representatives negotiated an agreement that essentially shattered the previous model of electric utility monopoly in the Ocean State.³²⁷ The group resolved that in keeping with the deregulatory intent of the Federal Energy Regulatory Commission (FERC), the electric utilities should act to dissolve the previous system that had existed since Marsden Perry had set up his electric power company. No longer would the electric utilities own all electric power generation,

327. The Rhode Island Electric Industry Restructuring Collaborative consisted of representatives from the state's "major electric utilities: Narragansett Electric, Blackstone Valley, Newport Electric and the Pascoag Fire District; government agencies: the state Division of Public Utilities and Carriers (DPUC), representatives of Governor Almond and the federal Small Business Administration; and business, consumer and environmental groups: TEC-RI, the Conservation Law Foundation and a coalition of advocates for low-income consumers." TEC-RI was The Energy Council of Rhode Island. See Bob Wyss, "Alliance Agrees: Deregulate Electricity in R.I.," *Providence Journal*, May 13, 1995, and Rhode Island Electric Industry Restructuring Collaborative, "Report and Set of Independent Principles to the Rhode Island Public Utilities Commission from the Electric Industry Restructuring Collaborative," May 12, 1995.

transmission and distribution facilities. By divorcing ownership of the electric power generation plants from the rest of the system, greater efficiency for the entire electric power grid could theoretically be achieved. Using a model comparable to the phone companies that competed for service using the same wiring system, the new owners of the electric power plants would compete to sell electric power to the operators of the electric power grid. This competition would lead to greater efficiency in the system with lower costs for the consumer. The continued reliability of the grid was a factor that was acknowledged by all parties, as were the environmental groups' desires to lower the polluting emissions from all of the electric generation plants.³²⁸ The largest unknown variable resulting from the agreement was how the electric utility debt, estimated at 1 to 3 billion dollars, might be paid off even as the electric generation plants were sold off.³²⁹

While electricity costs had often been a political issue in the Rhode Island government, the Public Utilities Commission, the legislature and governor moved with uncharacteristic verve to turn the recommendations of the Electric Industry Restructuring Collaborative into actual law. Efforts in 1995 to permit the deregulation fell apart due to

328. See Rhode Island Electric Industry Restructuring Collaborative, "Report and Set of Independent Principles to the Rhode Island Public Utilities Commission from the Electric Industry Restructuring Collaborative," May 12, 1995, and Dr. Richard Rosen, Tim Woolf, Dr. Bill Dougherty, Bruce Biewald, Dr. Stephen Bernow, and Regulatory Assistance Project, "Promoting Environmental Quality In A Restructured Electric Industry," The National Association of Regulatory Utility Commissioners (Boston, MA: Tellus Institute, 1995): B-1 to B-2.

329. This debt included those incurred for the nuclear power plant in Seabrook, NH. Interestingly, this debt estimate was proposed by the Conservation Law Foundation. See Bob Wyss, "Alliance Agrees: Deregulate Electricity in R.I.," *Providence Journal*, May 13, 1995, and "Innovative Electric-rate Plan Faces Long Road," *Providence Journal*, May 30, 1995.

a squabble between the Democratic majority legislature and the Republican governor, Lincoln Almond, following the governor's veto of a bill that would have permitted the construction of an electric power plant at Quonset Point, run by the state's Port Authority. The General Assembly had rewritten Almond's initial proposal to allow this new plant to sell electric power throughout the state and not just to the manufacturing facilities at Quonset Point. NEES had protested this threat to their monopoly, leading Almond to veto the proposed legislature.³³⁰

The resulting rancor soured relations between the government branches until the next year when the desire to lower electric rates overcame political resistance. The General Assembly leadership then made electric utility deregulation a major issue and devoted the necessary focus to make the required progress.³³¹ In February 1996, following months of stealthy negotiations with the electric utilities, the Rhode Island House Majority Leader, Democrat George D. Caruolo, introduced legislation to deregulate this industry. The Utility Restructuring Act of 1996 state would allow direct access for consumers by 2001 and "require utilities to unbundle rates, including a rate for demand-side management (DSM) and renewables."³³² Some industrial consumers would be permitted direct access beginning in 1998. The new law would also allow a large

330. Russell Garland, "Electric Battle Shorts out in Senate," *Providence Journal*, August 05, 1995.

331. Ken Mingus, "Legislators Set Priorities For The 1996 Assembly In Providence, A Need For Healing Rifts," *Providence Journal*, January 08, 1996.

332. Office of Power Technologies of the U.S. Department of Energy, "Rhode Island, Restructuring Legislation Introduced," *State Renewable Energy News* 5, no. 1 (Winter 1996): 2.

percentage of the recovery of utility "stranded costs," that is, the infrastructure expenditures that had become redundant, to be passed on to the consumers.³³³

Caruolo proposed that the deregulation would lower the overall costs of electricity in the state as well as the amount of government oversight of the industry. He did admit that the proposed legislation could lead to increased air pollution as the new power generation companies might attempt to burn more coal due to its lower costs.³³⁴ Some environmental groups supported the proposed legislation. "We should embrace deregulation," the Conservation Law Foundation of New England's Armond Cohen told the Environment Council of Rhode Island while speaking at the Audubon Society of Rhode Island facilities. The deregulation would lead to newer electric power plants being constructed, such as the one at the Manchester Street Station in Providence. Burning natural gas, this plant emitted less pollution into the environment and used less cooling water, lowering the environmental damage in Narragansett Bay.³³⁵

Despite the support of the utilities and the environmental organizations, it took another six months for the legislature to pass a bill to deregulate the electric utilities. Some legislators were concerned that the ordinance would not lower costs sufficiently to make it worth the effort while others were not convinced that the federal government

333. Office of Power Technologies of the U.S. Department of Energy, "Rhode Island, Restructuring Legislation Introduced," *State Renewable Energy News* 5, no. 1 (Winter 1996): 2-3.

334. See Robert C. Fredericksen, "Lawyer: Bill Good For Environment," *Providence Journal*, February 14, 1996, and John E. Mulligan, "Caruolo: Deregulation Could Elevate Air Pollution," *Providence Journal*, February 28, 1996.

335. Robert C. Fredericksen, "Lawyer: Bill Good For Environment," *Providence Journal*, February 14, 1996.

would permit such a radical restructuring of the industry in the state. Simultaneously, public concerns that the Department of Environmental Management would not perform its role and dismay that the utilities would be rewarded by allowing them to retire their debt by charging the consumers for their poor business decisions limited enthusiasm for the new scheme.³³⁶ The Public Utilities Commission and some consumers, as well as the Blackstone Valley Electric and Newport Electric companies, wanted direct access for everyone starting in 1998, as opposed to the later date that NEES had negotiated.³³⁷ By March the bill was stalled in committee and Caruolo acknowledged that this debt or “stranded cost” needed to be better defined less taxpayers be saddled with excessive costs when the utilities sold off their power plants.³³⁸

Caruolo would eventually convince the House to pass the bill in June of 1996 following a reduction in the amount that the consumers would have to pay for utility debt servicing. The bill then languished in the state Senate for two months as negotiators attempted to smooth out the differences between the two houses. Once passed by the

336. See Bob Wyss, “Power Deregulation Bill Won't Cut Rates Enough, Says Collaborative Chief,” *Providence Journal*, February 14, 1996, John E. Mulligan, “Lawmakers Pitch Power-Industry Deregulation; Rep. Patrick J. Kennedy Says He Expects The Local Deregulation To Proceed Smoothly Over Any Federal Regulatory Hurdles,” *Providence Journal*, February 15, 1996, Peter Lord, “Air, Land & Water Focus On Our Environment; Environment For Change At The State House,” *Providence Journal*, February 18, 1996, and George H. Borts, “Should The Public Subsidize A Sweetheart Deal For NEES?,” *Providence Journal*, February 18, 1996.

337. “Electricity, The Big Guys Pay Less But Some Feel Rate Hikes Now For Large Users Just Balance Out The High Rates Businesses Used To Pay To Subsidize Lower Residential Rates,” *Providence Journal*, April 21, 1996.

338. Bob Wyss, “Caruolo's Deregulation Bill May Be Retooled,” *Providence Journal*, March 14, 1996.

Senate on August 1st, the House then took issue with some of the changes in the bill. A fair amount of horse trading on other bills ensued before the both houses could approve a final version of the bill on August 2nd.³³⁹ Governor Almond subsequently signed the bill on August 6th and Rhode Island had leaped to the forefront of electric utility deregulation in the nation.³⁴⁰

Rhode Island's Utility Restructuring Act of 1996 was noteworthy in that it upturned one hundred years of the natural monopoly of the electric utilities. By requiring the electric utilities to break up their generation, transmission and distribution capabilities into separate businesses, and permitting new electric power generation companies to plug into the electric power grid to sell to any consumer, the old model of a state regulated

339. Caruolo had to discard his plan to restructure the Public Utilities Commission with its members appointed by the legislature and not the Governor. Tempers flared as the legislators attempted to finish out the session. An intermittent electrical blackout on the night of the 1st seemed to focus at least some of the attention of the assembled legislators in Providence. See Russell Garland, "House Approves Utility Overhaul," *Providence Journal*, June 12, 1996, Bob Wyss, "Electric Restructuring Bill Runs Into Snag," *Providence Journal*, June 26, 1996, Scott Mackay and Christopher Rowland, "Lawmakers Still Face Tough Issues," *Providence Journal*, July 11, 1996, Eliot Krieger, Scott Mackay and Christopher Rowland, "Electric Bill Hostage To Lawmakers' Squabble," *Providence Journal*, August 1, 1996, Eliot Krieger, Scott Mackay and Christopher Rowland, "Assembly Ends Session By Passing Electricity Bill," *Providence Journal*, August 1, 1996, Christopher Rowland, "Houses Divided, Must Stand Again, The General Assembly Was Forced To Reconvene Yesterday, After Negotiations Between The House And Senate Wednesday Night Nearing Hostility," *Providence Journal*, August 1, 1996, and Felice J. Freyer, "A Losing Deal For Teen Smokers, In A Trade Securing Passage Of Electric Utility Deregulation, Lawmakers Send A Bill To Governor Almond That Would Crack Down On Stores That Sell Tobacco Products To Minors," *Providence Journal*, August 6, 1996.

340. New Hampshire was the first state to pass legislation to deregulate its electric utilities in May 1996. See Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, U.S. Department of Energy, "The Changing Structure of the Electric Power Industry: Selected Issues, 1998," (Washington, DC: Energy Information Administration, 1998), 164.

power monopoly had been fractured.³⁴¹ On the environmental front, “due regard for the preservation and enhancement of the environment, the conservation of natural resources, including scenic, historic, and recreational assets, and the strengthening of long-range, land-use planning” was a major reason given for the policy change.³⁴² Electric power producers were advised to cooperate with state officials to lower power plant emissions, though the costs to meet the new clean air standards from the EPA could be passed on to consumers.³⁴³

Brayton Point Woes (Continued)

The Utility Restructuring Act of 1996 had recommended electric power producers should act in concert with state authorities to limit power plant emissions even though the law’s authors realized that Rhode Island’s electric power plants were among the least polluting in the nation.³⁴⁴ The coal burning Brayton Point units at the northern end of Narragansett Bay were just the opposite, and were considered to be amongst the worst

341. State of Rhode Island Public Utilities Commission and Division of Public Utilities and Carriers, “Summary of Major Provisions of the Rhode Island Utility Restructuring Act of 1996 (H-8124 Substitute B3),” State of Rhode Island Public Utilities Commission and Division of Public Utilities and Carriers, <http://www.ripuc.org/utilityinfo/electric/ura1996summ.html> (accessed March 15, 2015).

342. *An Act Relating To The Utility Restructuring Act Of 1996*, Chapter 316 96-H 8124B, 7 August 1996.

343. In this case renewable energy resources were defined as “power generation technologies that produce electricity from wind energy, small scale (less than 100 megawatts) hydropower plants that do not require the construction of new dams, solar energy, and sustainably managed biomass.” See *An Act Relating To The Utility Restructuring Act Of 1996*, Chapter 316 96-H 8124B, August 7, 1996.

344. *An Act Relating To The Utility Restructuring Act Of 1996*, Chapter 316 96-H 8124B, 7 August 1996.

polluters in the region.³⁴⁵ Despite numerous upgrades to the plants during the 1990s the aging plant was still a major contributor to the air pollution in the area. The station was not as efficient as the newer natural gas powered plants in Providence or Burrillville, Rhode Island.³⁴⁶ NEES's efforts to make environmental amends by planting trees in South America to offset some of the CO₂ being generated by the Brayton Point units was not considered a substantial improvement considering the environmental damage being created, particularly when consumers were being charged for this remediation. "I find it hard to believe people are going to slap more costs on the rates to deal with a problem that I don't believe will help the environment in Rhode Island," stated the leader of Energy Council of Rhode Island, Roger Buck.³⁴⁷ The head of the Rhode Island Department of Public Utilities was also unconvinced on the program. Even the chief executive officer of NEES, John W. Rowe was skeptical, adding that such efforts would

345. Paul Edward Parker, "Brayton Point Termed 'Worst Polluter' *Environmentalists Say The Power Plant Must Clean Up Its Act; Company Officials Agree, But Say It's In Order To Compete," *Providence Journal*, August 1, 1996.

346. While the efficiency did improve, the plants were still burning coal. Thus even as overall plant pollutant emissions tended to lower over time and the plant was operating within the EPA standards, environmental groups were not mollified and public concern was not abated. The ash produced was also a problem, though NEES sold some of the residue at Brayton Point to local concrete producers that later used it to build the Boston Harbor Tunnel project. See Edwin J. Brailey Jr., Herbert L. Miller, and Curtis G. Sterud, "Control Valves Limit Turbine Temperature Swings," *Power Engineering* 95, no. 4 (April 1991): 47-50, and Paul Edward Parker, "Brayton Point Termed 'Worst Polluter' *Environmentalists Say The Power Plant Must Clean Up Its Act; Company Officials Agree, But Say It's In Order To Compete," *Providence Journal*, August 1, 1996, and Marie Leone and Jason Makansi, "Flyash Reuse: From Boilers To Car Bumpers?," *Electrical World* 209, no. 3: 45.

347. Bob Wyss, "Utility Generates Stir With Tree-Planting Plan Critics Of 'Offsets' To Global Warming Say Only Rates Will Grow," *Providence Journal*, February 16, 1992.

not be easy. Rowe suggested that "Over the long run, I think a cleaner world will be a more expensive world."³⁴⁸

Tree planting operations were one attempt by NEES to address the growing concern regarding anthropomorphic global warming. With increasing evidence that the earth's climate was changing and that CO₂ emissions from industrial activity might be a major contributor to the acceleration of this global environmental problem, environmentalists attempted to act to limit this pollution. Since NEES was using coal to generate 42% of its electricity, primarily at the Brayton Point and Somerset, Massachusetts' plants, the utility was a large contributor to the production of CO₂. To help reduce the use of coal as a fuel, environmentalists desired to include the cost of such pollution in assessing electric utility rates. Utility executives and public regulators who were already being taken to task on the high cost of electricity in New England were not enthusiastic. "My position has moved from one of interest to one of being opposed to it because of the potential for increasing electric costs. We're talking about imposing costs above what federal and state environmental agencies require," stated the head of the Rhode Island Public Utility Commission, James J. Malachowski.³⁴⁹

Deregulation of the Rhode Island Electric Power Grid

With such external resistance to burning the most cost efficient fuel, aging plants that were often stressed to stay operating, and increasing regulatory pressure, NEES

348. Ibid.

349. Massachusetts was more aggressive in assessing the utilities to address the environmental externalities of their pollution. See Bob Wyss, "Utility Generates Stir With Tree-Planting Plan Critics Of 'Offsets' To Global Warming Say Only Rates Will Grow," *Providence Journal*, February 16, 1992.

moved to take advantage of the new Rhode Island electric utility deregulation to divide up their electric generation, transmission and distribution businesses.³⁵⁰ Following the state of Massachusetts passing similar legislation to Rhode Island's Utility Restructuring Act of 1996 Act, NEES announced in October 1996 that it would sell all of its power generation facilities, including its newly overhauled station in Providence as well as the aging coal-fired plants at Brayton Point and Somerset. Consumers would pay a surcharge during the first three years following the sales of the electric power generation plants, but the subsequent increased competition was expected to lead to a 10-17 percent overall reduction in prices.³⁵¹ Promises of lower prices and lower emissions were repeated. The Conservation Law Foundation praised the decision, proclaiming that "In our view this is a model for restructuring the electric industry nationally. . . We think it's a big environmental win."³⁵² The Rhode Island Public Utilities Commission was less effusive. Its chairman, James J. Malachowski, was annoyed that NEES was willing to be more flexible with its divestiture schedule with the state of Massachusetts than with Rhode

350. Brayton Point attracted interest from all sectors, from the local community members who complained about excessive soot on their homes from coal burning to the Massachusetts Department of Environmental Protection that sued NEES for failure to use proper chlorination equipment while using industrial chlorine to clean its seawater cooling systems. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 214, and "N.E. Power Company Settles Suit," *Boston Globe*, July 31, 1992.

351. Brian C. Jones, "New England Electric To Sell Power Stations Providence, Somerset Landmarks Included," *Providence Journal*, October 1, 1996.

352. Peter Lord, "Lower Electric Bills, Cleaner Air Foreseen. Experts Believe Monday's Decision By New England Electric Systems To Sell Its Generating Plants Will Benefit The Region," *Providence Journal*, October 2, 1996.

Island. "They came before us and said they were offering us the best they could do. They were very sure of that," stated Malachowski. "So now I'm questioning their credibility, their sincerity."³⁵³

The sale of Brayton Point could not happen rapidly enough to prevent new regulatory challenges. Later in October 1996 the Environmental Protection Agency announced that it would revoke the site's water discharge permit two years before it was scheduled to expire. The EPA stated it was taking this action based on studies by the Rhode Island Department of Environmental Management showing that the plants' seawater effluent temperature and large water use was adversely affecting the marine life in Narragansett Bay. In some instances a reduction of 86% in flounder, tautog and other species' population levels correlated strongly with Brayton Point water use. The plants' large water circulation killed off fish larvae that spawned in the Mount Hope Bay region in the northern part of Narragansett Bay, resulting in lower fish populations. Save the Bay applauded the EPA's response even as NEES scrambled to determine how the plants could be operated in a more restrictive environment.³⁵⁴ By early spring of 1997, with up to 25 bids for its power plants, NEES struck a deal with the EPA. It would lower the amount of water it used at the Brayton Point plants from 1.4 billion gallons of water a day

353. Ibid.

354. The report had been authorized by the RI DEM and discussed with NEES and state officials, yet it was the Massachusetts Department of Environmental Protection that publicized the study cautioning NEES that action needed to be taken to reduce the environmental damage. The next day the EPA revoked the plant license. See Bob Wyss, "EPA Pulls Brayton Point Permit. The Federal Agency Is Revoking The Permit For Cooling Water Discharges At The Power Plant," *Providence Journal*, October 23, 1996.

to 925 million, though the EPA permitted an increase of water flow in the summer months if required to meet high electrical demands resulting from heat waves.³⁵⁵

NEES attracted numerous buyers for its inventory of power plants, valued at 1.1 billion dollars. Interested bidders including Duke Energy from North Carolina, CalEnergy of Nebraska and Southern Co. from Georgia all showed interest now that federal regulation permitted multistate ownership.³⁵⁶ Even the Conservation Law Foundation submitted a bid for Brayton Point in an effort to gain control of the site to shut it down.³⁵⁷ In August 1997, U.S. Generating Co., an affiliate of Pacific Gas & Electric Corporation of San Francisco, California, bought the collection of NEES power plants for 1.59 billion dollars, 500 million dollars more than NEES had valued the

355. This rapid agreement with the EPA was in marked contrast to the normal multi-year test of wills in the court system between the utility and the environmental groups and regulatory bodies. See Bob Wyss, "A Boost For The Fish Power Plant Agrees To Cut Water Use. Environmentalists Hope That Because The Brayton Point Station Will No Longer Suck In Such Huge Quantities Of Water, Fish Will Increase In Mount Hope Bay," *Providence Journal*, April 04, 1997.

356. Ross Kerber, "Auction Of 18 Power Plants Is Igniting Utilities' Interest," *The Wall Street Journal*, February 6, 1997.

357. This bid, made in concert with another energy company that had proposed building a 180 MW coal burning electric plant in Woonsocket in the 1980s, aroused some concern from other Rhode Island environmental groups. Many felt betrayed, though Save the Bay was less hostile. "Curt Spalding, executive director of Save the Bay, was less than happy to be tossed this political hot potato. 'We're supportive of the approach,' said Spalding, who added that he had the highest regard for CLF's ethical commitment to improving the environment. 'As the issue of whether CLF should be doing this,' said Spalding, 'I'm not going to say anything about that.'" See Bob Wyss, "Environmental Group Takes Interest In Plants - Power Plants, That Is," *Providence Journal*, June 29, 1997.

plants.³⁵⁸ Politicians and NEES executives lauded the sale and the state's nation leading efforts to deregulate the electricity industry. By selling the plants for more than anticipated, NEES could lower the "stranded costs" being passed on to the consumers in Rhode Island, an earlier sticking point in passing the Utility Restructuring Act the previous year. State Senator William V. Irons, D-East Providence, chairman of the state Senate Corporations Committee, regarded the sale as "an example of courage where a little state like Rhode Island is leading the nation. . . . This will be a major statement of what this state is about."³⁵⁹ The final sales of the power plants took over a year to finalize, with U.S. Generating Co. taking control of the plants in September 1998. The completion of the deal was announced at media events in both Boston and Providence and was heralded as "a milestone in the transformation of New England's electric utility industry."³⁶⁰

The Blackstone Valley Electric and Newport Electric companies took longer to sell off their respective power plants. Agreements were not reached until April of 1998 for the sale of the utilities' last generation plants. All of their electricity would now be purchased from other electric power generating companies.³⁶¹ Only the Block Island

358. Bryan C. Jones, "Power Plants Are Sold For \$1.6 Billion In Historic Deal," *Providence Journal*, August 07, 1997.

359. *Ibid.*

360. Bob Wyss, "Power Companies Complete Historic Sale New Savings Expected For 330,000 Customers Of Narragansett Electric," *Providence Journal*, September 2, 1998.

361. The last plants were two 16 MW diesel generators in Portsmouth and Jamestown that were sold to the Wabash Power Equipment Co. of Wheeling, IL. The company planned to remove the two diesels, refurbish and then sell them off. See Bob

Power Company did not sell off its diesel generators as it lacked an electric power transmission line connection to the mainland and was dependent on fuel transported to the island.³⁶²

Concurrent with the divestiture of its power plants, the southeastern New England electric utilities also moved to take advantage of regional opportunities resulting from federal regulatory policies. In 1996, the Federal Energy Regulatory Commission had opened up the conduction of electricity across the electric power grid's transmission lines to promote the competitive sale of wholesale electric power. NEPOOL had responded by suggesting a new organization be formed to act as an Independent System Operator (ISO) for the grid in the New England area, ISO New England. On July 1, 1997 ISO New England was established to "operate regional power system, implement wholesale markets, (and) ensure open access to transmission lines."³⁶³ ISO New England would function almost as a super NEPOOL, acting to regulate the dynamic operations of the grid amongst the expanding number of generating and transmission companies. The regional synchronizer operated over the expanse covering most of the New England states (Connecticut, Massachusetts, New Hampshire, Rhode Island, Vermont, and portions of Maine). Its mission was similar to NEPOOL, that of safe and reliable electric

Wyss, "Buyers found for generating plants. The only utility-owned plant in Rhode Island without a pending sales agreement is the 102-year-old Bridge Mill Power Station in downtown Pawtucket," *Providence Journal*, April 15, 1998.

362. U.S. Energy Information Administration, "Rhode Island State Energy Profile," U.S. Energy Information Administration, <http://www.eia.gov/state/print/cfm?sid=RI> (accessed February 20, 2015).

363. ISO New England, "Our History," ISO New England, <http://www.iso-ne.com/about/what-we-do/history>, (accessed March 21, 2015).

power grid operation, long term planning for the power and transmission requirements for the area, and the administration of the wholesale electricity market for the region.³⁶⁴

Even as the old model of an electric utility company was being reconfigured, the old model of regional electric power grid organization was being strengthened. At the same time as this transition, the number of electric utilities in the state was diminishing. Rhode Island previously had five electric utilities (Narragansett Electric (the NEES subsidiary), Newport Electric, Blackstone Valley Electric, Block Island and Pascoag Fire District). In 1999, in the aftermath of the utility divestiture of all generation facilities, NEES filed a petition with the Rhode Island Public Utilities Commission to merge with the parent holding company of the Blackstone Valley Electric and Newport Electric companies to create one distribution company. The new distribution company would retain the name of NEES's subsidiary, the Narragansett Electric Company. NEES pledged that the new company would create "savings and efficiency gains" beneficial to the consumers.³⁶⁵ The merger would allow the company to react more rapidly in the event of natural disasters, increasing the reliability of the grid. Combining the companies would also allow cost savings by reducing service costs between separate companies. Finally the merger would aid the evolution of the competitive electric power market that had resulted from the legislature's previous actions. While concerned of the job losses

364. ISO New England, "Our Three Critical Roles," ISO New England, <http://www.iso-ne.com/about/what-we-do/three-roles>, (accessed March 21, 2015).

365. State Of Rhode Island And Providence Plantations Division Of Public Utilities And Carriers, Petition For Approval Of Merger, Docket No. D-99-12, 25 February 2000, State Of Rhode Island And Providence Plantations Division Of Public Utilities And Carriers, <http://www.ripuc.org/eventsactions/orders/NECmerger.pdf> (accessed March 21, 2015).

resulting from the merger, the Rhode Island Public Utility Commission approved the merger in February 2000.³⁶⁶ With the exceptions of the minor enclaves of the Pascoag Fire District and Block Island, NEES had thus finally achieved complete dominance of the Rhode Island electricity market, though with the elimination of its generation capacity, it was limited to the transmission and distribution side of the electric power grid.

Such local control was short lived. Even as NEES was acting to absorb Newport Electric and Blackstone Valley Electric companies, a larger firm was interested in acquiring NEES. National Grid, a British based electric utility company, had announced its desires to purchase NEES as early as 1998 in order for the “U.K. electricity company to grab a piece of the fast-consolidating U.S. electricity industry.”³⁶⁷ The sale required the approval of United States Securities and Exchange Commission to move forward, a process that took several years to acquire. A review of the Public Utilities Holding Company Act of 1935 was required to determine if National Grid, a foreign company, could acquire NEES. The Act also required a subsequent trend “towards the economical and the efficient development of an integrated public-utility system” for any merger to be authorized.³⁶⁸ While some financial concerns had to be addressed, the SEC approved the

366. Ibid.

367. National Grid agreed to assume 1 billion dollars of debt from NEES, a large value given the recent sale of the majority of the assets of the American company. See CNN, “Grid grabs U.S. utility,” CNN Money, http://money.cnn.com/1998/12/14/worldbiz/grid_deal/, (accessed March 22, 2015).

368. See Commission Notice: National Grid Group plc Acquisition of New England Electric System, Securities And Exchange Commission, (Release No. 35-27154; International Series Release No. 1217; 70-9473 and 70-9519), National Grid

merger on March 15, 2000, ending over a century of local ownership and leadership of the electric power grid in southeastern New England.³⁶⁹

Change in Momentum or Reversion to the Mean?

By the end of the millennium, it was not clear if operation of the electric power grid had reverted to the pre-1970s manner of close coordination between the electric utility executives and the branches of the Rhode Island government or if the influence of the growing number of environmental organizations was accelerating. There were certainly conflicting data points as opposed to the period where the environmental groups had successfully prevented the construction of the Charlestown nuclear power plant.

On the one side, the environmental groups had certainly influenced the electric utilities in their avoidance of new electric power generation plant projects. The ability of the groups to delay construction of any new oil- or coal-fired plant through lawsuits encouraged the utilities, particularly NEES, to promote conservation efforts in the region at the cost of increased sales. It is doubtful if any of the NEESPLANs would have been suggested let alone implemented if the concern of lengthy delays in plant construction had not permeated the NEES executive mindset. NEES was able to defuse much of the criticism that it might otherwise have been required to respond to by working with the

Group plc Acquisition of New England Electric System , Order Authorizing Acquisition of Registered Holding Company by Foreign Holding Company and Related Financings; Approving Other Related Requests; Discussing Individual Comments on the Acquisition; and Approving Service Transactions, March 15, 2000, <http://www.sec.gov/rules/other/35-27154.htm> (accessed March 22, 2015).

369. Ibid.

environmental groups.³⁷⁰ When natural gas burning plants were proposed in the 1990s for Burrillville and Providence, the utilities were able to get the plants licensed and constructed in a timely manner, perhaps because the newer plants were less polluting than the ones that otherwise might have been required. The environmental groups could thus alter the standard trajectory of the electric utilities that had previously followed the “grow and build” model.

The electric utilities were also able effectively use public relations to garner at least some public sentiment that they were concerned with the environment. In 2001 the Narragansett Electric Company presented its parcel of land at Rome Point to the state of Rhode Island. The land had previously been considered as a site for both conventional and nuclear power plants. The state turned the land over to the Department of Environmental Management, which promptly created the “John H. Chafee Nature Preserve” out of the area.³⁷¹ This gift earned Narragansett Electric the “John H. Chafee

370. Of course some of its actions made NEES suspect to the other members of NEPOOL and then later ISO New England, as well as the politicians in states that had supported the construction of the costly nuclear power plants. See John T. Landry and Jeffrey L. Cruikshank. *From the Rivers, The Origins and Growth of the New England Electric System* (East Greenwich, RI: Meridan Printing, 1996), 228, 234, 287, David Roe, *Dynamos and Virgins* (New York: Random House, 1984), 201-202, and Richard F. Hirsh, *Power Loss, The Origins of Deregulation and Restructuring in the American Electric Utility System* (Cambridge, MA: The MIT Press, 1999), 155-156.

371. Rhode Island Department of Environmental Management, “John H. Chafee Nature Preserve At Rome Point In North Kingstown To Be Dedicated Monday,” News Advisory, Rhode Island Department of Environmental Management, April 17, 2006, <http://www.dem.ri.gov/news/2006/pr/0413062.htm> (accessed July 1, 2015).

Outstanding Conservation Project/Program” award from the Environment Council of Rhode Island in 2002, an added, though perhaps unexpected benefit for the company.³⁷²

As well as limiting new construction and encouraging energy conservation, the environmental groups could hinder some of the operations at the most polluting electric power generation plants. State authorities could be lobbied and politicians persuaded with effective arguments and campaign contributions. These legislators and executives might then take action to pressure the Public Utilities Commission to limit electric utility operations and future plans. Legislation favoring or discouraging the electric utilities might be passed. The electric utility might even be sued by the state. These direct or indirect actions could affect plant operations and the overall efficiency of the electric power grid. Even when dealing with the demands of the New England heat waves during low capacity periods, efficiency and effectiveness were considered less important criteria than the stress that plant operations were placing on the environment.

On the other hand the utilities were also able to take advantage of new federal regulatory policies, perhaps in unintended ways. The Public Utility Regulatory Policies Act (PURPA) of 1978 and The Energy Policy Act of 1992 started to fracture the natural monopoly that the electric utilities had previously exercised. PURPA allowed new organizations to plug into the electric power grid, facilities that might have been overlooked in previous attempts to reach the highest levels of efficiency by the system

372. The Pascoag Utility District earned the award in 2013 for their conservation education program. No other utility was earned this accolade from ECRI. See John H. Chafee Outstanding Conservation Project/Program, Award Lists, Environment Council of Rhode Island, <http://www.environmentcouncilri.org/award-lists> (accessed July 1, 2015).

operators. Later, the Energy Policy Act of 1992 would lead to the divestiture of the generation section of the electrical utilities, leaving only the transmission and distribution portions under their control. While this new policy promised greater competition in the generation of electricity, one must also note that this led to a fissure of the standard model of electric utility operation. Any company capable of building and efficiently operating a suitable power plant could now provide electricity to the electric power grid. In the process a more efficient system could be created through competition. If this was correct, then the previous model of attaining maximum efficiency through monopolistic operation of the grid must have been flawed in some manner. Where previously the larger and more technically complicated plants had been extolled as paragons of efficiency, now the less expensive and demanding gas turbine plants were taking the largest portion of electric power generation. One, if not both, of the models must have been incorrect. Whether the new policies or models were more environmentally friendly than the old ones was yet to be determined.³⁷³

Another possibility is that the technological momentum of the electric power grid was influencing decision making bodies in ways that were not always in parallel with attaining maximum efficiency. As the electric utility and regulatory body executives struggled to comprehend the economic and technical issues of the period, decisions were made based on how these organizations had previously achieved success. The actual exigencies of the era were disregarded in favor of the historical lessons learned and

373. Richard F. Hirsh and Adam H. Serchuk, "Power Switch, Will the Restructured Electric Utility System Help the Environment?," *Environment* 41, no. 7 (September 1999): 34-36.

electric utility cultural biases. Rather than retiring the Brayton Point plant after it proved to be a drag on system performance, decades of time and millions of dollars were spent to try to make it work according to its design specifications, parameters that were continually being reduced. The concept of a technical problem that could not be overcome seemed anathema to the utility managers. The notion that the problem was due to technical overreach appears to have taken a long time to sink in. The new parameters of preventing environmental damage did not appear in this calculus, suggestive that the momentum of doing things the old, familiar way still dominated over any concern of environmental damage.

The twenty year period following the cancellation of the nuclear power plant at Charlestown, RI, thus saw a slightly new direction for the electric power grid. This vector change was the result of the political forces that the environmental groups could apply to all of the branches of the state and federal governments. Motivated by an evolving concern for the environment, these organizations were effective at altering the momentum of the electric power grid. Where the concerns of the environmental groups and the electric utilities overlapped, the change in momentum could be noticeable. Where the desire to protect the environment was in opposition to the demands for efficiency, the acceleration might be negligible. Whether the force to preserve the protection of the environment could be maintained against the prevailing powers for enhancing efficiency for the electric power grid was still indeterminate.

CHAPTER 7

ETHICAL ENERGY IN THE ERA OF GLOBAL WARMING

These choices may seem abstract, but they are sharp, imminent and practical. We stand at a crossroads: without decisive action our options will slip away. Delay in energy conservation lets wasteful use run on so far that the logistical problems of catching up become insuperable.

- Amory Lovins, *Energy Strategy: The Road Not Taken*

By the late 1990s apprehension that the effects of global warming were accelerating became the principal concern of the environmental organizations in the United States.³⁷⁴ Increased pollution and production of CO₂ and water vapor from the combustion of fossil fuels (coal, oil, and natural gas and their derivatives) correlating with the massive decrease of pristine wilderness areas, significant soil depletion, degradation of fresh water supplies and expanding human populations threatened the environmental health of the entire planet.³⁷⁵ Reversing this trend would absorb the attention of the many of the environmental organizations in the United States, with subsequent effect on the operation of the electric power grid over the next decades in southeastern New England.

374. Bjørn Lomborg, *The Skeptical Environmentalist, Measuring the Real State of the World* (1999; repr. Cambridge, UK: The Cambridge University Press, 2001), 258.

375. Vaclav Smil, *Global Catastrophes and Trends, The Next Fifty Years* (Cambridge, MA: The MIT Press, 2008), 171-172.

The green house effect was considered the primary cause of global warming. Burning any type of fossil fuel released these gases into the atmosphere where they tended to reflect heat from the earth's surface though still permitting radiant solar heat to penetrate. The net result was thought to be a buildup of the heat retained by the planet. Over time, the increased concentration of these gases could lead to a significantly large rise in the temperature of the planet, which in turn could result in deleterious conditions world wide.³⁷⁶ The consequences of a global temperature increase could be severe. The large masses of ice at the earth's poles could decrease in size, leading to an increase in the water level of the oceans and subsequent flooding of low lying areas throughout the globe. The shift in the oceanic water temperature could lead to altered weather patterns, affecting agricultural production, a higher frequency of extreme storms, and even a greater production of malarial carrying mosquitos.³⁷⁷ While the relative effect of increased production of CO₂ from industrial activity on the measured increases on the earth's temperature was debated, that human action was responsible for a large percentage of that change seemed reasonable.

New Problems and Older Concerns in the Environmental Movement

376. Bjørn Lomborg, *The Skeptical Environmentalist, Measuring the Real State of the World* (1999; repr. Cambridge, UK: The Cambridge University Press, 2001), 259-260.

377. See the Intergovernmental Panel on Climate Change, *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the IPCC* (Cambridge, UK, Cambridge University Press, 2001), 2-10 and Bjørn Lomborg, *The Skeptical Environmentalist, Measuring the Real State of the World* (1999; repr. Cambridge, UK: The Cambridge University Press, 2001), 287-300.

Such concerns and the desire to take action to reduce human created damage were an extension of environmental thoughts that stretched back generations. In the 1940s, Aldo Leopold had warned of the consequences of unremitted human activity on the land and had promoted a new ethical concern for the environment. By the 1960s Rachel Carson was advocating for the elimination of harmful chemicals that were affecting local ecological systems. In the 1970s, Barry Commoner had expanded these horizons by noting the interconnectedness of human economic activity and the environment, while Arne Naess had proposed that a new “Deep Ecology” philosophy was needed to guide non-privileged human behavior in a finite world. With the increasing number of scientific journals suggesting that global warming and climate change was not merely an ethical concern of inter-species domination over the world, earlier successes in limiting the use of pesticides or preserving small, local patches of wilderness seemed insignificant.³⁷⁸

Commentators on environmental affairs noted these trends and saw a validation of their earlier concerns. Yet with the “easy” environmental problems having been addressed, the population’s continued interest in possible future catastrophes appeared to decline. To some extent this was due to the environmental movement’s previous success in preventing the construction of the most polluting power plants, cleaning up some of the worst environmentally damaged sites, and the expanding populations of some of the previously designated endangered species. The longer term dangers from continuing

378. Philip Shabecoff, *A Fierce Green Fire*, Rev. ed. (Washington, DC: Island Press, 2003), 263-267.

human population growth, depletion of natural resources and reduction in the numbers of plant and animal species were still causes for concern if not alarm. Coupled with the potential for rising sea levels from the reduction of the polar ice caps, there were heightened concerns that the overall effect of human activity might cause global cataclysms. Since the time horizon for these problems was much longer, the threat from such environmental problems was more difficult to present. The Dean of the Yale School of Forestry and Environmental Studies, James Gustave Speth, noted that “We dealt with the more blatant immediate problems so people do not see that the world is flying apart.”³⁷⁹ The larger challenges of climate change required a higher national and even global level approach than the local or even regional actions to achieve the desired effects.

National level organizations within and outside the government took on efforts to reduce the human actions leading to global warming and alleviate its effects. The Environmental Protection Agency (EPA) conducted research on the potential causes and effects of global warming; the Department of the Interior (DOI) incorporated climate change in its wildlife and wetlands management programs; the National Aeronautics and Space Administration (NASA) used its satellites to monitor the extent of the polar ice caps; and other federal agencies developed their own plans to monitor or limit its consequences. This process accelerated over the years as different administrations occupied the White House. The Clinton administration showed interest in climate change, signing the United Nations Framework Convention on Climate Change at Kyoto

379. *Ibid.*, 263-266.

in 1996.³⁸⁰ The George H. Bush administration feigned concern while back pedaling from previous actions that might affect the nation's economy, while the Obama administration augmented federal activity and funding for research and actions to limit the consequences of climate change.³⁸¹

The national level environmental organizations were catalysts to the federal government's actions. Groups such as the Sierra Club, Greenpeace, the National Wildlife Foundation, the National Audubon Society, the World Wildlife Federation and others took the issue of climate change to heart, incorporating it in their mission statements. "Our nation must address climate change, continue moving toward cleaner energy sources, and make wildlife habitat and communities more resilient to such change," cautioned the National Wildlife Federation."³⁸² The Sierra Club set up programs to protest against the use of every fossil fuel since they all generated CO₂ and harmed the

380. The Kyoto accords were not ratified by the United States. See Steven Stoll, *U.S. Environmentalism Since 1945*. (Boston, MA: Bedford/St. Martin's, 2007), 92.

381. An Interagency task force on Climate Change Adaptation was created in 2009 and later replaced by the Council on Climate Preparedness and Resilience in 2013 "to develop recommendations for the President on how the federal government can strengthen policies and programs to better prepare the nation for the impacts of climate change." See United States Environmental Protection Agency, "Federal and EPA Adaptation Programs," Climate Change, United States Environmental Protection Agency, <http://www.epa.gov/climatechange/impacts-adaptation/fed-programs.html> (accessed April 7, 2015).

382. This declaration was passed unanimously at the annual Meeting of National Wildlife Federation on 28 March 2015. See National Wildlife Federation, "National Wildlife Federation Is A Voice For Wildlife, Dedicated To Protecting Wildlife And Habitat And Inspiring The Future Generation Of Conservationists," National Wildlife Federation, <http://www.nwf.org/Who-We-Are.aspx> (accessed April 7, 2015).

global environment when burned.³⁸³ The National Audubon Society suggested that not only were the earth's birds under threat from climate change, but that a new strategy of cleaner electrical energy generation and transmission was required.³⁸⁴ The national groups were well funded and spent tens of millions of dollars to lobby and fund the political campaigns of their supporters.³⁸⁵

Unlike previous issues where particular authors or speakers had become known as the leading spokesperson on an issue, the sheer number of scientists and environmentalists warning about the possible dangers of climate change reduced the effects of any individual forecaster. Some of the earlier thinkers remained salient to the continuing conversation. Arne Naess linked the “*increasing environmental degradation or devastation perpetuated through firmly established ways of production and consumption and a lack of adequate policies regarding human population increase* (italics in the original)” to the crisis.³⁸⁶ Naess promoted a lower level of energy consumption and a more distributed energy production with greater emphasis on smaller

383. Sierra Club, “Moving Beyond Fossil Fuels,” Sierra Club, <http://www.sierraclub.org/beyond-fossil-fuels> (accessed April 7, 2015).

384. Audubon, “Shaping a Healthy Climate & Clean Energy Future,” Conservation, <https://www.audubon.org/conservation/climate> (accessed April 7, 2015).

385. The national organizations contributed mainly to Democratic politicians. The electrical utilities were mainly Republican supporters and tended to have more money to spend on lobbying and campaign contributions. See Evan Mackinder, “Pro-Environment Groups Outmatched, Outspent in Battle Over Climate Change Legislation,” Opensecrets.org, <http://www.opensecrets.org/news/2010/08/pro-environment-groups-were-outmatc/> (accessed April 7, 2015).

386. Arne Naess, *Ecology, Community and Lifestyle*, Translated and Edited by David Rothenberg (1989. Reprint, Cambridge, UK: Cambridge University Press, 1998), 23.

and non-fossil fuel energy sources. Self reliance for both individuals and communities should be encouraged to resist the continuing technological juggernaut and the “megasociety.”³⁸⁷ Increasing the economic output of the developed world was increasingly harmful to the overall health and well being of the globe and its human population and thus should be rejected. The ecophilosophical model previously postulated was still vital to pursue.³⁸⁸

Despite Naess’ statements, there was not universal agreement that the problems of climate change had an ethical component, or that Deep Ecology was the best means to explore it. Others suggested that Deep Ecology and other ecological ethics were merely filling the void left by the erosion of older faith traditions. Human reason had led to the questioning of some of the basic precepts of the Western religious traditions. Yet that same rationality was still insufficient by itself to further enhance human flourishing in an era where a belief in God was no longer axiomatic. Unwilling to accept either of the divergent poles of anti-Christian eliminatory or extreme reductionist rhetoric the population looked for other moral touchstones to guide their actions.³⁸⁹ The ecological movement used human reason and science to detect the upsetting of biological equilibrium, but concurrently rejected the notion that the environment was only a medium for human endeavors. Such a frame of reference closed individuals off from

387. Ibid., 87-102.

388. Ibid., 210-212.

389. Charles Taylor, *A Secular Age* (Cambridge, MA: The Belknap Press of Harvard University Press, 2007), 599.

nature and the effects it had on human flourishing.³⁹⁰ Naess' Deep Ecology attempted to open up humans to the sources of power within nature itself to achieve personal completeness.³⁹¹ While acknowledging human activity within the earth's complex biologic community was not privileged, Deep Ecology could still promote a means of "non-exclusive humanism," though not using the trappings of traditional religious ceremony.³⁹²

By this time even the Roman Catholic Church was concerned about the religious component of the ongoing ecological crisis. In 1990 Pope John Paul II stated that this was not only an environmental issue, but a moral issue as well. Respect for human life and dignity should be the most important consideration in resolving these complex economic and technological problems. While acknowledging that scientific and technological advances had brought benefits for humanity, the Pope stressed that the unrestrained use of these advances had adverse effects on both man and the earth. The Pope's communiqué discussed possible solutions to the ecological crisis but stressed the common responsibility of mankind to address and solve the problems. Echoing White, the Pope called the example of Saint Francis of Assisi a "striking witness that when we are at peace with God we are better able to devote ourselves to building up the peace with

390. *Ibid.*, 317.

391. *Ibid.*, 9.

392. *Ibid.*, 19.

all creation which is inseparable from peace among all peoples.”³⁹³ Pope John Paul II’s consistent message indicated that ecological concerns were not inimical to the Roman Catholic faith and that protecting the biosphere was a moral imperative.

Nay-sayers rejected not only the alleged ecological crisis of global warming caused by fossil fuel combustion, but also any moral basis requiring action.

“Environmentalism seems to be the religion of choice for urban atheists,” argued noted science fiction writer Michael Crichton.³⁹⁴ Crichton viewed environmentalism as a type of displaced mysticism or religion. As the masses in cities no longer viewed their faith traditions with any seriousness, they had shifted to environmentalism to fill the void.³⁹⁵

Crichton saw the tenets of environmentalism as based on misguided faith that accepted no reason. Technology and human decisions helped create environmental problems; only humility and reason could help humanity solve them.³⁹⁶

393. Pope John Paul II, "The Ecological Crisis: A Common Responsibility," *Land: A Call To Stewardship*, January 1, 1990, http://www.ncrlc.com/ecological_crisis.html / (accessed December 14, 2011).

394. Michael Crichton, "Environmentalism As Religion" (speech, Commonwealth Club, San Francisco, CA, September 15, 2003).

395. *Ibid.*

396. Crichton noted that in environmental tracts, “There’s an initial Eden, a paradise, a state of grace and unity with nature, there’s a fall from grace into a state of pollution as a result of eating from the tree of knowledge, and as a result of our actions there is a judgment day coming for us all. We are all energy sinners, doomed to die, unless we seek salvation, which is now called sustainability. Sustainability is salvation in the church of the environment.” Crichton stated that these ideas were based on a “remapping of traditional Judeo-Christian beliefs and myths.” See Michael Crichton, "Environmentalism As Religion" (speech, Commonwealth Club, San Francisco, CA, September 15, 2003).

Amory Lovins was more specific regarding how the electric power grid might be transformed to limit the environmental damage it created, as well as provide reliable power to maintain the economic vitality of the nation. Lovins had continued to study the nation's electric power systems during the 1980s and 1990s and had noted many of the problems bedeviling the electric utility industry. The large scale power plants were too expensive, were inefficient, broke down too often, and were environmentally malignant. Rather than continue to pursue the old model of small numbers of power plants of increasing electrical capacity and efficiency, a goal that was no longer economically viable, the utilities should shift to a more distributed power generation model.³⁹⁷ The growing efficiency and capacity, along with the declining cost, of renewable energy sources, such as wind power turbines and solar powered photovoltaic cells, made their use more attractive to utilities and consumers. Less expensive energy storage devices in the form of fuel cells would allow more convenient methods to meet smaller loads and some of the peak electricity demands without the need of greater numbers of larger power plants. The improved digital power inverters permitted new electricity sources to plug into the grid producing the same voltage and frequency as all of the other electric power generators. A larger number of smaller but more reliable electric power sources would reduce the requirements for large scale distribution power lines that took up huge swaths of land and wasted energy from the electric line losses in the cables.³⁹⁸ The lower capacity and less technically demanding units would be a smaller financial risk to the

397. *Ibid.*, 2-4.

398. *Ibid.*, 4-5.

utilities. Fewer oscillations in the electric utilities' business models would be experienced during the construction of these types of power plants, as opposed to the stresses that the expensive nuclear or conventional powered plants had created when they had not been completed on time or budget.³⁹⁹ Improving the means and number of electric power generators and taking advantage of the increased computing power now available would permit the producers to improve the quality of service as well as reduce the cost.⁴⁰⁰ The smaller plants were typically less environmentally harmful than the larger ones. They tended to have fewer polluting emissions per the unit of electric power delivered, reducing the harm to nearby fish and wildlife, and required less land and water to operate than the larger plants.⁴⁰¹ Since the smaller plants had a smaller physical footprint and levied fewer social costs on the public they served, the political rancor of a "megaproject" being imposed on a smaller community could also be reduced.⁴⁰²

This democratic nature of smaller scale energy production was consistent with Lovins' previous writing. By now, Lovins had two more decades of technological development and utility experimentation to buttress his arguments. He was able to offer specific policy recommendations to utility managers, federal and state regulators, electric power generation and distribution companies, and even real estate developers. The benefits that would accrue to local, regional and national users of the electric power grid

399. *Ibid.*, 109-134, 151-152.

400. *Ibid.*, 5-6.

401. *Ibid.*, 303-307.

402. *Ibid.*, 296-297.

would be substantial, even leading to global benefits because of the greater cleanliness of Lovins' proposed distributed system. A distributed system was less open to catastrophic failure from technical failures or external attacks. A less expensive system could potentially bring the benefits of electric power to the large portion of the global community that still did not have any. The resultant system would be more reliable and make the world safer and more just. Conservation of electric power was also important as wasting energy could overcome any improvement that a distributed system might provide.⁴⁰³ For Lovins, reforming the electric power grid could be accomplished in a manner that not only protected the environment but maintained the comfort of the population enjoying its technological benefits.

Rhode Island Environmental Groups in the New Century

The consensus view on the perils of climate change caused by fossil fuel use and the possible methods to decelerate these trends diffused down to the regional and state environmental groups. These concerns impacted the operation of the electric power grid in the New England region, though not with the alacrity that environmentalists might have desired. Towards the end of the 1990s, the Rhode Island government funded studies that noted the costs, both economic and environmental, on the continued suburban sprawl in the state. A greater suburban population along with a decaying urban core required longer electric power transmission lines, using up more land than the report's authors thought necessary. The report advocated improving urban infrastructure, while

403. Amory Lovins, *Small is Profitable* (Snowmass, CO: Rocky Mountain Institute, 2002), 311-382.

purchasing land for natural conservation was recommended as a method to limit the declining rural character of the state. The study concluded that Rhode Island could devise effective strategies to reverse the trend. Limiting such suburban sprawl would lead to improvements in the environmental quality of the state.⁴⁰⁴ Another study, written in 2007, envisioned much of the city of Providence under water if the worst case scenario of ocean level increase caused by climate change occurred. The Coastal Resource Management Council of Rhode Island recommended improved federal and state coordination, including the emphasis on renewable energy, to help prevent increased erosion of the coastline.⁴⁰⁵

The numerous Rhode Island environmental groups were receptive to the issues of climate change. The groups often proposed new state regulations and actions to limit the production of any carbon emission, whether coming from the smokestacks of electric generation plants or the automobiles on the state highways. Save the Bay considered climate change as one of the larger threats to the ecosystem of Narragansett Bay. The organization noted changes to the bay's "salt marshes and fish habitat, changes in species diversity, and challenges with water quality. In Narragansett Bay, water temperatures have increased 3° F in the last hundred years. In that same time, Bay waters have risen up

404. The President of Salve Regina University, Sister Theresa Antone contributed to the study, as did the President of Narragansett Electric, Lawrence Reilly. See H. C. Planning Consultants, Inc. and Planimetrics, LLP, for Grow Smart Rhode Island, *The Costs Of Suburban Sprawl And Urban Decay In Rhode Island*, (Providence, RI: The Providence Journal, 1999), 8, 14, 17.

405. Brown University escaped submergence in all scenarios. See Grover Fugate, "Implications of Climate Change For Rhode Island" (PowerPoint presentation, 2007) <http://www.whitehouse.senate.gov/download/?id=40c8a0d3-a62b-43e5-a4e7-f582c75ef8ae&download=1> (accessed April 26, 2015).

to seven inches and the rate of sea level rise has increased.”⁴⁰⁶ These changes led to increased beach erosion, damage to coastal facilities and property, and more dynamic weather patterns affecting the area. Save the Bay advocated renewed efforts to limit such change, stating:

We must also work to mitigate climate change. We can do this by supporting efforts to reduce the use of fossil fuels, creating more renewable energy, and increasing the efficiency of our buildings and homes. It is important that the people who live and work in and around the Narragansett Bay watershed and coastal communities understand the Bay's role as part of a global ecosystem.⁴⁰⁷

The Audubon Society of Rhode Island had similar concerns, supporting the use of sustainable energy sources and energy conservation to limit environmental damage to the region.⁴⁰⁸ The Environment Council of Rhode Island (ECRI), leading an assembly of approximately 60 state groups, said that “Climate change poses significant threats to Rhode Island’s health, economy, and environment.”⁴⁰⁹ The organization proposed numerous actions that the state government should take to resolve some of the problems, including increasing energy efficiency, maintaining the state subsidy of sustainable

406. Save the Bay, “Climate Change, A Threat to Narragansett Bay,” Save the Bay, <http://www.savebay.org/climate> (accessed May 02, 2015).

407. Ibid.

408. Audubon Society of Rhode Island, “Issues at Audubon,” Advocacy, Audubon Society of Rhode Island, <http://www.asri.org/our-major-projects/issues-at-audubon.html> (accessed May 02, 2015).

409. Environment Council Of Rhode Island, “ECRI Resolution on RI Climate Change Response,” Environment Council Of Rhode Island, <http://www.environmentcouncilri.org/files/ecri-resolution-ri-climate-change-response> (accessed May 02, 2015).

energy sources and insulating homes in lower income housing areas.⁴¹⁰ The Conservation Law Foundation (CLF) echoed these apprehensions, calling climate change “the defining environmental issue of our generation.”⁴¹¹ Having expanded its influence and now with local offices across the entire New England area, CLF, continued to advocate for greater energy conservation, investment in renewable energy sources and the reduction of fossil fuel burning to limit the overall production of CO₂. CLF would also become a party in the class action suit of the Commonwealth of Massachusetts v. Environmental Protection Agency, a case that confirmed the power of the Environmental Agency to further regulate emissions affecting climate change.⁴¹²

The smaller Rhode Island environmental and conservation groups often advocated actions to limit carbon emissions leading to global climate change as well. The South Kingstown Land Trust, for example, working with the University of Rhode Island’s Graduate School of Oceanography and the College of the Environment and Life Sciences, studied the effects of climate change in its area. The association was concerned that more dynamic weather events (storms and increasing sea water temperatures) were

410. See Environment Council Of Rhode Island, “Exploring Climate Change Resilience Strategies In Rhode Island Urban Under-Served Communities,” Environment Council Of Rhode Island, <http://www.environmentcouncilri.org/sites/default/files/ECRI%20Climate%20Adaptation%20Report%20FINAL.pdf> (accessed May 02, 2015), and “2015 Emerging Environmental Priorities, January 14, 2015,” Environment Council Of Rhode Island, http://live.ecri.gotpantheon.com/sites/default/files/2015_Emerging_ECRI_Priorities.pdf (accessed May 02, 2015).

411. Conservation Law Foundation, *CLF 40 Years, Protecting New England’s Environment* (Boston, MA: Conservation Law Foundation, 2006), 3.

412. *Ibid.*, 15.

leading to rapid environmental damage from invasive species migration and coastal property damage. To limit the damages, improved monitoring of local and invasive non-native animal and plants and the use of “Low Impact Development” to improve environmental resilience in the most threatened areas was advised.⁴¹³ The People’s Power and Light group, organized in 2002, advocated for the more environmentally friendly use of energy and the reduction of fossil fuel use to generate electricity. The organization proposed more efficient energy use, conservation, and wind powered turbines to generate more “green energy.”⁴¹⁴

Another organization looked at the religious component of the environmental crisis as a major motivating force. The Rhode Island Interfaith Power & Light assemblage established in 2007, suggested that people of all faith traditions in the state should work together to tackle the issue of climate change “so we can fulfill our moral obligation to care for creation.” This association of 15 other like minded faith organizations worked with People’s Power and Light and coordinated with National Grid, now the operator of the transmission and distribution portion of the electric power grid in

413. This study included collaboration with URI, the South Kingstown Land Trust, The Nature Conservancy, and the Rhode Island Coastal Resources Management Council. See Rhode Island Sea Grant & URI Coastal Resources Center, “Building Capacity to Adapt to Climate Change Through Local Conservation Efforts,” (Kingston, RI: Rhode Island Sea Grant & URI Coastal Resources Center, 2013), 1-2, 65-66.

414. People’s Power and Energy also worked to provide less expensive home heating oil to lower income families. See People’s Power and Energy, “Home,” People’s Power and Energy, <http://www.ripower.org/> (accessed May 03, 2015).

the state, to shift portions of the monthly electric bill to subsidize the production of renewable energy sources.⁴¹⁵

Such groups exhibited the intermingling of both religious and environmental ethical outlooks. Proponents of these perspectives suggested that the more ancient faith traditions did share concepts with the modern environmental movement, including the virtue of sustainability. Sustainability included such human activity as protecting the commons against pollution, minimizing excessive production and using appropriate technology, extolling greater local and regional self-sufficiency, and delivering environmental justice to the most susceptible members of society.⁴¹⁶ Environmental activists emphasized the “ethical responsibility to respect and conserve Earth’s ecological integrity and biodiversity while acting to achieve social and economic justice.”⁴¹⁷ Guarding the environment was not only important to protect human health and biodiversity, it was also an important facet of attaining a more just, sustainable and democratic social order. Such tasking was seen as harmonious with other Judeo-Christian teachings from the Bible, as opposed to Lynn White’s earlier critiques. Humans, however, were no longer privileged over other species to go forth and multiply

415. The President of the RI Interfaith Power & Light, Rev. Dr. Anita Louise Schell, was a Brown University graduate. Her doctoral dissertation, “How Then Shall We Live: An Interfaith Eco-Justice Model for the Local Community,” earned her the 2009 Norman Hall Prize for outstanding peace and justice work. See Rhode Island Interfaith Power & Light, “Home,” Rhode Island Interfaith Power & Light, <http://www.ri-ipl.org/index.html> (accessed May 03, 2015).

416. Dieter T. Hessel, “Religion and Ethics Focused on Sustainability,” *Environmental Law Reporter* 39, no. 4 (April, 2009): 10291-10293.

417. *Ibid.*, 10293-10294.

or establish dominion over the earth, but should act in concert with all species to attain a more just community. Producing sustainable energy resources would assist in limiting those emissions that were causing global environmental damage. Promoting effective policies to enhance these issues should be a part of every congregation's concerns. Failure to do so would only accelerate the damage being caused and would essentially be a sin.⁴¹⁸

Promoting social justice received greater emphasis in the environmental movement. Climate change was seen as a forcing function for these groups to attain "climate justice." Newer groups were still interested in preventing pollution, conserving land and wildlife for future generations, and appreciating the natural world on its own merits. Proponents for climate justice additionally were concerned that the greatest harm caused by climate change was affecting those least capable of withstanding it. With limited economic resources and lower levels of environmental awareness, society's poorest members were not prepared to suffer through any catastrophe, whether caused by more dynamic weather patterns or the flooding of lower elevation shoreline areas. Climate justice developed as a more radical concept of limiting environmental damage caused by climate change and went beyond mainstream efforts to create larger scale social fairness.⁴¹⁹

418. Ibid., 10293-10296.

419. Nichols also suggests that local food production and consumption was a new factor motivating the state environmental groups in the early 2000s. See Kelly Maree Nichols, "From Climate Justice to Green Business: A Rhode Island Case Study of Current Trends in the Environmental Movement" (Environmental Studies thesis, Brown University, 2009), 64-68, 79-80.

While few of the approximately thirty new environmental or conservation groups that were organized in the state during the first decade of the century espoused this view directly, more of the established groups were open to this perspective.⁴²⁰ Some of the newer groups, such as Ocean State Earth First, were further amenable to direct action to sabotage other businesses or organizations that were polluting the environment. Another, the Environmental Justice League of Rhode Island, suggested that “health, environmental quality, and social justice are all connected,” and that the ills of environmental damage disproportionately affected the lower income members of the state.⁴²¹ While these were more minority views, the evolution of the environmental movement to generate this stray voltage from the more humble origins of John Muir’s vision is remarkable.

Continuity of Power: Rhode Island Politics in the New Century

With national and local organizations driven by the concerns of global climate change, it is not surprising that the state agencies interacting with them also proclaimed interest in those worries. Having been involved in the deregulation of the utility industry in Rhode Island, Lincoln C. Almond, the Republican Governor from 1995 to 2003, displayed some awareness of this problem. In 2001 the Almond administration worked with other states and Canada to create a Climate Change Action Plan, which eventually

420. Kelly Maree Nichols, “From Climate Justice to Green Business: A Rhode Island Case Study of Current Trends in the Environmental Movement” (Environmental Studies thesis, Brown University, 2009), 79-80.

421. Another state organization, Ocean State Action, allegedly espoused climate justice but appeared more as a left wing political organization than one with environmental issues at the forefront. See Environmental Justice League of Rhode Island, “Our History,” Environmental Justice League of Rhode Island, <http://ejlri.org/about/our-history/> (accessed May 03, 2015), and Ocean State Action, <http://usaction.org/ri/> (accessed May 03, 2015).

led to many actions taken by the Department of Environmental Management to limit pollution and CO₂ production in the state.⁴²² A subsequent study, the Rhode Island Greenhouse Gas Action Plan was completed in 2002 near the close of Almond's term. The report, authored by members of the state's business, government, industry and environmental organizations and state departments, concurred with the scientific consensus that the increased production of CO₂ by human sources was accelerating the temperature rise of the planet. To limit this growth, the members recommended a number of actions, such as increasing the energy efficiency of state industries, using natural gas to heat buildings, and providing tax credits for the purchase of more efficient home appliances. Lower priority options also included spending tax money to build larger numbers of renewable energy sources and subsidizing the installation of photovoltaic electrical systems.⁴²³ The subsequent administration of Republican Donald

422. Almond also had to deal with a major home heating oil spill on Narragansett Bay in 1996 that required substantial effort to clean up. Subsequent work to approve dredging of Narragansett Bay to avoid future problems generated some friction between the Army Corps of Engineers, the Almond Administration and local environmental groups. See Environment Council of Rhode Island, "Governor Carcieri: A Legacy of Inaction," Environment Council of Rhode Island, <http://environmentcouncilri.org/sites/default/files/2010GovernorCarcieriReportCard.pdf> (accessed May 3, 2015), Save The Bay, "Our History, 1996," Save The Bay, <http://www.savebay.org/history> (accessed May 3, 2015), and The Committee on the Environment and the Northeast International Committee on Energy of the Conference of New England Governors and Eastern Canadian Premiers "Climate Change Action Plan 2001," <http://www.dem.ri.gov/climate/pdf/negecpp.pdf> (accessed May 3, 2015).

423. Stakeholders included a total of 33 different organizations such as the Rhode Island Department of Environmental Management, the Division of Public Utilities and Carriers, Save the Bay, the Conservation Law Foundation, and Narragansett Electric Company. See The Rhode Island Greenhouse Gas Stakeholder Process, *Rhode Island Greenhouse Gas Action Plan*, (Providence, RI: Rhode Island Department of Environmental Management and the Rhode Island State Energy Office, 2002), 3-6.

Carcieri (2003-2011), was not as enthusiastic about environmental issues in the state.

The Environment Council of Rhode Island considered Carcieri as a particularly uninterested executive, as the new governor rejected many of the recommendations from the wide variety of interested organizations and actors to address climate change during his administration.⁴²⁴

While the successive Republican governors were reticent to propose new methods to address the problems or even implement earlier recommendations, the state administrative organs continued to support these actions. The Department of Environmental Management (DEM) coordinated actions with adjoining states in the Regional Greenhouse Gas Initiative. This program required electric power generators in the New England and Mid-Atlantic area to provide the states an exchangeable grant based on the amount of CO₂ they generated. These grants were auctioned off quarterly, whereupon Rhode Island used the money to help fund energy efficiency and conservation programs, including “renewable non-carbon emitting energy technologies.”⁴²⁵

424. See Environment Council of Rhode Island, “Governor Carcieri: A Legacy of Inaction,” Environment Council of Rhode Island, <http://environmentcouncilri.org/sites/default/files/2010GovernorCarcieriReportCard.pdf> (accessed May 3, 2015), Save The Bay, “Our History, 1996,” Save The Bay, <http://www.savebay.org/history> (accessed May 3, 2015), and The Committee on the Environment and the Northeast International Committee on Energy of the Conference of New England Governors and Eastern Canadian Premiers “Climate Change Action Plan 2001,” <http://www.dem.ri.gov/climate/pdf/negecpp.pdf> (accessed May 3, 2015).

425. The major electrical generating plants in the state all participated in this program. See Rhode Island Department of Environmental Management “Regional Greenhouse Gas Initiative (RGGI) Rhode Island CO₂ Budget Trading Program,” Rhode Island Department of Environmental Management, <http://www.dem.ri.gov/rggi/index.htm> (accessed May 3, 2015).

Another source of money came from consumer electric bill. As part of the Rhode Island Utility Restructuring Act of 1996 Act, every electric distribution company was tasked to charge customers a small fee that the state could then use to fund energy efficiency programs and renewable energy sources.⁴²⁶ Such remittances allowed the Department of Environmental Management and other state agents to subsidize several actions that promised to lower the state's overall CO₂ production, provide for more sustainable energy sources and promote social justice. The DEM also synchronized its actions to reduce car emissions with the other states in an effort to lower the total amount of CO₂ being generated.⁴²⁷

Acclimatizing the IEEE Code of Conduct

Attaining a sustainable civilization, particularly with reference to the use of fossil fuels that produced climate affecting greenhouse gases, was not merely the concern of the local and national environmental organizations and the federal and state governments. Such concerns also diffused into the organizations that produced the designers and operators of the electric power grid. College electrical engineering departments had addressed some of these issues in their programs in the preceding decades. The

426. A charge of 2.3 mills per kilowatt-hour (.0023 dollars per kW-hr) was to be levied to support such programs. The Rhode Island Renewable Energy Fund was created to manage the money and support energy efficiency and conservation measures as well as support the creation of additional renewable energy sources. See *An Act Relating To The Utility Restructuring Act Of 1996*, Chapter 316 96-H 8124B, 7 August 1996, and Energy.gov, "Rhode Island Renewable Energy Fund (RIREF)," Energy.gov, <http://energy.gov/savings/rhode-island-renewable-energy-fund-riref> (accessed June 7, 2015).

427. Rhode Island Department of Environmental Management, "Climate Change and Rhode Island," Rhode Island Department of Environmental Management, <http://www.dem.ri.gov/climate/index.htm> (accessed May 3, 2015).

engineering curricula had changed to take into account some of the environmental issues that influenced federal and state laws and regulations concerning its discipline. At Worcester Polytechnic Institute, the faculty and administration had begun to change the teaching methods and curriculum in the 1970s, updating their techniques using a “radically different approach to technological education.”⁴²⁸ The plan removed standard grading criteria, shortened semesters and refocused class topics. Projects conducted by small groups of students included work on comprehending the environmental issues of the assignment.⁴²⁹ The core engineering disciplines were still emphasized, but other activities and educational programs began to open up to non-engineering perspectives. By the new millennium students were expected to not only be adept in the engineering arts, but also assess the design parameters of their structures “to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.”⁴³⁰ Classes included not only electric power engineering topics crucial to designing new electric power grid systems,

428. Worcester Polytechnic Institute, “The Story of the WPI Plan,” Worcester Polytechnic Institute, <http://www.wpi.edu/academics/library/history/plan/> (accessed June 4, 2015).

429. Worcester Polytechnic Institute, “A Planning Program for Worcester Polytechnic Institute: The Future of Two Towers - Part Three: A Model,” Worcester Polytechnic Institute, <http://www.wpi.edu/academics/library/history/plan/Three/section5.html> (accessed June 4, 2015).

430. Worcester Polytechnic Institute, “Program Overview,” Department of Electrical & Computer Engineering, Worcester Polytechnic Institute, <http://www.wpi.edu/academics/ece/program-overview.html> (accessed June 4, 2015).

but also on “Social Entrepreneurship,” for the “design of sustainable social business models.”⁴³¹

Brown University’s Electrical Engineering Department saw a similar shift in emphasis while still maintaining its emphasis on the core topics.⁴³² A new major, Environmental Engineering, was introduced in 2013, examining such topics as energy and the environment, “Sustainable Energy Technologies,” and “Principles of Ecology.”⁴³³ The University of Rhode Island had comparable Expected Student Outcomes to Brown and Worcester Polytechnic Institute. While URI graduates were expected to have an “understanding that engineering knowledge should be applied in an ethically responsible manner for the good of society,” the concept of sustainability was not emphasized.⁴³⁴ The syllabus description of classes in the Electrical Engineering Department at Kingston looked comparable to those of the preceding decades. Similar to Brown, URI had also

431. Worcester Polytechnic Institute, “Undergraduate Programs,” Department of Electrical & Computer Engineering, Worcester Polytechnic Institute, <http://www.wpi.edu/academics/ece/ugcourses.html> (accessed June 4, 2015).

432. Brown University, “All Engineering Courses,” Brown School of Engineering, <http://www.brown.edu/academics/engineering/undergraduate-study/courses> (accessed June 4, 2015).

433. Brown University, “Environmental Engineering (non-accredited),” Brown University, <http://www.brown.edu/academics/engineering/sites/brown.edu.academics.engineering/files/uploads/Environmental%20Engineering%20program%20outline.pdf> (accessed June 4, 2015).

434. University of Rhode Island, “Expected Student Outcomes,” 2014-2015 URI Undergraduate & Graduate Catalog, <http://web.uri.edu/catalog/expected-student-outcomes/> (accessed 6 June 2015).

established a college of Environment and Life Sciences, including a program for Environmental and Natural Resource Economics.⁴³⁵

The Institute of Electrical and Electronic Engineers (IEEE) code of conduct for its members had also undergone a subtle shift since the 1970s. In 1974, following the 1963 amalgamation of the American Institute of Electrical and Electronic Engineers and the Institute of Radio Engineers to form IEEE, a new code of ethics was produced. The code of ethics was similar to the previous one published in 1950, calling for high standards of “diligence, creativity and productivity.”⁴³⁶ Absent were the earlier admonitions that the public was not capable of comprehending the work that electrical engineers performed. Instead, the new code exhorted electrical engineers to “fulfill their responsibilities to the community” by protecting “the safety, health and welfare of the public and speak out against abuses in these areas affecting public interest.”⁴³⁷ These changes were in part due to the membership’s emphasis on professionalism, a quality “based not only on traditional high standards of technical achievement but that embraces concern for the impact of technological developments on society as well.”⁴³⁸

435. University of Rhode Island, “Environment and Life Sciences,” 2014-2015 URI Undergraduate & Graduate Catalog, <http://web.uri.edu/catalog/environment-and-life-sciences/> (accessed June 06, 2015).

436. “IEEE Code of Ethics for Engineers,” in A. Michael Mahon, *The Making of a Profession: A Century of Electrical Engineering in America* (New York: The Institute of Electrical and Electronic Engineers, 1984), 265.

437. Ibid.

438. Donald Christenson quoted in “IEEE Code of Ethics for Engineers,” in A. Michael Mahon, *The Making of a Profession: A Century of Electrical Engineering in America* (New York: The Institute of Electrical and Electronic Engineers, 1984), 263.

Changes to the society's code of conduct in the 1980s made it more inclusive. All members of the society, not merely the engineers, were now considered subject to the code's parameters. In 1988, the new president of the society, Emerson W. Pugh presided over another alteration to the code of ethics. The code was shortened; some redundancy was eliminated, and it was rewritten with more aspirational goals to guide how members should act. After several years of work in committee and comments from the IEEE membership, the new standard took effect in 1991.⁴³⁹ The code of conduct now had ten canons, the first of which directed the members to "accept responsibility in making decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment."⁴⁴⁰ Though minor changes were enacted in 2006 to further acknowledge the occupational diversity of the membership, the code remained essentially the same.⁴⁴¹ While the "environment" now received mention in the first tenet of the new code and IEEE members were enjoined to inform the public on the ramifications of their work, sustainability was not a concern.⁴⁴²

439. "Emerson W. Pugh, "Creating the IEEE Code of Ethics," *Proceedings of the 2009 IEEE Conference on the History of Technical Societies, 5-7 August 2009* (Piscataway, NJ: IEEE, 2009), 1-13.

440. Ibid.

441. Ibid.

442. The concurrent National Society of Professional Engineers (NSPE) Code of Ethics for Engineers, while not an industry standard, was consistent with similar engineering society codes. These ethical codes typically placed a premium on technical excellence, honesty and economic performance. They are less rigorous on the consideration of environmental issues. The NSPE codes are illuminating in that they state that engineers "are encouraged to adhere to the principles of sustainable development." The term "sustainable development" is the only one in the code requiring

Members were exhorted to “improve the understanding of technology, its appropriate applications and potential consequences” in the 1991 ethical standard, yet the older themes of technical excellence were still predominant.⁴⁴³ This was a step towards addressing the population’s concerns regarding the effects of technological change on the environment and their health. It appeared to lag a step behind popular concern of what the operators of the electric power grid, or any technological system should do.

Gas Turbines Triumphant

Toward the end of the 1990s, essentially all of the government agencies regulating the electric power generation facilities and distribution system, the environmental groups concerned with anthropomorphic global warming, and the even the electric utilities themselves, endorsed the use of sustainable energy sources to power the electric power grid. With such agreement among these organizations, one might have expected a myriad of renewable energy systems to be built that could all plug into the distribution network of National Grid. In a relatively small state such as Rhode Island, the best practices of Amory Lovins could be economically practiced and the more exacting ethical standards of Save the Bay could be met even as the electric utilities made a profit and the lights remained on. While the desire to do all of these may have been high, the actions of the interested parties belied a sense of true urgency regarding the

an explanatory footnote. National Society of Professional Engineers, "NSPE Code of Ethics for Engineers," National Society of Professional Engineers, <http://www.nspe.org/sites/default/files/resources/pdfs/Ethics/CodeofEthics/Code-2007-July.pdf>. (accessed June 11, 2015).

443. “IEEE Code of Ethics,” from Emerson W. Pugh, in “Creating the IEEE Code of Ethics,” *Proceedings of the 2009 IEEE Conference on the History of Technical Societies, 5-7 August 2009* (Piscataway, NJ: IEEE, 2009), 1-13.

proposed challenges of global warming and how the electric power grid might exacerbate them.

The construction of the natural gas fired electrical generation plants in Tiverton and Johnston, Rhode Island at the turn of the current century reflected this discordance. Both stations were of medium size (265 and 576 megawatts respectively) and were built in the period following electric utility deregulation in the Ocean State.⁴⁴⁴ While still supplying electricity to ISO New England, the parent entity operating the electric power grid, the plants were smaller than the larger scale nuclear or coal-fired plants of the previous decades. Gas turbine technology was sufficiently mature to limit the risk of building and operating the facilities. Burning natural gas limited the air pollution the new electric power plants caused, though they still created CO₂ and water vapor while operating.

The Tiverton plant had its genesis in 1996 when the Energy Management Inc. of North Dartmouth, Massachusetts, the same company that ran the cogeneration plant in Pawtucket, bought a parcel of land in the Tiverton Industrial Park to build a natural gas burning electric power plant.⁴⁴⁵ The company filed its proposal for the plant in 1998 with the state's Energy Facility Siting Board, beginning a review process that could be expected to take from one to two years to conduct. Later that year, the state's Economic

444. See Bob Mello, "Town, State Officials Cheer Groundbreaking For Power Plant," *Providence Journal*, October 8, 1998 and Timothy C. Barmann, "More Power To You - New Plant In Johnston Will Boost State's Output To All-Time High," *Providence Journal*, August 4, 2002.

445. Jerry O'Brien, "Tiverton To Sell Land For Electric Power Plant," *Providence Journal*, March 13, 1996.

Development Corporation granted the construction company a “Certificate of Critical Economic Concern,” which caused state regulatory bodies to accelerate their assessment.⁴⁴⁶ Three months from that decision, a ground breaking ceremony was held in Tiverton, headed by Rhode Island Governor Lincoln Almond. "Without question, we're serving as a model for the rest of the country," Almond stated, claiming that the deregulation of the electric utility industry in the state had led to the construction of the plant.⁴⁴⁷ The plant was more efficient than similar gas turbine facilities in the area, leading to less expensive energy costs and reduced pollution in the region.⁴⁴⁸ The Tiverton plant became fully operational in 2000.⁴⁴⁹

The natural gas burning power plant in Johnston, RI was also constructed rapidly. A Texas energy firm, Houston Industries, began negotiating with the town of Johnston in 1998 to buy a parcel of land near the central landfill to construct a new power plant. The financially strapped town of Johnston was very interested in the company’s pitch.⁴⁵⁰ After the construction was placed on the Rhode Island Economic Development Corporation’s fast track status in 1998, the state’s regulatory bodies again acted rapidly to

446. See Celeste Katz, “Power Plant Proposal Takes First Step Forward,” *Providence Journal*, July 16, 1988 and Brian D. Mockenhaupt, “State Puts Power Plant On Fast Track,” *Providence Journal*, August 18, 1998.

447. Bob Mello, “Town, State Officials Cheer Groundbreaking For Power Plant,” *Providence Journal*, October 8, 1998.

448. Ibid.

449. “Calpine Buys New Tiverton Power Plant,” *Providence Journal*, October 21, 2000.

450. Bob Wyss, “Power Plant May Come True In Johnston,” *Providence Journal*, March 25, 1998.

gain approval for the project.⁴⁵¹ Construction was pushed back for a time in order to work out an agreement to use the waste water from the Cranston water treatment facility but eventually began in 2001.⁴⁵² The 545 megawatt plant became fully operational in 2002.⁴⁵³

The construction of these two plants raised the electrical energy production in Rhode Island to 1945 megawatts, almost all generated by the burning of natural gas.⁴⁵⁴ These new plants appeared to validate some of Lovins' proposition regarding electric power grid stability. On August 14, 2003, most of New England was spared the problems of a large scale power outage that affected many of the northern states. The independent electric power plants comprising ISO New England were able to isolate the electrical fault that originated in Cleveland, Ohio before it affected the regional power transmission system, keeping most of the lights on in the area.⁴⁵⁵ On the other hand, increasing electrical capacity enabled consumer demand to increase as well. With more

451. Celeste Katz, "State Puts Power-Plant Application On The Fast Track To Approval," *Providence Journal*, October 09, 1998.

452. Bob Jagolinzer, "Site Work Under Way For Johnston Power Plant," *Providence Journal*, February 23, 2001.

453. Timothy C. Barmann, "More Power To You - New Plant In Johnston Will Boost State's Output To All-Time High," *Providence Journal*, August 4, 2002.

454. Ibid.

455. Portions of western Massachusetts and Connecticut lost power, but Rhode Island was unaffected. See Bruce Sundlun, "What Saved New England From Blackout," *Providence Journal*, August 31, 2003 and ISO New York Independent System Operator, "Final Report: On the August 14, 2003 Blackout," February 2005, Press Releases, NYISO, http://www.nyiso.com/public/webdocs/media_room/press_releases/2005/blackout_rpt_final.pdf (accessed June 15, 2015).

plants producing more electricity, even if the price was less expensive, the amount of CO₂ and other pollutants contributing to global warming also increased.⁴⁵⁶ While the political leaders, consumers and electric power plant operators might enjoy this transient condition, the potential environmental damage could not be swept under the rug.

The Quest for Sustainable Electric Power

Although gas turbine power plants were being constructed, the desire for more sustainable sources of electric power had not been forgotten. Renewable energy sources in the form of wind turbines had been proposed in Rhode Island for decades. During the struggle to gain approval for the nuclear power plant in Charlestown, RI, a University of Massachusetts engineering professor, Dr. William E. Heronemus, had proposed building a field of approximately 14,000 wind turbines in the waters off of southeastern New England. The wind turbines would produce electricity, and that power would be used to electrolyze water to form hydrogen gas. The gas would be stored and pumped inland for future use as a fuel to drive other electric power generators. This proposal, while promising to provide more electric power than the anticipated demand growth in the region, was not funded.⁴⁵⁷

By the turn of the century, wind turbine technology had advanced sufficiently such that large scale variants capable of generating one megawatt of electric power were achievable. In 1999, Endless Energy, a Maine firm cooperating with the Rhode Island

456. Timothy C. Barmann, "More Power To You - New Plant In Johnston Will Boost State's Output To All-Time High," *Providence Journal*, August 4, 2002.

457. William W. Smith, "Offshore Wind Power System," *Providence Journal*, September 18, 1975.

Renewable Energy Collaborative, suggested three different locations to build wind turbines in the Ocean State. Sites in Portsmouth, Tiverton and Quonset Point could provide the 15 mile per hour average wind speed necessary to generate a “good supply of electricity.”⁴⁵⁸ Eric Stephens, a company spokesman, stated that the wind turbines produce “better energy because it's generated by renewable sources. There's no fossil fuels, it doesn't lead to oil spills and it lessens our dependency on foreign oil. People value it more because it comes from local renewable sources,” though he admitted that the turbines did not generate any electric power when the wind stopped blowing.⁴⁵⁹ The Town of Portsmouth responded favorably, if slowly, to such proposals, recommending in 2003 that a field of twelve 150 to 220 foot towers be erected to provide environmentally friendly and economically attractive energy. Without money to fund the proposal, the concept remained merely that.⁴⁶⁰

A much larger project was envisioned for the waters off of southeastern Massachusetts in Nantucket Sound. In 2001 Jim Gordon of Cape Wind Associates proposed building an offshore wind project with 130 wind turbines, each capable of generating a maximum power of 3.6 megawatts for a maximum total of 454 megawatts.⁴⁶¹ Gordon planned to use a similar setup for this development that the Danes

458. Soljane Martinez, “Energy Firm Pitches Project Bringing Wind Turbine To Town,” *Providence Journal*, January 29, 1999.

459. *Ibid.*

460. Shahien Nasiripour, “Portsmouth, R.I., Wind-Power Proposal Gets First Airing,” *Providence Journal*, June 26, 2003.

461. Cape Wind, “FAQs: Cape Wind Basics,” Cape Wind, <http://www.capewind.org/faqs/cape-wind-basics> (accessed June 29, 2015).

and other European nations had used to generate electric power without the attendant CO₂ pollution.⁴⁶² While the initial proposal was somewhat vague, this project attracted attention from a wide range of local communities eager to lower their electric bills and create jobs building the system, including environmental groups interested in lowering the carbon output from electric power production and government agencies willing to assist the creation of a new source of less expensive power and taxes for the region. The project appeared to have many of the aspects of the future electric power grid that Lovins had offered. It featured sustainable energy production from wind power, had numerous independent electrical generators to improve system reliability, did not saddle the manufacturer with unaffordable construction costs, and was supportable environmentally. Providing power to the region would also limit the necessity to build other transmission lines or pipes to bring natural gas into the region.⁴⁶³

The wind farm proposal also attracted the attention of numerous wealthy and politically connected individuals who were opposed to the construction of the wind farm in their backyard. While acquiring the necessary federal, state and local permits might have been expected to take several years, the resistance of the moneyed elite of the area stretched this process out for over a decade. Pro-environmentalist luminaries in Congress who had castigated the Bush administration for its lack of enthusiasm in limiting the global production of greenhouse gases now found the wind turbine farm a hazard to their

462. Wendy Williams and Robert Whitcomb, *Cape Wind: Money, Celebrity, Class, Politics, and the Battle for Our Energy Future on Nantucket Sound* (New York: Public Affairs, 2007), 14-16.

463. Amory Lovins, *Small is Profitable* (Snowmass, CO: Rocky Mountain Institute, 2002), 311-382.

vacation area. A well financed “grass roots” organization to oppose the construction was organized to promote environmental goals and actions. The drama of various environmental groups such as the Audubon Society and the Conservation Law Foundation supporting the project against the pleas of the environmentally minded Democratic Senators Ted Kennedy and John Kerry from Massachusetts was compelling. The coalition of the wealthy elite politicians with other rich Nantucket property owners such as Doug Yearly, a member of the board of directors of Marathon Oil who funded the “Alliance to Protect Nantucket Sound,” added to the irony regarding of the evaluation of the wind farm.⁴⁶⁴ The resulting rancor also extended the timeline required to start the project. Initially discussed in 2001, Cape Wind Associates spent the next decade earning permits from the Army Corps of Engineers, Massachusetts Siting Board, Department of the Interior, Department of Defense, Massachusetts Department of Public Utilities, Federal Aviation Administration and others all the while working through the numerous legal appeals funded by the affluent summer dwellers.⁴⁶⁵ While National Grid had contracted to purchase 50% of the wind farm’s electric power output, by the middle of

464. Wendy Williams and Robert Whitcomb, *Cape Wind: Money, Celebrity, Class, Politics, and the Battle for Our Energy Future on Nantucket Sound* (New York: Public Affairs, 2007), 83-85, 307-309.

465. “This was an old story, dressed up in new technology. It may, in fact, be as old as the primate brain, obsessed as it is with power and social status.” See Wendy Williams and Robert Whitcomb, *Cape Wind: Money, Celebrity, Class, Politics, and the Battle for Our Energy Future on Nantucket Sound* (New York: Public Affairs, 2007), 307, and Cape Wind, “FAQs: Cape Wind Basics, Cape Wind,” <http://www.capewind.org/faqs/cape-wind-basics> (accessed June 29, 2015).

the second decade following the announcement of the project, not a single turbine had been erected or a single watt of electric power produced.⁴⁶⁶

A much smaller scale project was more successful. By 2005 Rhode Island was able to apportion some of the money collected in its Renewable Energy Fund to assist in the construction of a wind turbine in Portsmouth.⁴⁶⁷ The location selected was on the grounds of Portsmouth Abbey, a Catholic school for grades 9 to 12 run by members of the Benedictine order. The electric bill for the school and associated monastery was significant and the school administration had looked for ways to reduce the expenditure. Energy conservation had some effect but a desire to promote renewable energy led to consideration of wind, geothermal and solar power sources to reduce the bill. The order's concept of stewardship, as well as the economic rationale, certainly charged the monks with the grandeur of contributing to the electric power grid. After some additional study assisted by the Renewable Energy Fund and Roger Williams College, the Abbey leadership decided to construct a wind turbine. The location was not optimal, but the

466. See Cape Wind, "FAQs: Cape Wind Basics, Cape Wind," <http://www.capewind.org/faqs/cape-wind-basics> (accessed June 29, 2015) and David Abel, "More Doubt Is Cast On Cape Wind Plan," *The Boston Globe*, January 24, 2015, <https://www.bostonglobe.com/metro/2015/01/24/cape-wind-terminates-additional-contracts-casting-more-doubts-project-viability/voEIRKmjXziMT5HAoM41KN/story.html> (accessed June 30, 2015).

467. While the fund was collecting over 2 million dollars a year from the electric bill surcharge, the state was borrowing from the fund to pay for other social services, limiting the ability of the state's Renewable Energy Office to perform its duties. See Steve Peoples, "State Owes Energy Fund \$5 Million," *Providence Journal*, July 10, 2005.

wind velocity was sufficient to power the proposed 660 kilowatt turbine.⁴⁶⁸ The 241 foot tall turbine cost 1.2 million dollars, with the state Renewable Energy Fund picking up \$400,000 of the cost. The turbine was expected to power half of the school's electricity needs over its twenty five year life. Surplus power was to be sold back to Narragansett Electric Company, the local National Grid subsidiary, which was required to buy it.⁴⁶⁹ Construction began in the fall of 2005 and the turbine came on line in March 2006.⁴⁷⁰ The project was a success. Within a year the wind turbine "had generated nearly 1.3 million kWh of 'clean' electricity and had supplied 39.35 percent of the School's electrical energy use."⁴⁷¹ The wind turbine significantly reduced the school's operating costs and even permitted some sales back to National Grid. "Total wind turbine revenues during its first year of operation were \$222,710, including \$64,661 in renewable energy credits, \$28,496 in wholesale electricity sold back to the grid, and \$129,553 in retail electricity displaced."⁴⁷² For this work, as well as other activities to reduce its energy

468. Portsmouth Abbey School, "Wind Turbine," Portsmouth Abbey School, <http://www.portsmouthabbey.org/page.cfm?p=1418> (accessed June 7, 2015).

469. This was not disadvantageous to National Grid, which sold power to Portsmouth Abbey at 13 cents per kilowatt hour and bought it back from the turbine excess capacity at 6 cents. See C. Eugene Emery Jr., "Officials Visit Abbey To See Which Way The Wind Blows," *Providence Journal*, May 26, 2006.

470. See Steve Peoples, "Wind Power Project Gets Under Way At Abbey," *Providence Journal*, November 17, 2005, and "Divine Power - Portsmouth Abbey Holds 'Dedication And Thanksgiving' For Its Wind Turbine," *Providence Journal*, May 13, 2006.

471. Portsmouth Abbey School, "Wind Turbine," Portsmouth Abbey School, <http://www.portsmouthabbey.org/page.cfm?p=1418> (accessed June 7, 2015).

472. *Ibid.*

use, recycle garbage and produce renewable energy from photovoltaic cells, the school received accolades from the Environmental Protection Agency and the Garden Club of America. Portsmouth Abbey earned the Environment Council of Rhode Island's 2006 "Senator John H. Chafee Award" for "Outstanding Conservation Project."⁴⁷³

Given Lynn White's and Pope John Paul II's earlier accolades for Saint Francis of Assisi, it was intriguing that a Benedictine order installed the first large scale renewable electric power source in the state. The order had a history of supporting both scholarly work as well as physical labor.⁴⁷⁴ Saint Bernard had advocated working in partnership with God to develop his creation, or at least give it "a more humane expression."⁴⁷⁵ Much as the medieval monks had used wind and water mills as power sources on their monasteries, the contemporary members of the order used wind turbines to generate electric power. Reverence for and conservation of nature along the lines of St. Francis was necessary but not considered sufficient for the Abbey to maintain its existence. Instead, the Abbey leadership decided that a constructive engagement with nature would affect a more positive outcome.⁴⁷⁶

473. Portsmouth Abbey School, "Stewardship," Portsmouth Abbey School, <http://www.portsmouthabbey.org/page.cfm?p=511> (accessed June 07, 2015).

474. René Dubos, "Franciscan Conservation versus Benedictine Stewardship," in *Environmental Stewardship*, ed. R. J. Berry (London: T&T Clark, 2006), 57.

475. René Dubos, *A God Within* (New York: Charles Scribner's Sons, 1972), 171.

476. Along with Benedictine precepts, the economic realities of funding the school's expensive electricity bills were certainly a consideration in erecting the Abbey's wind turbine. See René Dubos, "Franciscan Conservation versus Benedictine Stewardship," in *Environmental Stewardship*, ed. R. J. Berry (London: T&T Clark,

Other Rhode Island communities observed Portsmouth Abbey's success and desired to emulate it for economic and environmental reasons. The electricity produced by the wind turbine could be used to reduce the amount a town would normally purchase from National Grid. Excess power generated could be sold to the utility, though at a lower rate. Renewable Energy Certificates earned from the utility companies that purchased power from sustainable energy sources, such as the wind turbines, could be redeemed or traded for other funding.⁴⁷⁷ Portsmouth and Middletown town officials, as well as representatives from Raytheon Corporation in Middletown and the Navy facility in Newport all toured the Portsmouth Abbey facility.⁴⁷⁸ Even Governor Carcieri promoted a study to investigate the lighting of 150,000 homes by wind power.⁴⁷⁹ The subsequent study indicated that Carcieri's proposal was achievable, although the best locations to site wind turbines were offshore. Electric power generated using these turbines was thought to be competitive with the future costs of electricity from other sources.⁴⁸⁰

2006), 58-59 and Alex Kuffner, "Wind instrument - Heavenly Source Powers Abbey," *Providence Journal*, March 29, 2006.

477. Timothy Barmann, "One if by Land . . .," *Providence Journal*, April 27, 2008.

478. C. Eugene Emery Jr., "Officials Visit Abbey To See Which Way The Wind Blows," *Providence Journal*, May 26, 2006.

479. Timothy C. Barmann, "Change In The Wind," *Providence Journal*, January 13, 2006.

480. Applied Technology and Management Inc., *Final Report: RIWinds Phase I: Wind Energy Siting Study*, April 2007.

The town of Portsmouth was particularly enamored with the prospect. Using wind for power had been evident in the community for centuries. Boyd's windmill on nearby Prudence Island had been constructed in 1810 while the Prescott Farm in Portsmouth had a windmill built in 1812 to grind malt for a local distillery.⁴⁸¹ After the success at Portsmouth Abbey, the town's population viewed wind power as an attractive energy source.⁴⁸² With this popular support, the town council requested and received permission from the state Renewable Energy Fund to borrow up to \$2.6 million to construct wind turbines at the town middle and high schools to offset the costs of electricity to run the schools.⁴⁸³

Despite this enthusiasm, construction was not imminent. It would take another two years to resolve the financial, regulatory and technical issues before the wind turbine was built. The state legislature froze the funding for the construction as the annual state budget deficit crunch required another look at the manner in which these projects were financed and approved.⁴⁸⁴ The project was scheduled to cost 3 million dollars, including 2.6 million financed by the town from "zero-interest Clean Renewable Energy bonds

481. The windmill was originally built in Warren and transported to Middletown. It underwent periodic upgrades over its lifetime. See Gary Kulik and Julia Bonham, *Rhode Island, An Inventory of Historic Engineering and Industrial Sites* (Washington, DC: Government Printing Office, 1978), 165-166.

482. Alex Kuffner, "Survey Shows Wide Support For Wind Power," *Providence Journal*, July 20, 2015.

483. Alex Kuffner, "Town Approved To Borrow For Wind Turbines," *Providence Journal*, December 12, 2006.

484. Kia Hall Hayes, "Freeze On School Building Imposed," *Providence Journal*, April 21, 2007.

from the state and a \$400,000 loan at 2 percent interest.”⁴⁸⁵ The town of Portsmouth spent the time to examine more powerful models than the one that was operating successfully at Portsmouth Abbey. Town planners eventually settled on a 339 foot tall wind turbine design capable of generating 1.5 megawatt of electric power that would be constructed on the grounds of the town high school.⁴⁸⁶ The wind turbine, built by the Canadian firm of AAER, was finally erected in March 2009 and immediately began generating electric power for the school and making money for the town.⁴⁸⁷

As the Portsmouth wind turbine was being raised, Governor Carcieri’s wind energy proposals were also reaching maturity. Despite a lack of interest at times in the Democratic controlled legislature to fund the Republican Governor’s proposals, the concept of building an offshore wind turbine farm in the vicinity of Block Island was achieving maturity.⁴⁸⁸ Deepwater Wind, a Providence based firm, won the initial contract to build wind turbines to meet Carcieri’s vision of a wind farm capable of supplying 15% of the state’s electric power requirements.⁴⁸⁹ This multi-billion dollar

485. Gina Macris, “Portsmouth Poised To Make The Most Of Wind-Swept Location,” *Providence Journal*, March 02, 2009.

486. See Talia Buford, “Powerful Change May Be Blowing In The Wind,” *Providence Journal*, May 30, 2007, and Gina Marcus, “Portsmouth Buying Wind Turbine,” *Providence Journal*, March 12, 2008.

487. Gina Macris, “Wind Turbine Paying Dividends,” *Providence Journal*, May 11, 2009.

488. Peregrine Energy Group, Inc., *Rhode Island Offshore Wind Stakeholders Final Report* (Boston, MA: Peregrine Energy Group, Inc., 2008), 2.

489. See Timothy Barmann, “One if by Land . . .,” *Providence Journal*, April 27, 2008, and Gina Macris, “Portsmouth Poised To Make The Most Of Wind-Swept Location,” *Providence Journal*, March 02, 2009.

project was projected to bring hundreds of jobs to the Rhode Island, an important argument as the state struggled under the latest economic downturn. The new administration in Washington under President Barack H. Obama was favorably inclined to fund renewable energy programs such as Deepwater Wind, in part to staunch the nation's carbon dioxide generation.⁴⁹⁰

In the meantime, while other wind turbine projects were considered, only a small number were actually constructed. The New England Institute of Technology in Warwick, RI installed a 100 kilowatt wind turbine in 2009, financed purely by private funds. Though the school expected to profit from the renewable energy produced by the wind turbine, the main purpose of the venture was to “train students for ‘green-collar’ jobs in the state's emerging alternative energy industry.”⁴⁹¹

Despite continuing apprehension about the effects of global warming on Rhode Island, enthusiasm for wind turbine construction began to wane. Some of the disadvantages of this technology became more evident as its use increased. The larger wind turbines such as the one at Portsmouth High School were noisier than the smaller ones and a small number of people claimed that the acoustic frequencies propagating from the turbine gear boxes made them ill.⁴⁹² The rotating blades of the wind turbines

490. Alex Kuffner, “On The Bay, Power In The Wind,” *Providence Journal*, February 7, 2009.

491. Alex Kuffner, “Technical School Installing Turbine,” *Providence Journal*, July 23, 2009.

492. Michael Bahtiarian, “Facts & Myths of Wind Turbine Noise,” (PowerPoint Presentation, December 6, 2012).

killed large numbers of birds.⁴⁹³ The larger capacity and more technologically advanced wind turbines cost more money to construct and hook up to the power grid, money that the state was always struggling to find. The town of Jamestown, RI backed away from their ambitious plan to construct three large wind turbines as the cost became prohibitive.⁴⁹⁴ Local communities were undecided regarding the aesthetic appeal of the turbine towers as well, with some residents opposed to any new edifice in their backyard. North Kingstown, RI residents attempted to halt construction of a 427 foot wind turbine that home owners feared would be located too close to their dwellings, while the town council of Charlestown, RI voted to prohibit the construction of any “Wind Energy Facility or Wind Turbine” in the town limits.⁴⁹⁵

Some of this newfound angst resulted from the lessons being learned from the operation of the town of Portsmouth’s wind turbine. The turbine was designed to directly power the high school with surplus generated power to be sold to the electric utility company. When it was constructed, the wind turbine’s output was installed directly into

493. The National Audubon Society estimated that over half a million birds were killed annually by the wind turbines, including 83,000 birds of prey. The Audubon Society still considered global warming to be the greater problem and advocated the continued use of properly sited wind turbines. See Audubon, “Audubon’s Position on Wind Power,” Audubon, <http://www.audubon.org/content/audubons-position-wind-power> (accessed June 8, 2015).

494. Alex Kuffner, “Jamestown - Second Thoughts On Wind Turbines,” *Providence Journal*, August 13, 2012.

495. North Kingstown did permit a smaller wind turbine to be built. See Andy Smith, “Wind Tower Stirs Protest,” *Providence Journal*, January 04, 2011 and Charlestown, R.I., Town Council, “Charlestown, R.I., ordinance prohibiting wind turbines,” National Wind Watch, <https://www.wind-watch.org/documents/charlestown-r-i-ordinance-prohibiting-wind-turbines/> (accessed June 8, 2015).

the electric power grid distribution system, not the high school, and all of its electric power went to National Grid first. This difference allowed the utility to charge the town for electric power distribution services, lowering the overall amount the town was saving in its electric bill. The Public Utilities Commission later resolved the price differential in favor of the town, but this still adversely affected the community's budget.⁴⁹⁶

Worse was to come. In February, 2012 the Portsmouth High School wind turbine started to experience mechanical problems that required week long shutdowns. In June the expensive gear box atop the turbine tower failed, the turbine stopped spinning and electric power generation ceased. The company that had manufactured the wind turbine had gone bankrupt in 2010 and the successor company was unwilling to honor the previous warranties on the components. Repairs were estimated to cost \$460,000 with no guarantee that they would work. Justifiably apprehensive on such new costs, the town council debated the future of the wind turbine and studied alternatives. The idle wind turbine remained in place but failed to achieve its purpose of lowering the town's electric bill or reducing the human effects on global warming.⁴⁹⁷

Other Rhode Island wind turbine projects progressed more smoothly, though not at the pace or magnitude initially desired. A wind turbine in North Kingstown, RI was erected in 2012 by a private firm, Wind Energy Development. Sited next to the president

496. Interestingly the Public Utilities Commission became involved only after a private citizen petitioned the state to resolve the disparity. See Alex Kuffner, "Town Prevails In Wind-Power Dispute," *Providence Journal*, October 21, 2011.

497. Portsmouth Council President Joseph Robicheau semi-seriously proposed that the malfunctioning turbine be scrapped, suggesting that "We could put it in the Dumpster." See Alex Kuffner, "Portsmouth - Costs To Fix Turbine May Wipe Out Profit," *Providence Journal*, July 16, 2012.

of the company's home, the 411 foot turbine delivered electricity straight into the electric power grid.⁴⁹⁸ Unlike the Portsmouth wind turbine that did not function, the North Kingstown one operated smoothly with one exception; it was unprofitable to operate without a substantial government subsidy. The company sold electricity produced by the wind turbine at a rate approximately \$.10/kWh less than required to meet the rate of return required by investors to fund the initial cost. Without substantial long term federal and state government subsidies to fund wind powered electricity generation, the entire enterprise was at risk.⁴⁹⁹ The firm continued to propose further wind powered renewable energy projects in the state despite their unprofitability.⁵⁰⁰

The Narragansett Bay Commission's battery of three wind turbines in Providence was a more successful endeavor. In 2005 the Environmental Protection Agency funded a

498. Tim Faulkner, "Slow Going for R.I. Wind Turbine Development," EcoRInews, Last updated November 26, 2012, <http://www.ecori.org/renewable-energy/2012/11/26/slow-going-for-ri-wind-turbine-development.html> (accessed June 9, 2015).

499. The wind turbine owner, Wind Energy Development, sold power to National Grid at a rate of \$.1335 per kWh when a rate of the \$.22 to .275/kwh was required to make it profitable. See State of Rhode Island Public Utilities Commission, In Re: Distributed Generation (DG) Standard Contracts And Ceiling Prices For 2014, Docket No. 4288, Pre-Filed Testimony of Larry Stone, Bostonia Partners, February 12, 2014.

500. The president of Wind Energy Development, Mark DePasquale stated he diversified his construction firm and entered the wind turbine business to address the environmental concerns of his daughters. The Public Utilities Commission acted nonplused that he would want to continue an unprofitable venture in other Rhode Island communities. See Tim Faulkner, "Slow Going for R.I. Wind Turbine Development," EcoRInews, last updated November 26, 2012, <http://www.ecori.org/renewable-energy/2012/11/26/slow-going-for-ri-wind-turbine-development.html> (accessed 9 June 2015), and State of Rhode Island Public Utilities Commission, In Re: Distributed Generation (DG) Standard Contracts And Ceiling Prices For 2014, Docket No. 4288, Pre-Filed Testimony of Larry Stone, Bostonia Partners, February 12, 2014.

study to investigate the use of wind turbines to power the waste water treatment facility at Fields Point near Providence. The Narragansett Bay Commission used the next two years to examine the environmental effects of installing wind turbines at the site, as well as the costs, wind strength and other technical issues associated with the project. Working with the community as well as the Federal Aviation Administration to gain approval to install the 365 foot wind turbines, the Narragansett Bay Commission finally acquired all the permits necessary to commence construction in 2011.⁵⁰¹ It was projected that the three 1.5 megawatt wind turbines would be able to meet 35 to 60% of the waste water facility electric power requirements while preventing the emission of up to 3,000 tons of CO₂ gas per year that would otherwise have been released from the combustion of fossil fuels at a conventional electric generation plant.⁵⁰² The turbines were projected to cost a total of \$12 million dollars to build.⁵⁰³ The three wind turbines were finally constructed in 2012 but took another eight months to be connected to the electric power grid. In the first year

501. The turbines were within 4.5 miles of the T. F. Green airport and therefore required Federal Aviation Administration review. See Narragansett Bay Commission, “NBC Field’s Point Wind Energy Project,” Narragansett Bay Commission, <http://www.narrabay.com/ProgramsAndProjects/NBC%20Energy%20Projects/NBC%20Fields%20Point%20Wind%20Energy%20Project.aspx> (accessed June 10, 2015).

502. Power capacity of the wind turbines varied. See Renewable Energy – NBC Wind Energy Project, “NBC Sustainable Energy Management - Factsheet Series,” NBC Division of Planning, Policy & Regulation http://www.narrabay.com/~media/Files/ESTA%20Documents/Wind_Project_Fact_Sheet_03-22-2011.ashx (accessed June 10, 2015).

503. Providence Business News, “Narragansett Bay Commission approves two alternative energy projects,” Providence Business News, <http://pbn.com/Narragansett-Bay-Commission-approves-two-alternative-energy-projects,52601?> (accessed June 10, 2015).

of operation the turbines were required to operate at a reduced capacity, but they still exceeded the projected electric power generation.⁵⁰⁴

The state's efforts to encourage the construction of renewable electric power sources for the electric power grid were an attempt to minimize the production of greenhouse gases while creating a more sustainable society. Combining the larger scale wind turbines in the state, Rhode Island created 8.260 megawatts of renewable energy sources in the first twelve years of the new century. This total came from the three 1.5 megawatt wind turbines at Fields Point in Providence, a 1.5 megawatt wind turbine in North Kingstown, a 1.5 megawatt wind turbine at Portsmouth and another 660 kilowatts wind turbine at Portsmouth Abbey. Excluding the Portsmouth wind turbine that was not producing any power, a maximum renewable electric power capacity of 7.166 megawatts from wind power was available in the state.

Compared to other sources of electric power being generated in the state this amount was essentially negligible. Of the approximately 1800 megawatts of electric power capable of being generated in the state, a maximum of perhaps 50 came from renewable energy sources and of that barely seven came from wind power.⁵⁰⁵ Other sources of renewable energy in the state, such as the West Davisville solar arrays in

504. Alex Kuffner, "Providence Turbines Spin Past Their Power Goal," *Providence Journal*, December 30, 2013.

505. No two sources concur with the total electrical output possible from the state. The 1800 MW figure is a reasonable average based on U.S. Energy Information Administration data. See U.S. Energy Information Administration, "Rhode Island Electricity Profile 2012," State Electricity Profiles, U.S. Energy Information Administration, <http://www.eia.gov/electricity/state/RhodeIsland/> (accessed June 22, 2015).

North Kingstown, the equivalent solar panel system in West Greenwich, the Forbes Street solar plant in East Providence and the hydroelectric plants along the Blackstone River could only add approximately 9.6 megawatts at peak capacity. The biomass incinerator at Johnston generated more than all of these combined, with a maximum capacity of 24 megawatts.⁵⁰⁶

The vast majority of the electric power made in the state was produced by burning natural gas at the electric generation plants at Manchester Street in Providence, Burrillville, Johnston and Tiverton. The capacity of these plants dwarfed the production from the wind turbines scattered throughout the state, and the correlating reduction in CO₂ production appears minimal. This is not to say the overall work done by electric utilities, consumers, and state regulatory organs to reduce the production of greenhouse gases were irrelevant. Rhode Island ranked lowest in the nation in terms of energy consumption per capita and was among the leaders in limiting CO₂ production.⁵⁰⁷ This did come at some cost, with the “Average Retail Price of Electricity to Residential Sector” being the fourth highest in the nation.⁵⁰⁸ Compared to the rhetoric of the various

506. U.S. Energy Information Administration, “Profile Overview, Rhode Island,” U.S. Energy Information Administration, <http://www.eia.gov/state/?sid=ri> (accessed June 22, 2015).

507. Only Vermont and the District of Columbia produced less CO₂, although the small population of Rhode Island was a factor here. See U.S. Energy Information Administration, “Profile Data, Rhode Island State Profile and Energy Estimates,” U.S. Energy Information Administration, <http://www.eia.gov/state/data.cfm?sid=RI>, (accessed June 22, 2015).

508. Hawaii, Massachusetts and Connecticut edged out the Ocean State in the March 2015 ranking. The other New England states were all in the top eleven. See U.S. Energy Information Administration, “Rankings: Average Retail Price of Electricity to Residential Sector, March 2015, Rhode Island State Profile and Energy Estimates,” U.S.

governmental and non-governmental organizations touting the advantages of the renewable energy sources to energize the electric power grid and mitigate the acceleration of global warming, the effects of these sources appear much restricted. The amount of green justice attained was unable to be determined.

Greater Regionalization and the Repeal of PUCHA

While these efforts to increase the capacity of renewable energy sources and lower the amount of CO₂ produced were taking place, the operators of ISO New England continued their work to supply electric power to the region. The companies operating the generation portion of the grid were now divorced from those performing the distribution and transmission assignments. While the electric utility companies were buffeted by the competing environmental demands from the federal and state regulatory bodies on emission standards and the amount of electricity that they were required to purchase from renewable energy sources, new legislation helped out their business models. The Energy Policy Act of 2005 passed during the second term of the George W. Bush administration had a number of facets that directly affected the operation of the electric power grid. The law required the Federal Energy Regulatory Commission (FERC) to stand up a new body, the Electric Reliability Organization (ERO), mandated to supervise the electric utility companies' actions to meet the required standards for electric power generation and transmission reliability. Greater authority was granted to the Secretary of Energy to purchase easement rights for transmission lines. No longer would electric utilities be

Energy Information Administration, (cents/kWh),
<http://www.eia.gov/state/rankings/?sid=RI#/series/226> (accessed June 22, 2015).

required to buy electric power from all qualifying facilities and other smaller generating firms based on the larger utilities' avoided costs, as long as FERC had determined that these smaller facilities had sufficient access to the wholesale electricity market.⁵⁰⁹ With the deregulation of the electric utility industry in Rhode Island, this last requirement was assured. The legislation carried provisions for increasing the use of renewable energy sources, improving energy efficiency standards and initiatives to improve the cleanliness of coal-fired power plants. There was even a gesture to the nuclear power industry, already languishing, by renewing the Price-Anderson Act, a law that dealt with insurance liabilities in case of a nuclear accident.⁵¹⁰

Perhaps most significant in the new legislation was the elimination of an old ordinance, the Public Utility Holding Company Act of 1935 (PUHCA). Congress had been convinced by electric utility industry leaders that the rationale for the older regulation was no longer valid. With the deregulation of the electric utility industry however, the electric utilities were no longer natural monopolies that owned all aspects of the generation, transmission and distribution of electric power. Independent operators could plug into the electric power grid and sell their product without being frozen out of the market by the larger electric power generation firms. Less expensive natural gas powered plants could be built more rapidly, lowering the capital cost requirements of any new competitor. To prevent the exploitation of consumers, state regulatory bodies had

509. Mark Holt and Carol Glover, *Energy Policy Act of 2005: Summary and Analysis of Enacted Provisions* (Washington, DC: Congressional Research Service, 2006), 1, CRS-1 – CRS-5.

510. *Ibid.*, CRS-34 – CRS-36 and CRS-38 – CRS-40.

been established. Federal regulatory bodies such as FERC and the Security and Exchange Commission (SEC) were now available to prevent financial abuses of consumers and stock holders.⁵¹¹ Despite some resistance from environmental and consumer groups as well as state politicians, the bill passed and was signed into law on August 8, 2005 by President Bush.⁵¹²

The repeal of the Public Utility Holding Company Act of 1935 was one more disruption to the system first envisioned by Samuel Insull. The fracturing of the natural monopoly and the lessening of regulatory oversight had been transients in the system, but the utilities had still been required to be singularly focused on the production of electric power. With the Public Utility Holding Company Act of 1935 no longer maintaining that focus, the utilities could become just another asset in a larger corporation, one that may or may not have the efficient operation of the electric power grid in mind. Additionally, PUCHA had been successful in meeting the earlier goals of breaking up the unwieldy holding companies of the 1920s and had created national regulation standards that the

511. Ibid., CRS-82 – CRS-84.

512. The Rhode Island delegation to Congress voted along party lines with Senator Lincoln Chaffee (R-RI) voting for it and Senator Jack Reed (D-RI) and Representatives James Langevin and Patrick Kennedy, both Democrats, voting against the bill. The new law was 551 pages long. The older Public Utility Holding Company Act that it repealed was a comparatively succinct 55 pages. See Mark Holt and Carol Glover, *Energy Policy Act of 2005: Summary and Analysis of Enacted Provisions* (Washington, DC: Congressional Research Service, 2006), CRS-82 – CRS-84, Govtrack.us, “H.R. 6 (109th): On Passage of the Bill in the Senate, Energy Policy Act of 2005,” govtrack.us, <https://www.govtrack.us/congress/votes/109-2005/s158> (accessed June 22, 2015), Govtrack.us, “On Passage of the Bill in the House, H.R. 6 (109th): Energy Policy Act of 2005,” govtrack.us, <https://www.govtrack.us/congress/votes/109-2005/h132> (accessed 22 June 2015), and Energy Policy Act of 2005, Public Law 109-58, 109th Cong. (August 8, 2005).

electric utilities and the nation had profited under. The abandonment of the successful law suggested that forces beyond those merely driving the electric power grid toward greater efficiency were at work.⁵¹³

Brayton Point Revisited

As the technology and regulations that had influenced operation of the electric power grid for generations was changing, one of the few remaining edifices of the electric power generation component of the system in southeastern New England was the coal-fired plant at Brayton Point. Having weathered numerous technical problems, regulatory confrontations with state public utility commissions and federal direction from the Environmental Protection Agency, the plant continued to produce hundreds of megawatts of electric power to meet regional demands. The provisions of the Energy Policy Act of 2005 were favorable for the use of coal as a fuel but the organizations arrayed against the continued operation of Brayton Point remained. Save the Bay and the Conservation Law Foundation continued to lobby for the plant to be shut down, noting problems with air and water pollution emanating from the plant.⁵¹⁴ Despite the numerous

513. Mark Holt and Carol Glover, *Energy Policy Act of 2005: Summary and Analysis of Enacted Provisions* (Washington, DC: Congressional Research Service, 2006), CRS-82 – CRS-84.

514. Conservation Law Foundation, *CLF 40 Years, Protecting New England's Environment* (Boston, MA: Conservation Law Foundation, 2006): 14-15 and Save the Bay, "Our History," Save the Bay, <http://www.savebay.org/history>, (accessed June 23, 2015).

upgrades the plant had received since it had been first constructed, the coal-fired units were among the most polluting units energizing the electric power grid.⁵¹⁵

At the turn of the current century, the Environmental Protection Agency became concerned with the thermal pollution from the cooling system at Brayton Point. The water from Mount Hope Bay, the northern portion of Narragansett Bay where Brayton Point was located, was used to condense the steam at the plant and then pumped back into the bay. The heated effluent water raised the overall temperature of the tidal waters, killing large quantities of fish larvae. The EPA had earlier reached an agreement with the plant owners to lower the cooling water flow rate to limit the environmental damage plant operation was causing to the watershed. In 2002 the federal agency and the Massachusetts Department of Environmental Protection conducted public hearings for a new plant site license. The proposed certificate would require the plant to lower its use of the bay water by 94% in order to further reduce the harm it was causing to the natural habitat of the bay.⁵¹⁶ The agencies desired the plant owners to build large cooling towers

515. Brayton Point was awarded the moniker of being one of the “Filthy Five” power plants in Massachusetts. See Conservation Law Foundation, *CLF 40 Years, Protecting New England’s Environment* (Boston, MA: Conservation Law Foundation, 2006): 14-15.

516. The Rhode Island Department of Environmental Management was also heavily involved. See Environmental Protection Agency, Brayton Point Station Somerset, MA, Final National Pollutant Discharge Elimination System (NPDES) Permit, October 2003, Environmental Protection Agency, <http://www.epa.gov/region1/braytonpoint/pdfs/finalpermit/braytonpointfactsht2003.pdf>, (accessed June 23, 2015) and Environmental Protection Agency, EPA - New England Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA (NPDES Permit No. MA 0003654) Date: July 22, 2002, 1-2,

to act as the heat sink for the plant condensers, a system that would use a minimal amount of water from the estuary. The EPA estimated it would cost approximately 80 million dollars to construct, a figure that Dominion Energy, the new owner of Brayton Point disputed.⁵¹⁷

The analysis and new restrictions were contested by Dominion Energy after the EPA issued a new operating permit for the plant in October 2003. By November, the company had appealed the permit to the EPA's Environmental Appeals Board (EAB). Like previous environmental litigation, the appeal took many years to resolve. In September 2007 the Environmental Appeals Board finally upheld the parent organization's initial decision. Dominion Energy consequently went to the Federal Court in the Fourth Circuit to petition for redress, but eventually accepted the EPA's demands. On December 17, 2007 the company reached an agreement with the EPA to end all litigation and accept the draft permit requirements.⁵¹⁸ Subsequent discussion resulted in

<http://www.epa.gov/region1/braytonpoint/pdfs/BRAYTONtableofcontents-chapter1.PDF> (accessed June 23, 2015).

517. Dominion Energy calculated a cost of \$176.7 million to build the new cooling system and that it would take 29 months to build it. The company was not enthusiastic about having to pay for and build this system as it envisioned an eight month period when the units at Brayton Point would not be able to generate electricity, or make a profit for the company. See Environmental Protection Agency, EPA - New England Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA (NPDES Permit No. MA 0003654) Date: July 22, 2002, 4-64 – 4-74, <http://www.epa.gov/region1/braytonpoint/pdfs/BRAYTONchapter4.PDF> (accessed June 23, 2015).

518. Environmental Protection Agency, Brayton Point Station: Final NPDES Permit, NPDES Permits in New England, EPA United States Environmental Protection Agency, <http://www.epa.gov/region1/braytonpoint/> (accessed June 24, 2015).

the company agreeing to build two huge, natural draft cooling towers on the Brayton Point property. The initial design envisioned the cooling towers to be 500 feet tall with a 220 foot diameter exhaust exit. Dominion Energy also was required to build a new waste water treatment system and storage basins, as well as install a new and more efficient emissions control system to reduce the amount of SO₂ and mercury exhausted into the atmosphere from burning coal.⁵¹⁹

Building the cooling towers took less time than had been devoted to the permit discussion and subsequent litigation. Design work began in 2008 with an initial completion scheduled for May 2012 in order to meet the EPA's permit requirements. The actual construction was completed a year in advance though the final project cost 550 million dollars, considerably more than estimated by any of the parties back in 2003. With the completion of the system, all of the turbine generators at the plant could be operated at full capacity, increasing the overall efficiency of the system while having a minimal effect on the waters of Narragansett Bay.⁵²⁰ While the thermal pollution into Narragansett Bay had been reduced, the cooling towers were not a panacea. The cascading water in the towers was noisy, requiring a 50 foot noise reduction wall to be

519. Environmental Protection Agency, FACT SHEET, Dominion Energy Brayton Point, LLC, Closed Cycle Cooling Tower and Unit 3 Dry Scrubber/Fabric Filter Projects, EPA Draft Permit Number, 052-120-MA13 (Boston, MA: Environmental Protection Agency, 2008), 5-7.

520. Other reports put the total costs at 620 million dollars. The engineering firm contracted to build the towers suggested they had saved the company 100 million dollars in the construction efforts. See Mott MacDonald, "Brayton Point Cooling Towers, New England, USA," Mott MacDonald, <https://www.mottmac.com/article/2409/brayton-point-cooling-towers-new-england-usa> (accessed June 25, 2015) and Grant Walker, "Big Tower Power: New 'Twins' At Somerset's Brayton Point Dominate Region's Skyline," *The Herald News*, October 10, 2010.

built around the base of the structure. Reaction from the local and regional environmental groups was mixed. Save the Bay saw that the towers provided “progress for the bay.”⁵²¹ The Conservation Law Foundation was less effusive. Noting the age of the plant, the group’s spokesman, Jonathan Peress, stated that the power plant at Brayton Point was “environmentally and technologically obsolete” and building the cooling towers was a “bad deal for ratepayers and the environment.”⁵²²

While the Brayton Point plant was being altered to meet the requirements of the Clean Water Act, the EPA was gaining more regulatory powers to control greenhouse gases under the guise of the Clean Air Act. In 2003 the EPA was petitioned by a number of environmental organizations to regulate the emissions of greenhouse gases such as CO₂, CH₄, N₂O and hydrofluorocarbons from “new motor vehicles and new motor vehicle engines” using the provisions of the Clean Air Act.⁵²³ The EPA rejected the petition in August 2003 stating that Congress had neither authorized the EPA to regulate

521. Grant Walker, “Big Tower Power: New ‘Twins’ At Somerset’s Brayton Point Dominate Region’s Skyline,” *The Herald News*, 10 October 2010 http://www.heraldnews.com/article/20101010/NEWS/310109722#310109722/?Start=3&_suid=143519255792909308421216612761 accessed June 25, 2015).

522. Ibid.

523. The Petitioners included the Green Party of Rhode Island. The organization, headquartered in Providence, RI was a member of the international Green Party movement though in the Ocean State its candidates had focused on “environmental issues as well as justice, non violence, and democracy issues.” See “Petition For Rulemaking And Collateral Relief Seeking The Regulation Of Greenhouse Gas Emissions From New Motor Vehicles Under Section 202 Of The Clean Air Act,” International Center For Technology Assessment, 310 D Street, N.E., Washington, DC 20002, et al. vs. HON. CAROL BROWNER, in her official capacity as Administrator of the United States Environmental Protection Agency, 401 M Street, S.W., Room W1200, Washington, DC 20460.

greenhouse gases using the Clean Air Act nor had the EPA determined what the emission specifications should be.⁵²⁴ The petitioners' case was picked up by numerous states and environmental groups, including Rhode Island and the Conservation Law Foundation.⁵²⁵ The suit was argued in front of the U.S. District Court in Washington, DC, in April 2005. In July the District Court found for the EPA, stating that the court would "uphold agency conclusions based on policy judgments . . . when an agency must resolve issues `on the frontiers of scientific knowledge.'"⁵²⁶ The plaintiffs then took the case to the Supreme Court where they were finally successful. In June 2006 the Supreme Court decided that the "EPA has statutory authority to regulate emission of such gases from new motor vehicles."⁵²⁷ The Court did not suggest what the limits should be, though the majority of the court concluded that the "EPA's steadfast refusal to regulate greenhouse gas emissions presents a risk of harm to Massachusetts that is both 'actual' and 'imminent.'"⁵²⁸

524. Environmental Protection Agency, "EPA Denies Petition to Regulate Greenhouse Gas Emissions from Motor Vehicles," News Releases, U.S. Environmental Protection Agency, Release Date: 08/28/2003, <http://yosemite.epa.gov/opa/admpress.nsf/fb36d84bf0a1390c8525701c005e4918/694c8f3b7c16ff6085256d900065fdad!OpenDocument> (accessed June 28, 2015).

525. *Com. Wealth Of Mass. V. Env. Protect. Agency*, 433 F.3d 66 (D.C. Cir. 2005).

526. *Ibid.*

527. *Massachusetts Et Al. V. Environmental Protection Agency Et Al.* 127 S. Ct. 1438, 1446 (2007).

528. *Ibid.*

Additional action did not occur during the election year of 2008 but in 2009 under the Obama administration a new EPA administrator presented updated findings on regulating greenhouse gases. After months of public comments, the agency stated in December 2009

that the current and projected concentrations of the six key well-mixed greenhouse gases — carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) — in the atmosphere threaten the public health and welfare of current and future generations.⁵²⁹

These gases from the combustion of fossil fuels in motor vehicles contributed to air pollution and threaten the “public health and welfare.”⁵³⁰

Though the EPA findings only applied to motor vehicle emissions, the possible expansion of new regulations to fossil fueled power plants was not far behind. Brayton Point created all of these gases in large amounts. The EPA estimated that in 2010 the plant generated approximately 5.9 million metric tons of greenhouse gases. Most of this pollution was carbon dioxide, but smaller amounts of nitrous oxide and methane were also emitted.⁵³¹ Burning coal generated large amounts of other air pollution, such as coal ash particulate, hydrogen cyanide, arsenic and mercury, all related to deleterious health

529. Environmental Protection Agency, Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act, Climate Change, U.S. Environmental Protection Agency, <http://www.epa.gov/climatechange/EPAactivities/regulatory-initiatives.html> (accessed June 28, 2015).

530. Ibid.

531. Grant Welker, “EPA: Brayton Point emits more carbon dioxide than any power plant in New England,” *The Herald Times*, January 14, 2012, <http://www.heraldnews.com/article/20071218/News/312189288> (accessed June 28, 2015).

effects on humans and the environment.⁵³² Based on these findings, environmental groups under the banner of “Coal Free Massachusetts” continued to protest the operation of the plant, even with the new cooling towers and upgrades installed.⁵³³

With the increasing federal and state interest in regulating the production of greenhouse gases, Dominion Energy became apprehensive about the future operation and profitability of the Brayton Point units. Even without the possibility of additional alterations to the plant to maintain its licensing, other economic factors were working against keeping the plant running. In 2008 a sharp reduction in natural gas prices made operation of the gas turbine electric power plants in the region more profitable than Brayton Point. This fuel price decrease resulted in lower energy costs for the electricity available from ISO New England. With total energy consumption in the region flattening and the price of coal increasing, the profit margin for running the fifty year old plant was not sufficient. The plant was no longer efficient enough to operate compared to the other electric power generation plants connected to the electric power grid.⁵³⁴

In 2012, Dominion Energy decided to sell the power plant despite having invested over 500 million dollars to keep it running.⁵³⁵ The subsequent sale to Energy

532. Coal Free Massachusetts, *Brayton Point, Operating at Our Expense*, (MA: Coal Free Massachusetts, 2013), 7.

533. *Ibid.*, 14-16.

534. Schlissel, David and Tom Sanzillo, *Dark Days Ahead: Financial Factors Cloud Future Profitability at Dominion's Brayton Point* (Boston, MA: Conservation Law Foundation and The Institute for Energy Economics & Financial Analysis, 2012), 5-22.

535. The Conservation Law Foundation estimated a billion dollar upgrade with a loss of almost that upon the sale. See Schlissel, David and Tom Sanzillo, *Dark Days Ahead: Financial Factors Cloud Future Profitability at Dominion's Brayton Point*

Capital Partners, a private equity firm based in California and New Jersey, was part of a three coal burning electric power plant deal, with a total cost to Energy Capital of 472 million dollars.⁵³⁶ Within a few months of ownership, Energy Capital announced that it would shut down the entire plant by 2017. Acceding to a “perfect storm” of low natural gas prices, a weak demand for electricity following the 2008 economic downturn, the increasing cost of environmental regulations, and the demand by public utility regulators to buy electricity produced from renewable sources, the plant was no longer considered economically viable by the owners.⁵³⁷ Even ISO New England no longer looked favorably on the plant, though the loss of 1,500 megawatts of electric power would reduce the overall reliability of the system. With a declining fortune, the plant was no longer essential to keep electric power flowing through the electric power grid.⁵³⁸ Environmental groups lauded the decision to shut down the most polluting plant in the region though the future of the plant residue remained undetermined. The vice president

(Boston, MA: Conservation Law Foundation and The Institute for Energy Economics & Financial Analysis, 2012), 5.

536. The price for only the Brayton Point plant was not disclosed. See Emily Overholt, “Dominion Sells Power Station In Somerset,” *Boston Globe*, August 31, 2013.

537. Alex Kuffner, “Brayton Point To Close; Twilight For Coal In N.E.?” *Providence Journal*, October 9, 2013.

538. Plant operating time had declined from 85% in 2008 to 16% in 2012. See Alex Kuffner, “Brayton Point To Close; Twilight For Coal In N.E.?” *Providence Journal*, October 9, 2013.

of the Conservation Law Foundation, Jonathan Peress, stated that “the two cooling towers will stand as reminders of an obsolete technology.”⁵³⁹

With this decision, the half century of electric power generation at Brayton Point appeared to be approaching its end. The resultant force of technical problems from age, environmental regulations, fuel price differences and local animus eventually drove the efficiency of the plant below that of the other natural gas fired plants, a reduction that could not be endured. Visible across Narragansett Bay, the two cooling towers stood as a testament to the conflict between the technical demands of the electric power grid and the ethical demands of the environmental movement.

Technological Determinism and Momentum in the 21st Century

Much like the earlier periods examined, the 21st century holds interesting trends to support both theories of technological momentum and technological determinism as applied to the electric power grid in southeastern New England. Which trend is the more important is equivocal. Weighing the data to support one theory over another may not be defensible in this short period of time. It may simply be that it is too early to tell and the ramifications of all of the actions occurring in this period have yet to play out. Much like the operators attempting to resurrect the electric power grid following the 1965 Northeast blackout, it may be best to step back and allow the transient to moderate prior to making any final determination for the period.

The behavior of the electric power grid in the first decades of the new millennium could certainly be understood to support the theory of technological momentum. Under

539. Alex Kuffner, “Brayton Point To Close; Twilight For Coal In N.E.?” *Providence Journal*, October 9, 2013.

limited stress from contingency or catastrophe, the system pattered along with few unexpected technical salients to resolve. The government and its regulatory bodies were eager and willing to assist the electric utilities in most of their designs for new construction or in limiting legislative interference. The Republican administrations in Providence moved mountains to accelerate the construction of the gas turbine electric power plants in the state. Nationally the elimination of the Public Utility Holding Company Act of 1935 ended other restrictions on how the electric utilities could organize their businesses following the deregulation of the industry during the preceding decade. To some extent, this reversion to the 1920s non-regulatory model was due to the fact that the utilities had solved many of the problems that had caused them friction earlier. The natural gas burning electric power plants were cleaner than the older coal burning ones. The reliability and efficiency of the electric power grid was improving with the incorporation of new technology in the system. Greater regionalization in the form of ISO New England compensated the most efficient and reliable electric power plants by awarding their parent companies with the most beneficial contracts. With more companies competing to be the most efficient electric power provider, the opportunity for any one of them to cause unwarranted problems was reduced. Whether the elimination of PUCHA would lead to the earlier financial exploitations of the holding companies was still unknown.

If there were no striking system catastrophes or external contingent forces that affected the electric power grid performance, the conversion of the population to support many of the considerations of environmental ethics was marked. While the worst case fears of global warming may have convinced the politically naïve, the long term

education efforts by the national, regional and local environmental organizations was effective. It was no longer merely the devoted senior leadership of groups such as Save the Bay advocating actions to reduce pollution from elements of the electric power grid. Now state legislatures and town councils were willing to expend valuable resources to support a more sustainable infrastructure. Wind turbines would be subsidized, even if their operation was less than the most efficient way of generating electric power. If progress was uneven or limited by political forces and ego, efforts to limit environmental damage were still applauded. When the future shut down of the units at Brayton Point was announced, it appeared as if all of the parties involved, from the ownership of the facility, the state and federal regulatory bodies and the local environmental organizations were relieved that the whole ordeal was finally ending. Even the conservative engineering societies amended their codes of conduct to incorporate some of the intent of the environmental movement's ethical concerns. Though the net change in the electric power grid in southeastern New England might be considered small, one could certainly discern a shifting mindset in the people and organizations that operated, maintained and regulated the advanced technology system. While the rate of change of the electric grid might have slowed compared to earlier decades, the baseline assumption of the net worth of the technology to the population was fluctuating. How this would affect the electric power grid remained to be seen.

The preceding narrative would be dismissed as being inconsequential by the adherents of technological determinism. The continued expansion of natural gas burning electric power plants was evidence that more efficient technology was replacing the less efficient machines. Shutting down Brayton Point was not as much the success of a

coalition of grass root and national organizations imbued with the spirit of limiting environmental damage than the scrapping of a 50 year old obsolescent electric power plant that was no longer efficient enough to operate in the system. Constructing wind turbines was a method to keep the less perceptive members of the population happy but was trivial in terms of actual electric power generation. The increased regionalization of electric power generation and transmission was in line with Mumford's proposals for the electric power grid. Even the most ardent of the environmental organizations were using the vocabulary of efficiency to evaluate the operations of the electric utilities. The alteration of the IEEE Code of Ethics to be more consistent with the expanding environmental ethic was not important. The actual numbers of megawatts generated by the new construction power plants should be the true measure of effectiveness of whether technological determinism was the more accurate model for predicting the development of advanced technology systems.

Herein lies the conundrum. Advocates of technological determinism could pull out the figures associated with the operation of the electric power grid during this period and make a persuasive case that the electric power grid was being operated to increase its efficiency with negligible external retarding forces. Looking at the numbers of megawatts generated by the sustainable sources in Rhode Island compared to other sources creates little sanguinity that wind turbines were the wave of the future. A more sustainable future may be a more just one, but this was of little regard compared to the increasing number of megawatts of electricity produced from the thousands of cubic feet of natural gas burned.

Technological momentum proponents would suggest these numbers were of interest but were not irresistible. Of far greater importance than increasing the overall system efficiency by another few tenths of a percentage point was the change in outlook of the humans using the technology. While society had experienced and often exalted the advances and opportunities that the electric power grid had provided, the unchallenged benefits of the electric power grid had evaporated much like the steam issuing from the cooling towers at Brayton Point. How society would construct the benefits of the technology compared to its disadvantages remained to be determined in the future. With the penetration of environmental ethics throughout society, one should not be too confident that the promise of cheaper electricity would be sufficient to motivate the population to permit future operations of electric power grid in the manner that the electric utilities desired.

Using two different coordinate systems, one quantitative and the other qualitative, to compare and contrast the two models is somewhat unsatisfying. This does not allow an adequate evaluation of which model best represents the expected actions of advanced technology systems. The perspectives appear to be talking past one another with little appreciation of the strengths and weaknesses of the other point of view. Stating that technological momentum is a better approximation for the electric power grid's development during this period is undemanding, but it also limits the comprehension of the potency of its competition. One is left less with an appreciation of the greater validity of either model than with the thought that the pronouncements of both may just be whistling in the graveyard of discarded theories.

CHAPTER 8

CONCLUSION

In human affairs, the willed future always prevails over the logical future.

- René Dubos

It's tough to make predictions, especially about the future.

- Lawrence Peter "Yogi" Berra

Findings: Technological Momentum or Determinism?

One of the advantages of observing the electric power grid in southeastern New England is that this advanced technology system evolved over a long period of time. With the events of the preceding century in mind, one should be able to compare the electric power grid's growth against the theories of technological determinism and technological momentum. Perfection of either theory is not anticipated; however the model that best fits the data gleaned from the history of this advanced technology system should be apparent. Discontinuities and divergences between theory and reality should also be expected, indicating issues that the theories fail to consider or weight properly. These variations are places that additional research and theoretical development may prove rewarding to better comprehend the development of advanced technology systems.

With this in mind, it appears that technological momentum is the better model to explain the development of the electric power grid in southeastern New England during the period examined. Technological momentum is not a perfect representation as has

been revealed over the course of this analysis, but it is a more solid explanation of how the electric power grid progressed in the manner that it did. While both theories are sound on the genesis and initial growth of an advanced technology system, Hughes' propositions show how the forces of contingency, catastrophe and conversion act to deflect the system's subsequent evolution. In technological determinism, once a technology is accepted by some critical mass of the population, technique or the megamachine shapes society to meet its needs. Altering the subsequent progression of the technology appears unlikely or perhaps even impossible. This is not to suggest that many of the elements of technological determinism are not valid or important, only that technological momentum provides greater insight on how such advanced technology systems are affected by human action beyond the promotion of mere efficiency.

Looking back at almost a century of development of the electric power grid in southeastern New England, one is tempted to suggest that because the system developed the way it did, that must have been the optimal way for this advanced technology system to evolve. Starting almost simultaneously in Providence, RI and the Connecticut River highlands, the separate systems organized by Marsden Perry in Rhode Island and Malcolm G. Chase and Henry I. Harriman in Massachusetts slowly but surely grew towards one another. When combined, both electrically and organizationally, the systems complemented one another; the steady hydroelectric power and efficient steam plants providing a diverse power output to meet the growing consumer and business demand. Surviving the financial crisis of the Great Depression, the destructive break up of the holding company structure and meeting the power requirements for a World War, the resulting New England Electric System's existence is still problematical. Did the electric

power grid develop in the manner that it did due to the sheer demands of the dominant technology, or did the system just happen to work out the way it did due to factors above and beyond those resulting from meeting the technical requirements from the laws of physics? Certainly the technical concerns and salients were important to consider and resolve, but these alone are only part of the reason why the electric power grid turned out the way that it did.

The period encompassing the initial growth of the electric power grid in southeastern New England to its maturation is thus of interest as this evolution is quite different from what the theories of technological determinism might propose. Instead of the developing technological system causing other social organizations to adapt to its technical demands, the social and political organizations in Rhode Island absorbed the nascent electric utilities to strengthen their own efforts. With Marsden Perry in charge of or at least the first amongst equals in the state's financial, electrical utility and political organizations, it is difficult to make the case that technique was the dominant factor in the electric power grid's progress. The pursuit of political influence using the profits of Perry's commercial concerns to support the Republican Party machine seems to be the more dominant force. The resulting political power was used to meet the desires of the electrical utilities in a positive feedback loop.

This sequence of events in Rhode Island is at variance with both theories of how advanced technology systems develop. Technological determinism suggests that human organizations need to alter their operations to assist the required acceleration of efficiency. The modification of all human activity to meet the demands of advanced technology systems should be readily apparent. Businesses, political organizations, and

civil society should all evolve to make the electric power grid ever more efficient and able to deliver electric power across society.¹ Technological momentum proposes that new organizations will reinforce the successful growth of the advanced technology system as these organizations, with large number of people and immense investments, have a vested interest in maintaining the status quo.² The former theory suggests that these organizations should be dynamically altering their actions to make the advanced technology system even more powerful. In the latter, they almost act as symbionts, assisting the growth of the advanced technology system, but also siphoning away some of its energy for their own ends. In the early period of the growth of the electric power grid, the political desires of the Republican Party machine were as important as the growing mass of these “technical, organizational, and attitudinal components” in propelling the growth of the advanced technology system.³ Keeping voters honest through the liberal application of money gleaned in no small part from the electric utility companies was not just good politics, it was good business. Republican political control of the state led to longer term permits that the new utility companies could use to acquire favorable loans to further promote their technical monopoly as well as the legislative one.

As the technical and organizational components of the electric power grid matured, the political influence on the electric power grid receded but was never

1. Jacque Ellul, *The Technological Society*, Translated by John Wilkinson (New York: Vintage Books, 1964), 395-397.

2. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Penguin Books, 1989), 458-460.

3. *Ibid.*, 460.

completely excluded. Savvy industrialists such as Samuel Insull proposed trading away some of the control of the system to public regulatory bodies in order to maintain the natural monopoly of electric power generation, transmission and distribution under the electric utility companies. With the increasing capacity of the technical components of the electric power grid, this bargain appeared logical. Growing and building the electric power grid was subsequently accomplished under the watchful eyes of the public utility commissions.

In Rhode Island, with the Republican Party as the dominant political force, appropriating Insull's doctrine was advantageous in maintaining the momentum of the electric power grid and its attendant organizations. As the political fortunes of the Republican Party waned and the Democratic Party became preeminent in Providence and Washington, the new administrations were less interested in supporting an industry that had strong ties to the political opposition. While the state and federal government were involved in maintaining the continuity of electric power for the population, the Public Utility Commission would no longer act as a mere adjunct for the electric utilities. Greater oversight and regulation, in the form of the Public Utility Holding Company Act of 1935, was going to be the norm in the future, regardless of how this might affect the efficiency of the system. This is not to imply that all members of the Democratic Party and the components of the state and federal government were opposed to the electric utilities. Obviously there were instances where the Democrats were as supportive of the electric utility companies as the Republicans were, such as the survival of the New England Power Association during the breakup of International Paper & Power or Thomas McCoy's efforts to provide Pawtucket with its own publically owned and

operated electric utility. These seemed to be more illustrative of personal and political desires than of increasing the efficiency of the electric power grid or maintaining its “steady growth and direction” than Hughes might suggest.⁴

With the maturation of the electric power grid in the 1940s, both political parties were more inclined to support the technical requirements of the advanced technology system and the desires of the companies that operated and maintained it. Winning a world war and building on post war economic expansion were goals that both parties could agree on. Electricity was seen as a positive good by the vast majority of the population and the organizations that engendered the inexpensive ubiquity of this service were extolled and well compensated. During this period the technological momentum of the electric power grid seemed fully established, with the virtuous feedback between the companies, universities, regulatory bodies, and the population permitting an improving quality of life through increasing electric power consumption.

This happy convergence of opinion was not to last. Many of the attributes of the electric power grid that assisted raising the efficiency of the system also led to greater pollution that harmed the environment. An augmented awareness of aspects of industrial pollution, including that from the production and transmission of electric power, became prevalent during the 1960s. The reaction against this pollution became one facet of the expanding environmental concern throughout the nation and globe. This distress grew out of the practical attempt to limit the effects of air and water pollution on human health, but the concerns grew to encompass the health of the entire planet. In this evolution of

4. Ibid.

ethical concern for the environment, greater numbers of individuals became energized to take action to prevent additional damage to the planet. Their worries were less about maintaining human survival with the style that the electric power grid provided than in ensuring the continued existence of all species. The organizations that this motivated cadre created would affect the operation of the electric power grid in a manner that none of the leaders of the groups promoting business as usual predicted.

This is another telling aspect of the development of the electric power grid that supports the technological momentum model. Neither Mumford nor Ellul could truly envision how the megamachine or technique could be altered in its drive for domination. Mumford appeared to require an act of God to alter the path of technology's domination over human civilization; a new great awakening of the population to change its core beliefs. Ellul was similarly opaque.⁵ There seemed little opportunity to get off of the bus of technique after one had accepted the enticing journey that advanced technology promised. Hughes was more astute in this respect, offering the opportunity of the changing human perspective on how a technology is viewed as a means to alter the momentum of an advanced technology system. Hughes was also more appreciative of the effects that the expanding environmental movement might have on advanced technology systems, including the electric power grid. Writing several years after Mumford and Ellul, Hughes noted that the change in attitudes and values, in opposition to

5. See Donald L. Miller, "The Myth of the Machine: I. Technics and Human Development," in *Lewis Mumford, Public Intellectual*, ed. Thomas P. Hughes and Agatha C. Hughes (New York: Oxford University Press, 1990), 162, and Jacques Ellul, *The Technological Society*, Translated by John Wilkinson (New York: Vintage Books, 1964), xxxiii.

the increased consumption of material, might well lead to new conceptions of how the electric power grid might be operated. Society might well alter how it used a technology and not allow itself to be a simple substrate for technology to act upon.⁶

This change in the appreciation of the electric power grid's value to society, as viewed through the lens of environmental ethics, certainly did lead to an alteration in the momentum of the system. Individuals and groups desiring to limit the environmental damage caused by pollution from the electric power generation plants influenced local, state and federal politicians to mitigate these stresses. Environmentally minded organizations led to the cancellation of the Charlestown nuclear power plants, shutting down the coal burning electric power plants at Brayton Point, and the construction of wind turbines in the state. Their support of electric utility deregulation, energy conservation and their acquiescence in the lower emission natural gas powered gas turbines led to the reduction in the amount of air pollution in the Ocean State. While the environmental groups' ability to prevent a facility from being built was greater than their ability to cause the construction of a project, one can not deny that the organizations made a difference in how the electric power grid developed. One can look across Narragansett Bay at the mammoth cooling towers at Brayton Point and accept the fact that these groups were consequential. The environmental groups' actions to affect the transmission and distribution portions of the electric power grid was less apparent, but they did at least cause the various state and federal regulatory bodies to consider

6. Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Penguin Books, 1989), 466-469.

ecological aspects of building electric power transmission lines. Whether the organizations were able to enhance environmental justice in any aspect remains unsettled.

Perhaps of greater importance than shutting down a polluting electric power plant was the conversion of the population to accepting an ethical perspective based on protecting the environment. The number of Rhode Island environmental groups increased, the state regulatory bodies accepted the vocabulary of these organizations, and even the universities educating future electric power grid operators and managers modified their programs to consider more sustainable energy systems. Promoting a sustainable electric power grid evolved from being a concern of a small segment of the population to a prevalent paradigm that the entire population embraced. Even the electric utilities were attentive to this mindset change. Conserving energy became an important part of the electric utility business model where previously the consumption of electricity to improve one's lifestyle, and utility profits, had been preeminent.

When this shift in outlook is considered with other contingent factors and system catastrophes affecting the electric power grid, one can note that the electric power grid of the early 21st century looks dramatically different than the system operators envisioned in the early 1970s. The natural monopolies of the electric utilities have been terminated and numerous independent companies compete to provide less expensive electric power to a regional coordinating body, ISO New England. The former local owners of the system have been absorbed by a multinational corporation. Instead of multiple nuclear power plants supplying the majority of electric power in state, the preponderance of electricity is produced by gas turbine power plants. Increasing numbers of wind turbines populate the state landscape providing electric power to the residents though also draining the state's

coffers. The long term ramifications of these changes have not been determined, but one cannot deny the effects of the environmental movement in achieving them. In this manner the theoretical construct of technological momentum better describes the change in the trajectory of the electric power grid.

Even with this assertion, throwing technological determinism into the trash heap with other discarded theories may be premature. Both Mumford and Ellul may have been unable to illustrate how the trajectory of advanced technology systems might be altered, but they were very perceptive on many other aspects of these system. The electric power grid certainly encompassed many of Ellul's characteristics of modern technology. The New England Electric System (NEES) possessed separate design and construction subsidiaries to attain the most efficient division of labor when operating the electric power grid. The system constructed its own ethical and technical standards through professional organizations such as the Institute of Electrical and Electronic Engineers (IEEE) to help build the network. To be fair, NEES did allow for the creativity of gifted individuals to achieve its objectives, but the mindset of rationality was encouraged by the ethical standards of performance under which these people operated.

Other characteristics seem less applicable. While the utility engineers and managers were certainly interested in constructing the grid the "one best way," they were often unable to attain such purity.⁷ Government regulatory bodies often quarreled with the utility companies regarding plant siting and company organization, leavening the

7. Jacques Ellul, *The Technological Society*. Trans. John Wilkinson (New York: Vintage Books, 1964), 79-80.

automatism of the network. Ellul stated that “Technical activity automatically eliminates every nontechnical activity or transforms it into a technical activity.”⁸ While the Rhode Island Public Utilities Commission could be viewed as having been captured by the industry it was created to monitor, the United States Congress’ actions in the Public Utilities Holding Company Act of 1935 should rightly be considered a nontechnical decision that affected the grid. The system had been modified on grounds not related to technical necessity, though one might argue that the sloughing off of the non-electrical functions of NEES in the 1930s supported the overall efficiency of the system. On the other hand, by forcing the divorce of the actual power companies from the complex financial underpinnings of the pyramidal holding company structure, Congress compelled the network to operate more efficiently. Much like entropy, the overall efficiency of the system was increased even though the local transient perturbations were unpleasant. Humans might think they were making decisions based on various political, economic or ethical factors, but in reality, “Man is stripped of his faculty of choice and he is satisfied,” Ellul warned.⁹ Humans had abrogated their decision making over this advanced technological system, preferring to meekly acquiesce to the electric power grid’s technical demands. This characteristic was certainly resident in the grid, but Ellul’s analysis is not overwhelming.¹⁰

8. Ibid., 83.

9. Ibid.,82.

10. Ibid., 116.

The irreversibility of the electric power grid was unquestioned; few could conceive of life in modern society without the basis of its energy. Yet with society conforming to the technical requirements of the grid, the individual's position in "technical evolution" decreases at an increasing rate.¹¹ With electric power reaching saturation throughout the region, citizens had little choice but to use the technology or essentially live outside of society. Electric power was essentially ubiquitous as the technology had spread so pervasively. NEES executives might advertise that the better living standards that electricity could power were a good thing. However, the electric power grid itself was uninterested in such value judgements. Electricity produced from nuclear power plants was neither good nor bad; it was merely 60 hertz power at 120 volts. Trying to attain the one best way of creating electric power was not the most important thing to accomplish; it was the only objective to be attained.¹²

Finally, the development of the electric power grid during this time period does contain numerous aspects of autonomy as postulated by Ellul. Yet to consider the electric power grid as a closed system does not appear to be justified. While the system operators did work to insulate their affairs from external influence, this was never achieved. While usually compliant, the state and federal governments acted to retard the wishes of the utility companies in numerous instances. The Supreme Court's Attleboro decision appears in opposition to the best business practices and technical requirements of the electric power grid. The Public Utilities Holding Company Act of 1935 solved this

11. Ibid., 92.

12. Ibid., 94-96.

issue in the utility's favor, but then also split up their labyrinthine financial structure that had accelerated their growth. The Public Utility Regulatory Policies Act (PURPA) had sections that led to unexpected consequences by the authors of the ordinance and the industry leadership. Proponents of technological determinism might suggest this is rearranging the technical cause and political and economic effects, but the reality is more ambiguous.¹³

Ellul's description of technique's affirmation of itself as an independent actor unconstrained by other ethical values seems more apt. Not only did the electric power grid operators resist judgment from external organizations, they created their own scheme of human behavior standards to support the system's dominance. Building a dam for a hydroelectric plant was thus easily justifiable, even if the resultant reservoir submerged numerous towns. Meeting the technical demands of the electric power grid would provide for the greater good of modern technological society. Other concerns were not considered relevant, or even worth the effort to imagine. Instead, achieving technical excellence along the lines of electrical engineering ethics was considered the greatest accolade.¹⁴

Other data points strengthen the deterministic model. When the electric power grid collapsed under its own weight during the in 1965 blackout, more of the then nascent computer technology was applied to monitor the system performance, removing human control to some extent. Considering the poor human response to the blackout, one might

13. Ibid., 133.

14. Ibid., 133.

reflect that this was a good decision. The acceleration of non-human control of the expanding technology would be a continuing concern. “This progressive elimination of man from the circuit must inexorably continue,” Ellul argued, suggesting elements of the smart grid long before it had even been envisioned.¹⁵

One is left with the thought that though technological determinism and the nature of technique are not sufficient to fully describe the development of advanced technology systems, the model does have many very perceptive, and at times unsettling insights. While accepting that technological determinism provides a better model for the electric power grid for the time period examined, perhaps this period was still not long enough for the megamachine to emerge as fully victorious. The current perturbation caused by the advent of environmental ethics may be only a minor pause in technique’s advance. Conversely the full impact of the population’s acceptance of a new ethic in the light of climate change may sweep the old manner of electric power generation away regardless of the strength of technique. The jury may still be out on the ultimate future of the electric power grid and the role of humans with this advanced technology system.

Implications

While every advanced technology system is unique, telling similarities exist. One cannot help but note some of the resemblances between the initial growth of the electric power grid in Rhode Island and that of other nascent systems such as the telecommunications system and the internet. Many of the same technical challenges of

15. Ibid., 136.

competing companies vying for monopoly control over specific areas, political problems associated with regulation (or lack thereof), financial difficulties from creative funding schemes and the intense demand from the population for these services mirror many of the events of the early days of the electric power grid. Other advanced technology systems may be following comparable paths but in a later stage of development; the railroad transportation system seems a fair candidate here. In either case the parallels suggest that technological momentum may be a suitable model to anticipate the development of these systems. Additionally, the manner in which the momentum of the electric power grid was altered may intimate methods to change the direction of these newer systems. A catastrophic system failure scenario might easily be constructed. While one hesitates to recommend shutting down the internet or telecommunication system in the northeast as the electric power grid was in 1965 to observe the response of the population, one might easily imagine the initial panic and longer term consequences based on this event. Converting the population to construct these technologies in a less favorable light is more difficult to envision, let alone what other contingent events might occur that would affect system operation. Other technologies may fall into this categorization; further research certainly seems warranted.

Other aspects of the preceding analysis seem illustrative. While a small area of the United States was used to bound the scope of the analysis, the examination of the development of the electric power grid in Rhode Island was certainly instructive. Despite a small geographic size and similar population, the Ocean State was at the forefront of numerous technical events and political incidents affecting the electric power grid. The Supreme Court case of Public Utilities Commission of Rhode Island versus the

Attleboro Steam & Electric Company was an important factor in the subsequent federal regulation of electric power transmission and the Public Utility Holding Company Act of 1935. Rhode Island's early deregulation of the electric utility industry was also ahead of much of the national efforts. Examination of advanced technology systems even within a limited political entity may be beneficial in confirming or refuting larger trends. History and technical development is apparent even in the smallest state, as long as one is willing to patiently observe it happening.

Finally, human agency was a significant factor while establishing the electric power grid's initial momentum and later altering its trajectory. Financiers such as Malcolm Chase, politicians such as Charles Brayton, and industry leaders such as Marsden Perry were all critical actors in the early stages of the system. Later, industry leaders like NEES's Guy Nichols and John Rowe, and environmental leaders like Claudine Schneider and Alfred Hawkes played key roles. While organizations such as the Conservation Law Foundation and Save the Bay were important in the preceding analysis, these individuals made an important difference in how the electric power grid in southeastern New England evolved. It is not unreasonable to suggest that other individuals, some larger than life, will play key parts in the development of other advanced technology systems. The efforts and actions of these individuals warrant further examination and illumination.

Conclusion

This study has examined the initial growth, development and maturation of the electric power grid in southeastern New England over the past one hundred and thirty years. During this time period, this advanced technology system generated significant

momentum to surmount the challenges of world wars, economic down turns and political regulation. Catastrophic system events could be analyzed and repaired while the contingent events from the world could be managed. The conversion of a large swath of the population to support the precepts of an emerging environmental ethic however led to changes in how the electric power grid was constructed, operated and maintained. The change in the trajectory of this advanced technology system indicates that technological momentum is a better model than technological determinism to explain the development of the electric power grid in the southeastern New England. It also suggests that other advanced technology systems may be equally applicable to analysis using this model.

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