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Anti-Nuclear Activism and the Past, Present and Future of United States Nuclear Energy Policy

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ABSTRACT

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Nuclear power has had a long and controversial history leading people to have many different views on the topic. Even though nuclear power does provide the nation with a significant portion of its electricity, many still fear its risks, especially after the events at Fukushima last spring. This thesis explores how public opinion, current events, and anti-nuclear activism have shaped nuclear power in America today. After reviewing the literature on nuclear energy in the United States, I discuss the past and current state of United States nuclear energy policy, and then describe changing American attitudes toward nuclear power over time. My final chapter focuses on anti-nuclear activism in the United States, looking in depth at the controversy currently surrounding two specific plants: Indian Point Energy Center and Vermont Yankee Nuclear Power Plant. In conclusion, I have developed my own opinion on the role of which nuclear power should play in American energy policy and its future.

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INTRODUCTION

Ironically, my interest in American nuclear power policy began when I was outside of the United States. I was on my term abroad in Germany during the spring of 2011. It all started upon my arrival in Germany last March. The group I was traveling with had just reached Freiburg and we decided to take a walk around the quaint city with hopes to adjust ourselves to this new place. On the walk with our Union College professor, we began to hear chanting and yelling. Not only were we a tad frightened, but we were also very confused, as the voices were yelling in German. We all had taken German prior to traveling to Germany, but we were not at the level of understanding it fluently. As we turned the corner we saw a large crowd of people, and a wall of yellow signs, balloons and flags with the words "Atomkraft? Nein, Danke!" written on them. We were soon able to put two and two together and realized the signs were saying "Nuclear Power? No Thanks!." We had walked into an anti-nuclear power rally. I was instantly intrigued, as I had never experienced an anti-nuclear power movement like this first hand in the United States. My only exposure to environmental activism had been at Union College, with members of the Environmental Club performing trash audits or asking for signatures petitioning against an issue. As I continued my travels through Germany for the next ten weeks, I saw the same sign, with a yellow circle and a little red smiling sun with the words "Atomkraft? Nein, Danke!" all over.

Growing accustomed to this image led me to question if this movement existed in the United States. In fact, due to my lack of exposure to the movement, I even wondered if it existed at all. At that point, I did not have the strongest knowledge in the area of nuclear technology. I had briefly learned about the controversy surrounding nuclear

power in a political science class titled Environment, Energy, and U.S. Politics. Having been exposed to the exciting rally in Germany made me want to explore the United States' own anti-nuclear movement.

My interest in the topic was reinforced as a result of what was simultaneously occurring in Japan, the disaster at Fukushima Daiichi. I was very interested in seeing what people in the United States thought about nuclear power in reaction to Fukushima. Aside from understanding public opinion on the topic, I was also interested in understanding how the decisions regarding nuclear power policy are affected by the attitudes of American citizens and current events involving the technology.

I feel this is an optimal time to study the topic because of the recent events in Japan. At this point, the world has now been exposed to three major catastrophic nuclear events: Fukushima, Chernobyl and Three Mile Island, and these are in addition to the events during WWII involving the atomic bomb. This subject is presently very important, as the world's source of oil seems to be getting smaller and smaller, and the nations are looking for other means of electricity. Many believe nuclear power to be a great source of clean energy; however, many others cannot look past the dangerous waste problem it creates. In time, the controversy over nuclear power will only become more present in politics as other means of energy run out. It is crucial to understand the policies surrounding the topic today, in order to have a better understanding of it for future generations.

In order to explore and understand nuclear power, my thesis looks at many aspects of the topic. To do this research, I analyzed literature that has been written about the topic, looked at media accounts, and analyzed past and current nuclear policies. With

these different means of gathering data and information I developed an understanding about how anti-nuclear activism, public opinion, and current events that have shaped United States policy on nuclear energy, which helped me formulate a reasonable course of action for nuclear power's future.

This thesis is divided into five main sections, including a literature review and four chapters. First, I present a literature review to discuss what has been presented in past works about nuclear power history, policies, and activism. The main point of this section is for me to present what has already been discovered about the topic, and to locate my own research in relation to existing studies.

The remainder of the thesis will be presented in chapters. The first chapter focuses on the role of nuclear power in the national energy plan for the United States. I also focus on the positives and negatives of the controversy and the risk surrounding the technology. The second chapter of this thesis focuses on the national attitudes toward nuclear power in America. This section will investigate who is more likely to be for or against the technology, with regard to variables such as gender, political affiliations, and location. I will also discuss the influence of nuclear power disasters on United States nuclear policy in this section. The third chapter studies the anti-nuclear movement in the United States and on a local level, looking in particular at the controversy of nuclear power at Indian Point Energy Center and Vermont Yankee Power Station. With that, I focus on local organizations and anti-nuclear activism. The fourth and final chapter of the thesis is my own policy analysis. Based on my research, I have developed an opinion on the role which nuclear power should play in American energy policy. My goal of writing this

thesis is to help others and myself, develop a standpoint on nuclear power while recognizing the need for electricity and the need to protect our environment.

LITERATURE REVIEW

Introduction

At this point in time, a considerable amount of research has been done on the topic of nuclear power. In the literature, a broad range of topics has been covered presenting different views and opinions on the matter. Because it is such a controversial topic, the ideas of various stakeholders are well-established. The issue researched in this thesis is the effect of activism, public opinion, and current events on American nuclear policy. This question requires the review of what has already been established in literature, and the media. The information presented below has the purpose of demonstrating what has been written, giving a background on the overarching topic being explored, and providing a context for my own study. I focus first on the history of nuclear power, followed by a review of what nuclear policy is like today. Then, I look at the emergence and the role of activism against nuclear power. This range of topics surrounding nuclear power will give a foundation of the status of the technology in the United States today.

History

In the history of mankind, nuclear power is relatively young. However, its impact has had a huge effect on humanity because of its impact on people, the environment, and politics, as observed in United States and elsewhere in the world. Many scholars have written on the development and growth of nuclear power, globally and domestically. In the present day, discussion surrounding nuclear power is at an all-time high, as the world's population is at its largest, and the demand for energy is constantly rising from an already very high point. Many scholars and scientists are trying to figure out the right

way to have nuclear power, or whether to have it at all. A question currently being asked in literature regarding nuclear power asks if America is experiencing a nuclear renaissance or nuclear relapse? (Culley 2010: 231). This is asked because many of today's power plants' licenses are nearing their expiration, and their owners are now applying to attain extensions. The future of nuclear power is often disputed due to past disasters such as Three Mile Island, Chernobyl, and Fukushima. These disasters open the public's eye to some of the horrors that can come along with nuclear power plants improperly function. Prior to the knowledge of the risks that are associated with nuclear power, it was a science that was greatly supported because it was an abundant and cheap energy source.

Dating back to the 19th century, scientists have studied the concept of nuclear chemistry. Early scientists discovered unlimited amounts of energy trapped in atoms, which was an incredible revelation at the time. The study of atoms soon expanded to a study of nuclear physics, as scientists were exploring what created the release of energy. This soon was discovered to be the splitting of atoms, which is the basic science of nuclear energy. The early developments of chemistry allowed for physicists to understand the chemical make up of the atom and discover how this unlimited energy source could be tapped. Furthermore, after this scientific milestone occurred, governments around the world became involved and curious, eventually leading to the arms race during World War II. Scientists developed atomic bombs with enormous power that were sought after by countries for a sense of security. Despite the evident destruction and power of nuclear bombs used during the war, such as on Hiroshima, scientists and the world saw how much energy could be created from a nuclear reaction. In the eyes of many scientists, the

power and destruction of these bombs represented a huge source of energy, which soon transitioned into the interest and development of nuclear power. The idea of an alternative to a nuclear arsenal had emerged. The primary developments were seen in Europe and the USSR. For example, in 1954, the USSR connected an experimental reactor to the energy grid, while in 1956 the United Kingdom opened Calder Hall, the first civil nuclear power plant with four reactors (Irvine 2011:31). Many countries were optimistic about the new technology and took the risk of investing in the relatively young science not knowing the long-term effects it may have.

On the home front, the United States also started to think about nuclear energy in the 1940s, with the implementation of the Manhattan Project during World War II for defense purposes. The Manhattan Project was the name of the Allies' nuclear research campaign, directed by American physicist, Robert Oppenheimer (Irvine 2011:25). The project was mainly conducted in the United States, because the United Kingdom lacked resources due to its destruction during the war (Irvine 2011:25). With efforts to establish national security with a nuclear weapon arsenal, the United States government passed the Atomic Energy Act of 1946, "which established the institutional framework within which atomic energy decisions would be made for approximately the next thirty years" (Duffy 1997: 23). Seeing as Congress put a time limit on the act, the government was unaware of what to expect with the future of nuclear power. They may not have expected its development and the controversy that surrounds it today. The Atomic Energy Act "created the Atomic Energy Commission [(AEC)], which inherited ownership of all atomic material, facilities, and information from the Manhattan Project; the General Advisory Committee (GAC), which was to advise the AEC on scientific and technical

issues; and the Joint Committee on Atomic Energy, which was to oversee AEC operations" (Duffy 1997: 23).

Like in Europe, the United States also introduced the concept of nuclear power to in order to relieve the stigma around nuclear weapons. Under President Dwight D. Eisenhower, an effort was displayed by his campaign "Atoms for Peace" in 1953. His administration wanted to show "the world that the United Stated was concerned with more than military uses of nuclear power and the prevention of global nuclear proliferation" (Rosenbaum 2011:291). Along with many other countries, the United States wanted to take this new science and develop it into something that had a positive reputation. At this point in time, the term "nuclear" likely received a stigma because of the bombs' massive destruction during the war. Eisenhower strived to "strip nuclear power of its "military casting"" and make it a technology to benefit society (Tucker 2009: 78). The government aimed to remove the negativities on nuclear energy and strongly pushed for peaceful atomic energy.

The following year, the Atomic Energy Act of 1946 was amended in order to allow a better environment to develop nuclear energy into American infrastructure. A change was needed because "the elaborate security restrictions of the [Atomic Energy Act of 1964], together with the government monopoly on all atomic information and materials, impeded both the proposed Atoms for Peace program and the development of the atom as an energy source" (Duffy 1997:33). The government wanted to open up the ability for energy firms to invest in nuclear power; however, many firms were hesitant due to the high costs of the plants in conjunction with uncertain profits and the uncertainty of the technology (Duffy 1997:33). Nuclear energy development was a key

point on the United States' government agenda, which translated into the amendments of the Atomic Energy Act in 1954, and the creation of a commercial power industry (Duffy 1997:33). Amendments to the act allowed private utility companies to invest and build nuclear power plants on their own. The development of nuclear power advanced with the policy revisions, as utility companies in addition to the government were able to get involved.

After the change in the law, on September 6, 1954, "ground was broken on the world's first commercial nuclear power plant in Shippingport, Pennsylvania" and later opened in 1957 (Tucker 2009:78). Over the next decade nuclear power continued to develop and grow. More and more plants were constructed in the United States, expanding the commercial nuclear power industry, as well as the nation's dependency on the energy source.

In the 1970s, changes in government legislation over nuclear power also occurred. During the Nixon Administration, the idea of Project Independence was introduced, where President Richard Nixon announced "a realizable goal that more than 50 % of the USA's electricity should be produced by nuclear power by the end of the century" (Falk 1982: 23). Along with Project Independence, the AEC was terminated in 1974, as a part of the Energy Reorganization Act. "The primary goal of the Energy Reorganization Act of 1974 was reducing the nation's dependence on imported energy supplies" (Duffy 1997:112). Alongside the abolition of the AEC, two new agencies were created: the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission (NRC). Both agencies had their own focuses on the regulation of nuclear power. The NRC is still active today, and ERDA was later halted with the establishment

of the Department of Energy in 1977 (Britannica- Atomic Energy Commission). Simultaneously in 1977, President Jimmy Carter stated his expectations of nuclear power by 2000 to be 25 % of America's power rather than Nixon's ambitious 50 %. (Falk 1982:23). Because nuclear power was becoming a more important and larger issue, the government worked to expand the sectors that would manage it. The government's decision for the Energy Reorganization Act of 1974 was effective because the NRC still plays a major role in nuclear power regulation today. Any subject matter regarding nuclear energy is required to go through the agency.

In a larger picture, the reorganization of the government also changed to allow input from various government units on a decisions regarding nuclear energy:

> Where there was once a small group of insiders restricting participation to program supporters, by the middle of the decade the range of governmental participants would be decidedly broader and less exclusive. In addition to the [NRC] and ERDA, the courts, the [Environmental Protection Agency] (EPA), the Fish and Wildlife Service (FWS), and the state and local government claimed jurisdiction. The AEC, for example, had not been very concerned with the environmental impacts of reactors, but the EPA and FWS were. More and more, licensing decisions were challenged in court, while state and local governments became involved through their sitting and rate-making powers (Duffy 1997:121).

In addition to pleasing many politicians whose voices now could be heard, this reorganization pleased the American public, especially those who did not favor the development of nuclear power. This change occurred during a time when many modifications were made in American politics regarding care for the environment such as the Clear Air Act and the Clean Water Act.

During following decades, the desire for nuclear power expansion halted as the NRC did not receive orders for new plants between 1973 and October 2008. By 1973, the United States was comfortable with the number of nuclear power plants in operation

(Rosenbaum 2011:289). Rosenbaum states, "In 1975, the Nuclear Dream seemed most resplendent: 56 commercial reactors had been built, another 69 were under construction, and 111 more were planned (Rosenbaum 2011:292). This comfort soon changed with Three Mile Island in 1979. The events of Three Mile Island opened Americans' eyes to the horrors of nuclear power, as the nation experienced a disaster caused by a valve failure in one of the reactor's cooling systems (Kline 2011:102). During the time period after Three Mile Island, the nuclear power industry went into a lull as Americans were hesitant to invest and continue to develop the risky technology. Many of the feelings created after Three Mile Island were reinforced in 1986, when another nuclear energy disaster occurred in Chernobyl, Ukraine. The Chernobyl Nuclear Power Plant experienced a core meltdown, which was very destructive because large amounts of radiation were released. Again, after being exposed to a horrifying nuclear disaster, the public opinion shifted to stigmatize nuclear power.

Nuclear Power in the 1990s and Today

In the 1990s, society's rise of environmental concern affected politics as the idea of climate change emerged, which in some ways helped the status of nuclear power. Efforts were made to turn around the nation's outlook on nuclear power as "the industry initiated an increasingly aggressive strategy to promote commercial nuclear power as the most desirable economic and environmental alternative to the greenhouse gas emissions associated with fossil fuel combustion for generating electric power" (Rosenbaum 2011:290). This idea coincided with President George H.W. Bush's conservative administration. With the increasing science being discovered about climate change and global warming, many people became more favorable toward nuclear power, as it does

not emit carbon dioxide into the atmosphere. President Bill Clinton also demonstrated concern for the environment when he displayed an interest in reducing greenhouse gas emissions with his compliance in the worldwide effort to reduce emissions, the Kyoto Protocol in 1997.

In contrast, Clinton's successor President George W. Bush had an interest in nuclear power expansion. The administration's efforts towards developing nuclear power were stated in its 2001 Nuclear Energy Plan. The plan indicated that "'a dramatic improvement in United States power plant performance over the last 25 years' had occurred and that the industry 'has established a strong foundation for the expansion of nuclear energy in the next two decades'" (Rosenbaum 2011:290). The attempted comeback of nuclear power was a major element in the Bush administration's energy plan. There were many pieces of the puzzle, which called for research and development in order to promote the science. Investigation of nuclear power was important because of its ability to be emission-free. In the past, scientists did not particularly value nuclear power as a clean technology. Clean technologies were not as heavily demanded because scientists had not yet discovered how harmful emissions were to the atmosphere. However, with continuing science of global warming, American nuclear power policy shifted because there was a need to move away from high-carbon emitting practices. In a worldwide effort to reduce emissions, many nations signed the Kyoto Protocol of 2001, but unfortunately the United States was not included on that list. Bush stated in an interview during his presidency, "Kyoto would have wrecked our economy. I couldn't in good faith have signed Kyoto…"(Bush as quoted by Associated Press 2005: Para 4). To

make up for their lack of signing, the Bush Administration changed American energy policy with hopes to limit carbon emissions.

The Bush administration's approach to limiting emissions was to create policy promoting the expansion of more clean technology. Rather than creating a policy to put an end to the emissions, the Bush administration continued to allow the fossil fuel producers and emitters to carry on production. However, in compensation for his refusal to sign the Kyoto Protocol, the Bush administration heavily pushed nuclear power as a means for clean, emission-free electricity. The Bush administration created a joint government/industry program named "Nuclear Power 2010" (NP 2010), which became the face of its energy plan (Squassoni 2009: 5). The main goal of NP 2010 was to construct new nuclear reactors in the United States. Before this goal, there had not been plans for a new plant in the United States since the 1970s (Squassoni 2009: 6). Alongside NP 2010, the government planned for heavy investments into the research and development of nuclear energy, Squassoni states "The Bush administration tripled the [Department of Energy's] [Research and Development] budget for nuclear energy from 2001 to 2009" (Squassoni 2009: 6). Another strategy that helped support the role of nuclear power was the push of early site permits (ESP) that were implemented during George H.W. Bush's presidency, under the Energy Policy Act of 1992. ESPs made it easier for plants to get licensed, as it was considered "one-step" licensing where as before ESPs:

> utilities had to apply for a construction license and, once construction was complete, an operating license. This process led to several instances in which the construction, but not the operation, of reactors was licensed. The new process combines those two licenses and limits the kinds of interventions that led to delays (Squassoni 2009: 7).

To push the expansion of clean energy, rather than push the decrease of coal-burning carbon emitters, Bush tried to deregulate the construction of nuclear reactors as much as he could.

During the first decade of the 2000s, the advance of nuclear energy generated by the Bush administration also generated nuclear power as a hot topic in public opinion. Nuclear power was returning to its state as a controversial topic while waste management and green technology were becoming major concerns of the era. Following the Bush administration's large push towards nuclear power, politics were less concerned with the matter when the Democratic President Barack Obama took office. The Obama administration's push towards nuclear power has been a lot less present than the Bush administration's. With hopes to please a very environmentally conscious crowd, in mid-2008, prior to being elected, Obama stated:

> I think we do have to look at nuclear, and what we've got to figure out is can we store the material properly? Can we make sure that they're secure? Can we deal with the expense? Because the problem is, is that a lot of our nuclear industry, it reinvents the wheel. Each nuclear power plant that is proposed has a new design, has – it, it has all kinds of changes, there are all sorts of cost overruns. So it has not been an effective option. That doesn't mean that it can't be an effective option, but we're going to have to figure out storage and safety issues. And my attitude when it comes to energy is there's no silver bullet. We've…got to look at every possible option (quoted in Squassoni 2009:17).

Rather than being a strong proponent of the technology, Obama publicly recognized the concerns and risks that came along with the technology. Going into his presidency, Obama knew that energy would be a main issue he would face because it is one of the biggest issues of present day. As our population is growing, the demand for electricity is simultaneously growing. The United States currently faces the problem of how to

successfully meet that demand, and many believe nuclear power may be part of the answer.

The Obama Administration has already made a number of decisions that have impacted the development of United States' nuclear power. One key impact has been the abolishment of funding for research for the Yucca Mountain waste storage facility, as stated in the Obama administration's 2010 budget submission. Yucca Mountain, located in Nevada, had been proposed as a nuclear waste repository site for many years as a place to safely store radioactive waste and spent fuel. The idea of Yucca Mountain is very controversial, as many Americans fear storing dangerous material in the Earth. The government looked for one spot to store all the waste together, as currently waste is spread out across the nation. Waste is either stored on- site at commercial plants, in containment facilities, or in repositories in states such as New York, South Carolina, Nevada, Idaho, and Washington (Rosenbaum 2010:296). In Obama's 2010 budget submission, funding towards waste management was decreased from US$228 million to US$197 million, and was strictly allocated for licensing of already constructed plants (Squassoni 2009:17). Included in this decision was a plan to "convene a "blue-ribbon" panel of experts to evaluate alternative approaches for meeting the federal responsibility to manage and ultimately dispose of spent nuclear fuel and high-level radioactive waste from both commercial and defense activities," as stated by the Department of Energy in 2009 (Squassoni 2009: 17). It is evident the Obama Administration was hesitant to be as forward with nuclear energy as the Bush administration was, largely due to the issue of nuclear waste, which is a concern to many environmentally-minded Democratic voters.

In time, the Obama administration began to show more of an interest in the technology, as evidenced by the President's State of Union Address on January 25, 2011. In his speech Obama requested "for nuclear power to be included in a national goal of generating 80% of United States' electricity "from clean energy sources" by 2035" (Holt 2011:1). The President's main environmental concern was to lower emissions, so he recognized nuclear power as a way to meet his goal. In addition, the President also discussed a Clean Energy Standard that "could provide a significant boost to American nuclear power expansion, particularly in areas of the country with relatively limited renewable energy resources (Holt 2011:1). Coinciding with the want for lower emissions, Obama pushed for less oil dependency, especially after the Gulf oil spill during the previous spring of 2010. Many Americans felt the Gulf oil spill justified the use of nuclear power. It seems that with the push towards clean, emission-free energy and energy independence away from oil, the Obama administration became more receptive towards nuclear energy.

However, only a couple months later, a nuclear disaster occurred which raised concerns globally. On March 11, 2011, Japan faced a nuclear catastrophe as a result of a tsunami caused by an earthquake. The Fukushima Daiichi Nuclear Power Plant was severely damaged as the tsunami hit the coastally located plant. The damage to the plant caused large amounts of radiation to be released into the surrounding areas and ocean. More specifically, "the tsunami blacked out all electric power at the six-reactor plant, resulting in the overheating of the reactor cores in three of the units and overheating of several spent fuel storage pools at the site…the overheating caused major hydrogen explosions and release of radioactive material to the environment" (Holt 2011:1). This

disaster was portrayed globally through the media and raised many concerns in the political and public realms. Many politicians had concerns about an event like this occurring in the United States. Questions were being asked regarding nuclear safety regulation, nuclear energy expansion, and radioactive waste regulation in America (Holt 2011:1). Events such as Fukushima displayed to the world a very negative side of nuclear power, which results in governments around the world being very hesitant and cautious in their policies towards the technology.

Despite the horrors of Fukushima, the United States continued efforts towards nuclear power to make it the safest and most practical it can be. Under the Energy and Water Development Act, the Obama Administration still plans to invest in measures of nuclear energy. On July 8, 2011, the Appropriations Committee of the Energy Development Act published a report, which stated:

> the funds provide money for nuclear energy research and development, fuel cycle research and development and radiological facilities management…funds from this account would be used "to further the next generation of safe, secure and economically beneficial nuclear power options while ensuring the safety and resiliency of our nuclear power plants" (GOP Legislative Digest 2011: Para 12).

Before construction of new plants, the government is heavily focusing on discovering the best way to construct and run the plants to limit and prevent vulnerability to accidents. At this point, the government wants to make sure any future plants are the safest, most reliable, and most cost-effective they can be. The NRC and the Department of Energy are working close to make these ideas a reality in order to provide America a safe, clean and secure future.

The various sources used thus far into the literature review have made an immense impact on understanding the background and current policy of nuclear power

today in America. Establishing this information is important because it creates an understanding of the significance of nuclear power. It is likely that nuclear power will remain in political discussion regarding energy policy in the future, as scientists and politicians work closely to supply America with electricity.

Anti- Nuclear Activism in the United States

With the establishment of the new regulations, it is essential that the different political institutions that deal with nuclear power work closely together to ensure the reliability of United States nuclear power. However, not everyone in America is convinced of that reliability, which has led to an anti-nuclear movement that is seen within the larger environmental movement. The question of nuclear power began with the world's reaction to the presence of nuclear bombs in World War II. Across the globe, people saw images and heard of the devastation where about 75,000 civilians died as a result of an atomic bomb in Hiroshima during 1945 (Emsley 2001: 478). People took many precautions, as they feared their homes would be the next victims of these atrocious weapons. Bomb shelters soon became staples in the construction of new buildings because of the uncertainty of the nuclear arms race. Despite the horror, countries believed in the need for a nuclear arsenal for domestic security, which later transitioned into the development of nuclear power. The Manhattan Project may have not been active anymore, but its aims remained a core concern of the American people.

In the United States, a movement opposed to nuclear power emerged during the 1970s, when advances in the environmental movement deemed the decade the "Green Decade." However, the roots of environmentalism emerged before then. With the early influences of environmental writers dating back to the mid-1800s, many Americans were

exposed to environmentalist ideas that promoted the care for the outdoors. The literature from writers such as John Muir, Aldo Leopold, Ralph Waldo Emerson, and Henry Thoreau introduced the ideas of preservation and conservation, setting the stage for the future environmental movement. With industrialization and the expansion of the American west, Americans began to understand what these men had written about. Eventually, more formal organizations aimed towards environmentalism were established, such as the Sierra Club and the National Audubon Society. Groups such as these had a major impact on the emergence of environmentalism, as they were able to recruit members and raise environmental awareness around the country. These early foundations of preservation and conservation would later be the backbone of the anti-nuclear energy movement.

A major step towards environmentalism occurred with the help of an individual named Rachel Carson. In her book, *Silent Spring,* published in 1962, Carson, a former researcher for the Fish and Wildlife Service, discussed how synthetic chemicals poisoned the environment (Kline 2011:83). She specifically analyzed the "problems created by the indiscriminate use of the insecticide DDT and its spread through the food chain" which led to the book's title representing the "silent spring" that occurred due to the death of robins from the DDT toxicity (Kline 2011:83). Carson's work was a major landmark in the environmental movement because it raised awareness about the harms of what humans were putting into the environment. Ideas of environmentalism were beginning to include protecting nature from these harmful anthropogenic forces. People were realizing the harm manmade pollution and chemicals cause the environment. Because many animal species were suffering from this treatment of the environment, it was safe to say that if it

was not good for them, it was not good for the health of human beings. Human health became a major element in the movement, as the correlation between a healthy environment and a healthy individual was recognized.

Carson herself commented on the subject of nuclear power as the controversy surrounding it, was developing. Kline notes "Carson warned that the speed of change in society was based not on natural factors but on the impetuous pace of human inventiveness. Atomic power, she wrote, had created an 'unnatural' overabundance of radiation; the chemicals being poured into the nation's waters were 'the synthetic creations of man's inventive mind, brewed in his laboratories, and having no counterparts in nature'" (Carson as sited by Kline 2011:83). Her recognition of anthropogenic forces is powerful as it targets human activity for environmental degradation. Carson was noting an important fact that would later be a key component in the idea that humans are causing climate change. She recognized early the human need to invent, demand, and consume as a problem because planet Earth will likely not be able to handle the stress. Today, Carson's thoughts have become reality because consumerism is now a main problem. Humans have developed so much technology and so many objects that have flooded and deteriorated the environment with manmade matter and chemicals. The use of the term "unnatural" is essential in Carson's idea of nuclear power because it labels nuclear power as inorganic and out of place. With regards to nuclear waste, it is not meant to be in the environment. A fear of nuclear power was strengthened, as radioactive waste entering the environment was deemed unsafe.

At this point, environmentalism in America began to establish itself in society. Activists began to organize and come together to hold protests and demonstrations. This

was an ideal time for environmentalists to organize because the 1970s was considered to be a social movement-oriented decade. Environmentalists recognized how to recruit and what tactics to use because they had seen the successes and failures of the Civil Rights and Free Speech movements. There began to be many organized events, which brought together a mass group of people to demonstrate under the belief that "power in numbers" would be beneficial. The first major demonstration was seen in New York City in 1977, which brought together fifteen thousand people to protest nuclear weapons and nuclear power (Meyer 2007: 124). Many Americans had not forgotten about the horrors of Hiroshima and the devastation of radiation. People did not understand why the government had even considered nuclear power and in this case, "protest emerged in response to a policy problem" (Meyer 2007: 125). The policy problem faced was the government's engagement in the Nuclear Dream, pushing the construction of numerous plants.

In response to the various concerns of environmental protesters, the government soon took action in an attempt to answer the growing activism. Many political outcomes of this movement occurred, as a considerable amount of legislation was created in the 1960s and 1970s. Prior to a fight specifically against nuclear power policy, there was an opposition against waste and chemicals in the environment more generally, which required much regulation. Some of the legislation seen includes the Clean Air Act, The Wilderness Act, Water Quality Act, the establishment of the Environmental Protection Agency, the Federal Environmental Pesticide Control Act, the Clean Water Act, the Safe Drinking Water Act, and the Resource Conservation and Recovery Act. With the changes occurring, the environmental movement had become institutionalized.

Just as the American public became a bit more comfortable with the new regulations, the concern over chemical waste in the environment was heightened again with Love Canal in 1978 and Three Mile Island in 1979. The story of Love Canal involves a community's discovering that it had been built atop a chemical waste dump, explaining numerous health problems (Kline 2011:108). Three Mile Island, as mentioned previously, was the first major nuclear disaster on American soil. Large strides of the environmental movement were sparked and justified by these events. Both incidents involved a contaminated environment that led many Americans to change their environmental views, and again, raised questions about the government's policy on the environment. Focusing on nuclear power, after Three Mile Island, another notable demonstration occurred which gathered over sixty five thousand people in Washington, D.C. on May 6, 1979 (Meyer 2007: 124). This moment in history defined American policy on nuclear power; all orders for the construction of new plants ceased in 1979, and didn't resume until the Bush administration's efforts to revive nuclear power.

Thus far, the environmental movement has had many impacts that have resulted in the state of the environment being an important piece of a politician's agenda. However, currently the debate over nuclear power does not seem to be the most important national energy priority. The focus currently is still on fossil fuels, with regards to issues such as the proposed Keystone XL Pipeline and hydrofracking. The Keystone XL pipeline was a proposed pipeline that would cut through a vast area of the United States, to transport oil from Canada, while hydrofracking is a means to extract natural gas from Marcellus Shale with the use of extremely dangerous chemicals. Both ideas would increase dependency on fossil fuels and pose environmental threats largely associated

with leaks, causing them to be controversial topics. President Obama recently denied the Keystone XL Pipeline and there is a major debate regarding hydrofracking occurring. The future of fossil fuels will heavily impact the future of nuclear power because if ideas continue to be rejected, the United States may look towards nuclear technology as an alternative to meet the high energy demands. Obama's rejection of the Keystone XL Pipeline has not caused a change in anti-nuclear activism because he still demonstrates interest in fossil fuels through the expansion of offshore oil drilling and safe natural gas drilling. Until any major legislation is made regarding the future of fossil fuels, it is likely that anti-nuclear activism will remain at current levels and will be carried out mainly on a more local level by local organizations and citizens.

In general, opposition towards a nuclear power plant tends to emerge at the local level. Local people fear radioactive waste or environmental degradation in the place they call home, their community. In addition, many people have felt left out in the decision-making process, while their wishes are not being heard. In the 1960s and 70s, when nuclear power was being heavily invested in, many plants were planned and constructed, despite the fact that many local citizens pushed against development of these plants.

One particular local group, worth noting, is the Clamshell Alliance. Inspired by a citizen occupation that had successfully stopped the construction of a nuclear plant in Whyl, West Germany, a group of Americans came together to fight against a proposed plant in Seabrook, New Hampshire (Gyorgy 1980: 395-396). Even though the plant was eventually built, the Clamshell Alliance made a large impact through protesting, as they were the first American group to have an ongoing demonstration. Opposition against the construction of the plant was based on fear that the large amounts of water released from

the plant would affect the surrounding marine environment, and the fear of earthquakes and radiation (Falk 1982: 55-56). The protestors displayed this opposition with a series of demonstrations and sit-ins at the site of the plant during the years preceding the plant's construction. The first demonstration was on August 1, 1976, with a mere eighteen "Clams," as the protesters became known as. Eventually, the demonstrations got as many as 18,000 Clams on site (Falk 1982: 56). The activists fought long and hard to keep the site of the plant, a 715-acre estuary, untouched, but unfortunately their voices were not heard and the plant was completed in 1986. (Gyorgy 1980:395). Despite their lost fight at Seabrook, the Clamshell Alliance has remained an active anti-nuclear organization to this day. This is just one example of resistance towards the construction of a plant, demonstrating that it was a controversial topic.

The Clamshell Alliance is one of many organizations that are fighting to end the use of nuclear power in the United States and around the world. Like the Clamshell Alliance's involvement, the majority of the anti-nuclear movement today is seen at a local level. This will be explored with the discussion of prominent cases in Chapter Three.

Conclusion

As a whole, this literature review establishes what has been previously written about nuclear power policy, the emergence of activism, and the development of local controversies surrounding the topic. This provides me with a strong background to understand how and why activism emerges against nuclear power, and what the effects of this are, at both local and national levels. In this thesis, I will often refer back to this literature because the information discussed in this section represents the context of what

will later be discussed in the next four chapters. The chapters in this thesis focus first on nuclear power policy today, then on the national attitude toward the topic, followed by activism as a whole and on two specific controversies, and finally, I offer a policy analysis on the topic. Combining the broad range of texts presented in this literature review with my own research will allow the reader to understand why the topic of nuclear power is so important today, particularly with regards to decisions surrounding America's energy dependence.

CHAPTER ONE:
THE PLACE OF NUCLEAR POWER WITHIN UNITED STATES ENERGY POLICY TODAY

Introduction

Today, the world revolves heavily around the creation, production, and consumption of energy. One of the main problems every nation in the world faces is how to supply the energy demand of its industries and citizens. This challenge is extreme in the United States due to the high-consumption lifestyle of American citizens. The American government has been forced to plan strategically to meet the excessively high energy demand. Seeing as the United States has about 4.6% of the world's population and consumes about 25% of the world's energy production, the American government has a complex energy policy with many resources to meet the demand (Rosenbaum 2011:281). This chapter is going to look at the role energy, specifically, nuclear power in the United States, and its controversy.

Since industrialization, mankind has developed many ways to extract electricity from natural resources, primarily through the burning of fossil fuels. Fossil fuels have been very effective in delivering large amounts of energy; however, their environmental impacts have been devastating to the Earth and to the atmosphere. For decades, scientists have researched and developed ways in which to extract energy without having negative impacts on the Earth. In order to transition away from the burning of fossil fuels, there has been development in wind, solar, hydro, and most significantly in terms of scale, nuclear power. Nuclear power has acted as the best option because it has the second highest output of electricity generation behind fossil fuels, exhibiting its large potential. Many scientists are continuing research on nuclear power because its main ingredient,

uranium, is believed to be in healthy supply. This differs from fossil fuels, where many scientists believe peak oil production is near or has been reached. As of 2009, the United States was importing about 62% of its oil, which many find unsettling (Rosenbaum 2011:283). Current politicians are working for the United States to reduce foreign energy imports and increase domestic energy production. With growing information of the harms and depletion of fossil fuels, a movement away from fossil fuels has begun, and many ask if nuclear power is the solution.

One way the United States is hoping to decrease its dependence on fossil fuels and meet the high demands for electricity is through the development of nuclear power. In the United States today, there are currently 104 functioning nuclear power plants providing the nation with about 20% of its electricity (NRC 2012: Power Reactors, Para 1-2). The United States' nuclear power industry comprises of four different reactor types, 26 operating companies, and 80 different reactor designs, at 65 individual sites (NRC Information Digest 2011: 28).

On a global scale, the United States produces about 27% of the world's nuclear power electricity, followed by France in second place producing about 17% (NRC Information Digest 2011: 19). Statistics like these demonstrate how important nuclear power generation has become. In 1990, the United States had its nuclear power plant peak with 112 plants (Rosenbaum 2011: 292). Nuclear power is situated throughout the country, but as demonstrated in Figure 1, a majority of the United States' plants are east of the Mississippi River.

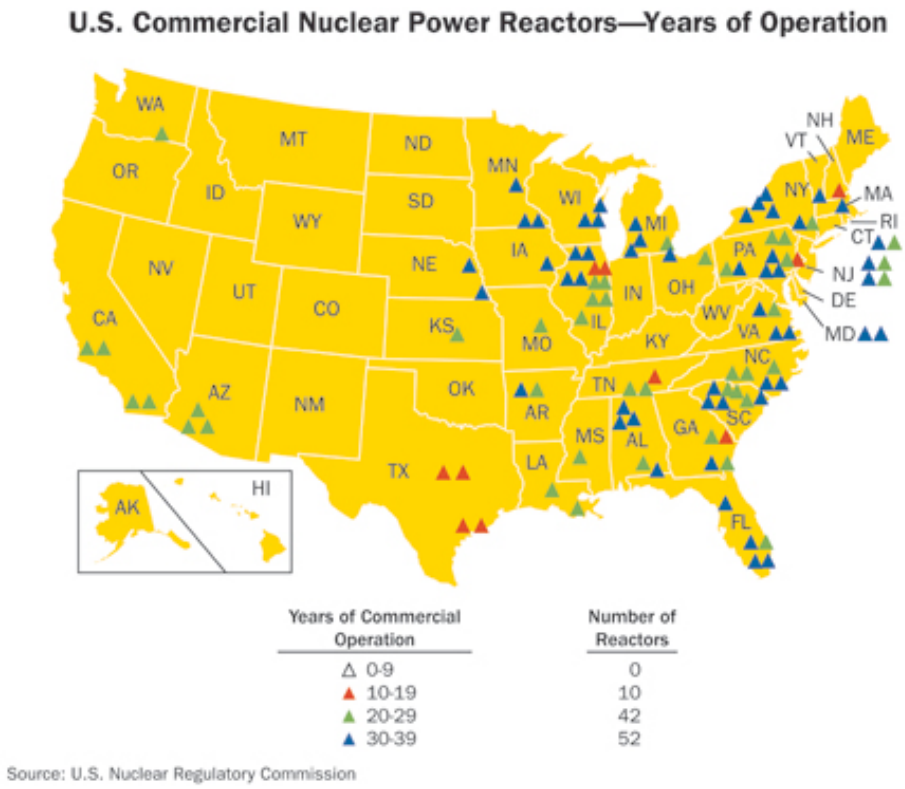


Figure 1. Map of U.S. Commercial Nuclear Power Reactors (NRC 2012: Map of Power Reactor Sites)

Since commercial nuclear power's introduction to the United States, the nation has become very dependent on the power source. Currently 31 of the 50 states use nuclear power and as of April 2009, four states generate more than 50% of their electricity from nuclear power. As demonstrated in Figure 2, these states are New Jersey, South Carolina, Connecticut, and Vermont. Vermont leads significantly with 71% of its electric generation coming from nuclear technology (NPR 2009: Visualizing The U.S. Electric Grid). In addition, currently 13 states use this as a source for 25 to 50% of their electric generation, for example, with New York at 29% (NPR 2009: Visualizing the U.S. Electric Grid). It is likely that nuclear power generation may continue to grow as more momentum is gained towards moving away from burning fossil fuels. An increase in the United States since 2000 has already been recorded as the "net nuclear electric generation

has increased by 6.6%, and coal-fired electric generation has decreased by 6.2%" (NRC Information Digest 2011: 17). The resource of nuclear power has clearly developed into being an essential element of the United States' energy plan.

Nuclear power in the United States is not a uniform industry, as it comes in various shapes and sizes at numerous locations, but all 104 facilities are governed by the Nuclear Regulatory Commission (NRC). With nuclear power's growing importance in national energy planning, the NRC, which regulates anything that has to do with nuclear technology, is continuing to be a valuable government agency. This is because it regulates one of the United States' main domestic energy sources. The NRC prides itself on the experience of the agency, stating that by the end of 2010, American reactors had accumulated 3,100 years of operational experience (NRC-Information Digest 2011:43). Regulatory and enforcement activities are a major part of the NRC's actions as the agency works hard to safety oversee the American nuclear power industry (NRC-Information Digest 2011:43). In addition, as nuclear power continues to be a controversial topic, the NRC has had increased efforts to include the public in decisions regarding the extension of licenses and proposed plants.

The NRC is "headed by five commissioners appointed by the President and confirmed by the Senate for five-year terms, [with that,] one of them is designated by the President to be the Chairman and official spokesperson of the Commission." The five commissioners currently are Gregory B. Jaczko, Kristine L.Svinicki, George Apostolakis, William D. Magwood,IV and William C. Ostendorf (NRC 2012:The Commission, Para 1). The NRC was created under the Energy Reorganization Act of 1974 and is currently

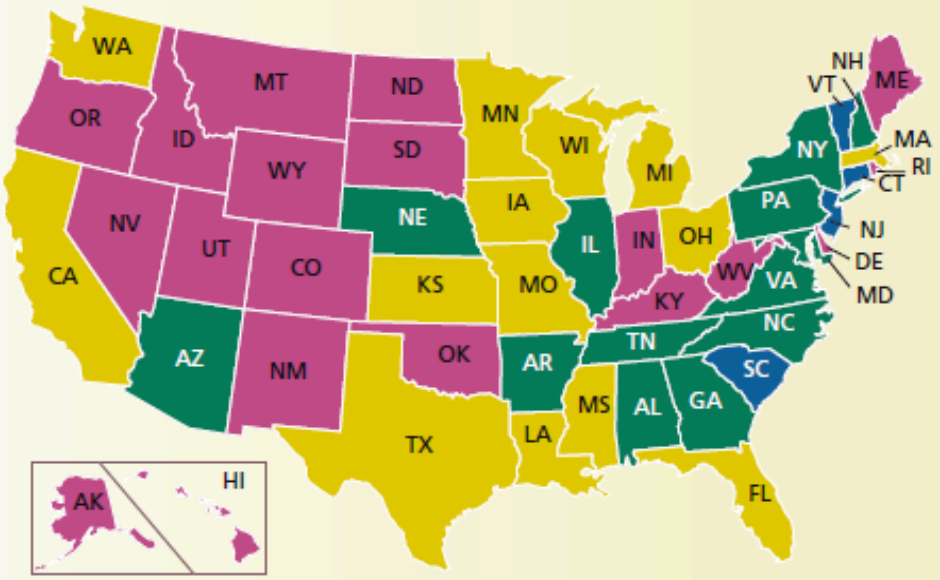
governed by laws such as the Atomic Energy Act of 1954, as amended, and the Nuclear Waste Policy Act of 1982 (NRC 2012: Our Governing Legislation, Para 1-2).

After demonstrating a dependence on the source of nuclear power, the technology will likely be a major part of the United States' energy future. Because of the original regulations under the Atomic Energy Act, plants are scheduled to function for 40 years. In present day, many of these plants are reaching their license expiration, which is leading to the controversial topic of whether or not to renew these plants' license. According to the NRC, "as of March 2011, approximately two-thirds of the 104 licensed reactor units either have received or are under review for license renewal. Of these, 71 units have received renewed licenses," as shown in Figure 3 (NRC Information Digest 2011:47).

Figure 3 demonstrates that the United States is dependent on this power because of the numerous extensions that have already been granted. The United States has not been ready to give up these sources of electricity. Because nuclear power in the United States is a commercial industry, the application for license renewal of a plant is dependent on the utility company that runs the plant. The decision by the NRC depends on the "plant's economic situation and on whether it can meet NRC requirements" (NRC Information Digest 2011:47). If the 71 licenses were not extended, the United States would be looking elsewhere for a large portion of the nation's electricity. Without extensions, all the plants in the United States would be shut down before 2075. However, there still is belief in nuclear power because numerous utilities have applied for new reactors or license renewal at various plant locations in the United States. Most of the proposed plans for new plants are at or near an existing plant, as shown in Figure 4. Over

the course of its relatively short history, nuclear power has become a main element in the United States' current and future energy plan.

Figure 11. Net Electricity Generated in Each State by Nuclear Power



Percent Net Generation from Nuclear Sources

None (19)

State	Net Capacity	Net Generation
Alaska	0	0
Colorado	0	0
Delaware	0	0
Hawaii	0	0
Idaho	0	0
Indiana	0	0
Kentucky	0	0
Maine	0	0
Montana	0	0
Nevada	0	0
North Dakota	0	0
New Mexico	0	0
Oklahoma	0	0
Oregon	0	0
Rhode Island	0	0
South Dakota	0	0
Utah	0	0
West Virginia	0	0
Wyoming	0	0

1% to 24% (14)

State	Net Capacity	Net Generation
California	7	16
Florida	7	15
Iowa	4	9
Kansas	9	19
Louisiana	8	17
Massachusetts	5	14
Michigan	13	22
Minnesota	11	24
Mississippi	8	23
Missouri	6	12
Ohio	6	11
Texas	5	10
Washington	4	6
Wisconsin	9	21

25% to 50% (13)

State	Net Capacity	Net Generation
Alabama	16	28
Arkansas	12	26
Arizona	15	27
Georgia	11	25
Illinois	26	49
Maryland	14	33
Nebraska	16	28
New Hampshire	30	44
New York	13	33
North Carolina	18	34
Pennsylvania	21	35
Tennessee	16	34
Virginia	14	40

More than 50% (4)

State	Net Capacity	Net Generation
Connecticut	26	53
New Jersey	22	56
South Carolina	27	52
Vermont	55	74

Note: Percentages are rounded to the nearest whole number. Units measured are in megawatts.
Net summer capacity data are from the State historical tables.

Source: DOE/EIA, "State Electricity Profiles," data from April 2011, www.eia.doe.gov

Figure 2. Net Electricity Generated in Each State by Nuclear Power (NRC Information Digest 2011: 18).

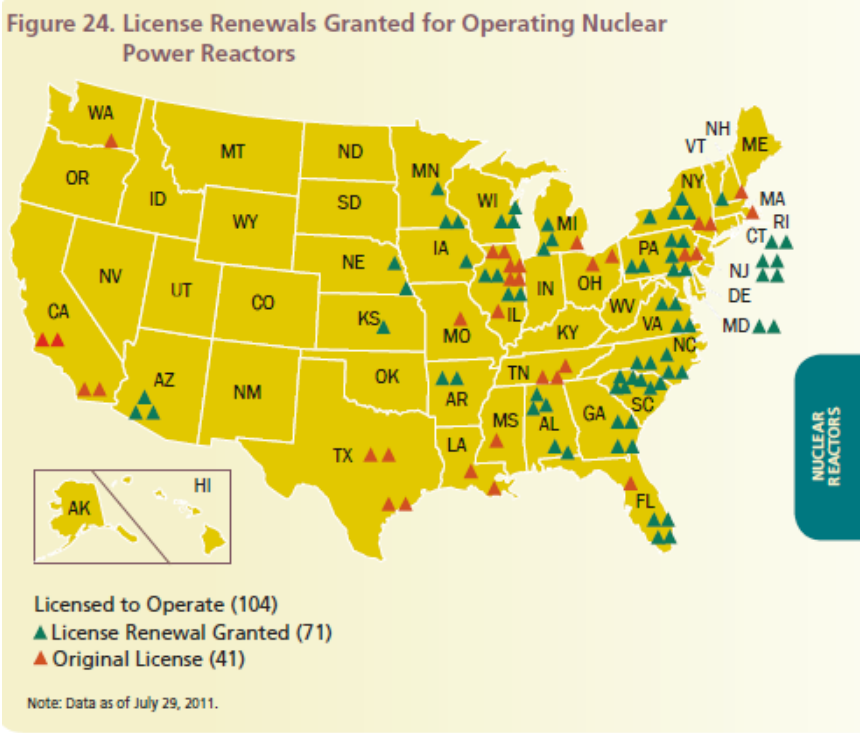


Figure 3: License Renewals Granted for Operating Nuclear Power Reactors (NRC Information Digest 2011: 47)

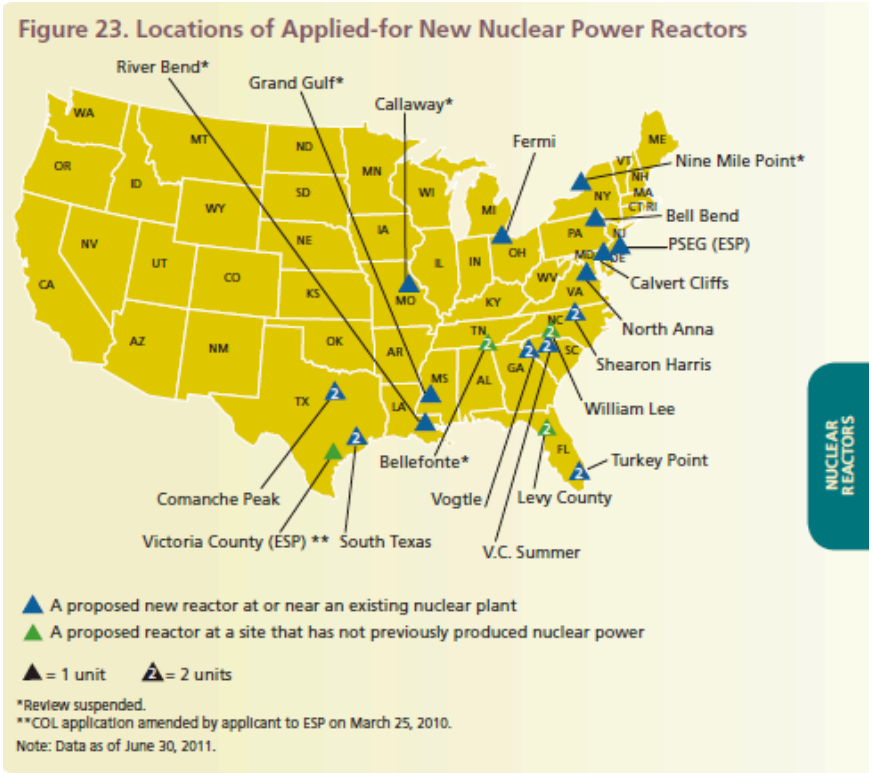


Figure 4: Locations of Applications for New Nuclear Power Reactors (NRC Information Digest 2011: 43)

In addition to the likelihood of nuclear power remaining an essential element of the plan, the controversy surrounding the topic will also continue to exist. Ever since its birth, nuclear technology has been a controversial topic, as it is a science that efficiently generates a large source of energy, while simultaneously it has the potential to be very harmful. Investors and utility companies overlooked the numerous negativities associated with nuclear power and built the 104 plants Americans see today.

The Pros of Nuclear Power

The most attractive characteristic of nuclear power is that it is an efficient and abundant energy source that defeats one of today's largest clean energy challenges: carbon dioxide emission. Nuclear power is able to create electricity without the release of virtually any emissions.

Nuclear	8.8
Wind	17.6
Large-scale hydro	17.6
Energy crops	37.4
Geothermal	173.8
Solar Voltaic	292.6
Gas	946.0
Diesel	1,698.0
Oil	1,822.0
Coal	2,101.0

Figure 5: UK Government Energy Technology Support Unit report on the output of carbon dioxide in pounds per Mwhr of energy produced by power sources (Lovelock 2009: 107).

Electricity is created through nuclear fission, without the risk of increasing large amounts of greenhouse gases. Nuclear power is favorable when compared to high emitting burning of fossil fuels. Figure 5 displays the emissions of carbon dioxide in pounds of weight per Megawatt hour of electricity. It is demonstrated above, that nuclear power emissions are significantly smaller than those of fossil fuels. The emissions associated with nuclear power are in low amounts caused by the construction of the reactor facility, and/or if the spent fuel is transported off-site from the requirement of trucks or rail. On a side note, nuclear power is able to create electricity nearly carbon free without requiring the sun to shine and the wind to blow, when compared to those needs of renewables. Many believe this one aspect of low emissions is enough to outweigh the negatives.

Another positive characteristic of nuclear power is the use of uranium as the main element in the chemical reaction. Uranium is very common and exists in significant quantity in the Earth's crust. The element occurs primarily in two isotopes: Uranium-235 and Uranium-283 (Greenburg 2009:54). In addition to its convenient accessibility, a small quantity of uranium can go a long way, which makes nuclear power quite efficient. Nuclear power is considered greatly productive when compared to coal: "one gram of uranium-235, when completely fissioned, yielded as much energy as three metric tons of coal, which is more than annual average household energy requirement for home heating in the United States" (Makhijani, Saleska 1999:22). Uranium's ability to have such a large energy output through nuclear fission may be the answer to help supply America's energy demand without needing to harm the atmosphere any more than it already has been.

Coinciding with the small amount of uranium required, the amount of waste is relatively small when compared to the waste of burning fossil fuels. Lovelock makes an interesting point while advocating for nuclear power, "compare the small and easily buried quantity of nuclear waste with the mile-high mountain, twelve miles in base circumference, of solidified carbon dioxide that the world makes every year. The nuclear waste is a minor burial problem, but the carbon dioxide waste will kill us all if we go on emitting it" (Lovelock 2009:108). A thought like this puts both energy sources into perspective and proves them both to be harmful, but it does give insight on the harms carbon dioxide specifically can cause. It seems the thought of carbon dioxide as a harm is often disregarded because it usually does not affect everyday life, whereas a nuclear disaster could completely alter or potentially end one's life in an instant.

One more attractive point regarding the use of uranium is the potential of being able to recycle it after it has been used once. This concept is still young, but scientists are exploring it with hopes that this concept would greatly limit the amount of uranium to be mined. A strong believer in the technology, former Senator Pete V. Domenici of New Mexico, wrote:

> we have a national treasure of uranium just sitting in our spent nuclear fuel storage pools. Each used rod is compromised of 95.6% uranium. The United States has already demonstrated at the Argonne National Laboratory that it can separate out this uranium at a high enough quality that it can be enriched and manufactured again into new fuel for our current generation of reactors (Domenici 2004: 99).

To recycle uranium will reduce the already low carbon footprint and sustainably use the material. Even though this technology has not been established entirely, it gives nuclear power a stronger potential for America's energy future.

The Cons of Nuclear Power

In contrast with the positives of the technology, there are also numerous negatives associated with nuclear energy. The largest concern of nuclear power is the radiation dangers which the energy source poses. Radiation is a by product from the nuclear fission to create the heat that will power the turbine to produce electricity. The consequence of radiation is a natural phenomenon that takes place:

> When the nucleus of a uranium atom is struck by a neutron, the atom breaks into fragments. Nearly all these fission products, few of which exist in nature, are unstable. They seek to return to stability by giving off an energy wave, called a gamma ray, or a particle, called alpha or beta radiation. Some transmute into a new, stable state in a matter of seconds; others remain radioactive for millennia (NY Times 2012: Nuclear Energy, Para 71)

When a leak occurs in a plant or spent fuel storage tank, there is a risk of radiation reaching humans, which leads to one of the primary concerns of the NRC to be ensuring safety for American citizens. It is essential that radiation does not come in contact with humans because it can be extremely harmful to their health. Because the particles are trying to find stability, they can alter people's cells when passing through their bodies. This can lead to cell mutations that can cause health complications such as cancer or deformities. The damage done to a human body is dependent on the amount and level of radiation in the waste. In an extreme case, for example, if the radiation is strong enough, "standing a few feet away from uncontained nuclear waste would kill a human in seconds" (Smith 2009:165). Furthermore, a substantial body of research focusing on the health conditions of people living in areas surrounding plants has found that rates of cancers such as leukemia are higher near some nuclear power plants (Goldstein 2002:12). The risk of radiation and its scary consequences have lead many to fear living near a

nuclear plant. Harm from radiation can occur largely from exposure to spent nuclear fuel or leaks, and unfortunately this phenomenon has been seen in history, largely with the Three Mile Island (1979), Chernobyl (1986), and Fukushima (2011) disasters.

Case Study: Three Mile Island

The first major nuclear power plant accident occurred on March 28, 1979 near Harrisburg, Pennsylvania. There were no deaths from the Three Mile Island event, but its occurrence did have a major impact on the United States, as it raised awareness about nuclear power and necessary emergency planning. The accident occurred in Three Mile Island Unit 2, after it had been functioning for about one full year. The cause of the Three Mile Island accident was a failure of the cooling system of the reactor that led to a core meltdown.

Luckily, there were no fatalities and radiation exposure as a consequence of this accident was minimal. After doing numerous studies, the NRC writes, "estimates are that the average dose to about 2 million people in the area was about 1 millirem. To put this into context, exposure from a chest x-ray is about 6 millirem" (NRC 2012: Backgrounder on the Three Mile Island Accident, Para 9). It is also estimated that the highest possible radiation dose received by someone who was very close at the time of the accident was 70 millirems (Bodansky 2004: 418). Because of the low levels of radiation, there is not a correlation between Three Mile Island and cancer rates that are higher than normal cancer rates (Bodansky 2004: 419). Aside from the radiation risks, the major impacts that Three Mile Island had on the United States were to improve emergency planning, and nuclear power plant equipment, and since that day in Pennsylvania many adjustments have been made.

Case Study: Chernobyl

On April 26,1986, the city of Chernobyl located in Soviet Ukraine experienced a severe nuclear core meltdown. The reactor meltdown caused an explosion that released a "catastrophic cloud of high levels of atmospheric radioactivity over the Soviet Union and its adjacent European neighbors" (Rosenbaum 2011:11). It is believed that about a 77,000 square mile area was affected by the cloud (Holt 2011:11). From the instant of the accident, health consequences were undeniable throughout the Soviet Union and Europe; 31 emergency workers lost their lives due to radiation exposure and injuries. These emergency workers, often referred to as "liquidators," risked their lives to contain the radiation, aid those injured by the explosion, and put the fire at the plant out. The many doctors, helicopter pilots, and firemen were exposed to very high levels of radiation at the scene of the disaster (Mould 2000:27). Currently, the number of deaths caused by the accident is unknown, however in 2005 a United National panel stated, "the release of Iodine-131, a highly radioactive material that gets concentrated in the thyroid gland, would eventually cause 4,000 deaths (NY Times 2012: Nuclear Energy, Para 70). Correspondingly, an increase in thyroid cancer was seen largely in children as a result of drinking milk contaminated with the dangerously radioactive iodine, as released by the Chernobyl Forum in 2006 (Holt 2011:11). Aside from just thyroid complications, Greenpeace estimated 200,000 deaths occurred in Belarus, Russia, and Ukraine as a result of the accident; however, today it is likely the estimate is higher (Holt 2011:12). Chernobyl's intensity was so devastating that today, 25 years later, consequences still exist as the local area around the plant is now nearly deserted.

Case Study: Fukushima

The most recent nuclear disaster occurred at the Fukushima Daiichi Nuclear Power Station on March 11, 2011 when the plant was severely damaged by the fate of Mother Nature. The plant, located 170 miles north of Tokyo, first lost power due to a magnitude 9.0 earthquake. Soon after, a tsunami caused by the earthquake hit the coastally located plant critically damaging the backup generators, whose primary job was to keep the cooling systems working (NY Times 2012: Nuclear Energy: Para 1). Aside from the damage to the equipment, without the cooling, the plant faced a series of fires and explosions that caused the release of radioactive gases into the local environment (NY Times 2012: Nuclear Energy: Para 1).

The radiation around the site of Fukushima moved quickly, as "some of the highest radiation levels were found beyond 10 miles from the plant" (Holt 2011:9). The surrounding populations were quickly evacuated from the plant to prevent exposure to the severely harmful radiation, displacing over 160,000 people in an evacuation zone equaling 3% of Japan's landmass. (NY Times 2012: Nuclear Energy, Para 7). In addition to the thousands displaced, the disaster at Fukushima has had a worldwide effect as radioactive material was found in tap water, and agricultural products that were to be exported. The health consequences of Fukushima are still being discovered and unfortunately, will likely be seen in the future with increased rates of cancer. In comparison to Chernobyl, the amount of radiation that has been released at Fukushima thus far is equal to about 10% of the amount released at Chernobyl; however, officials believe that with time Fukushima's radiation has the potential to surpass Chernobyl's.

Radiation

The risk of radiation from nuclear power is a permanent risk, because of nuclear waste's lengthy half-life. Different types of waste are classified by the level of radiation; some have a longer half-life than others, which is an indicator of how dangerous the waste is. "A half-life is the time taken for the level of radiation emitted by an isotope to be reduced to one-half of its initial value. Half-lives can range from only fractions of a second to billions of years, so that some radioactive waste materials remain lethal for hundreds or thousands of years, whereas others become virtually harmless in a matter of days or months" (Craig, Vaughan, Skinner 2011:100). A major problem of nuclear power waste is often the waste is a mixture of radioactive isotopes with short and long half-lives (Craig, Vaughan, Skinner 2011:100). This poses a problem because any waste with elements which have a long half-life is very dangerous, even if a majority of the material is made up of elements with a short half- life. Currently nuclear energy waste is put into three categories based on the level of radioactive waste:

> Low-level wastes are generally those in which the maximum level of radioactivity is up to 1000 times that considered acceptable in the environment; intermediate-level wastes have 1000-1 million times that considered acceptable; and high-level wastes have still higher levels of activity. The volume of high-level waste produced is a very small proportion of the total; however, it does account for 95% of the total radioactivity of the wastes with which we must deal (Craig, Vaughan, Skinner 2011: 101)

In conjunction with the health effects of this hazardous material, the estimated length the material will be threatening is a concern because it will determine for how long and where the waste will be stored.

High-level waste is the largest concern of the United States' government because it is the most radioactive. Spent nuclear fuel rods that are used at the plant site of the

nuclear fission make up a majority of the high-level in the United States. Due to radioactive material these rods can give off, they are required to "be isolated from human exposure for approximately 10,000 years" (Craig, Vaughan, Skinner 2011:104). Due to these strict and cautious regulations, where to put the waste is a huge and currently unsolved question. During the early years of nuclear energy, the waste issue was slightly overlooked, as scientists believed that waste could potentially be recycled, or even a permanent storage location would be much simpler to find. It has been difficult because in the end, no one wants the waste in his or her backyard.

One location that has been on the United States' radar for many years as a potential location for permanent storage is Yucca Mountain. Even though plans for research and development of Yucca Mountain have been halted by President Obama, it is likely the site is still on the minds of numerous politicians, especially those in favor of nuclear power. Yucca Mountain was initially introduced as it met the American government's criteria for a storage facility. The criteria being, the site is located a substantial distance from population centers, has security and prevention or minimization of any environmental impact, such as no ground and surface water contamination (Craig, Vaughan, Skinner 2011:191). Seeing as Yucca Mountain is located in a rural area of southern Nevada, the government believed this to be an ideal location. Unfortunately for many politicians, many American citizens did not feel the same way about the Yucca Mountain plan, seeing as over 219 various organizations in December of 1998, requested that the Department of Energy consider the site unsuitable (Smith 2009:165). Despite Nevada's very low water table, citizens are still concerned about potential leaks into the water. Another issue is moving the waste from the United States' 104 nuclear power

plants to Nevada. This question has generated fear nation-wide. In order to move all the waste, anywhere from 15 to 80 thousand separate shipments would need to occur. In addition, "at least 50 million Americans live within a half-mile of likely transportation routes (rail and interstates) that would cross 43 states", which would put a large portion of the country under temporary risk (Smith 2009: 166). Many Americans would find this risk to outweigh nuclear power's attractive side.

Non Radiation Related Environmental Issues

Aside from the problem of nuclear waste impacting human health, there are other aspects of the science that pose risks to specifically to the Earth. A large concern for many environmentalists is heat damage. Nuclear power plants are often placed on waterways or bodies of water because their function requires water to cool the reactors. Without the water, the cores would remain dangerously hot increasing the risk of a core meltdown. After the water has cycled through the system, its temperature has risen and is then put back out into the waterway it was extracted from. This can be a major threat to the bodies of water as the warm water can negatively impact the local ecosystem. The warm water can alter the local conditions as numerous aquatic animal and plant species cannot survive in the warmer temperatures. This fear has been fought by many activist groups such as the Clamshell Alliance, whose actions were discussed in the literature review. Technological advances, such as cooling towers, have been adopted by numerous plants but thermal pollution has forever changed many natural ecosystems.

Another concern for the environment comes about from the discussion of uranium. Even though the use of uranium is considered to be quite efficient, the exploitation of the element is environmentally devastating. Like coal, it is a resource that

must be mined. The uranium cycle is a long process as the material must also be milled and enriched before being used at the nuclear plant site. In addition to the destruction of the ecosystem where the mining occurs, transportation of the material does have a carbon footprint. Like the political tension over oil, political tension over uranium is also a possibility. Greenburg, for example, writes:

> most of the United States' supply of uranium comes from abroad. The 104 operating nuclear power plants in the United States use between 50 and 60 million pounds of nuclear fuel a year. U.S. production is between 4 and 5 million pounds a year. In addition to mines outside the United States, a good deal of U.S. supply comes from the drawdown of inventories held by fuel fabricators, suppliers, and governments (Greenburg 2009: 56)

As nuclear power grows as a source of power, the dependence on uranium may become as high as it is on oil. Just as there have been wars over oil disputes, a war over uranium rights could be possible in the future. Despite its efficiency, uranium as a source leads to environmental degradation, and could potentially cause political risks for the United States.

In addition to political vulnerability, the technology of nuclear power has various vulnerabilities of its own. In the case of nuclear power, age is not just a number. Today over half of the plants in the United States are functioning beyond their initial life expectancy due to the many license extensions granted by the NRC. Age is a problem because the equipment that was designed to last for 40 years is now being used for 60. This has caused problems because reactor parts were not designed to work as long as they have and also aged more quickly than planned, causing pipes to crack and walls to become thinner, leading to an increased chance of risk. In addition, this has caused many plants that are currently operating or under construction to fail essential safety requirements (Rosenbaum 2011:294). Another point to note that may be a point of

vulnerability is the variation of different types and designs of the 104 reactors in the United States. With the various designs it is difficult to pinpoint issues of the design or figure out which design is best. Due to the various accidents that have occurred, one may wonder if the science of nuclear power is a phenomenon that mankind can handle. The Union of Concerned Scientists have raised concern regarding this issue:

> Is nuclear power in the United States safe enough today just because a reactor has not experienced a meltdown since 1979? The answer is a resounding no. In the 27 years since the TMI [Three Mile Island] meltdown, 38 U.S. nuclear power reactors had to be shut down for at least one year while safety margins were resorted to minimally acceptable levels. Seven of these reactors experienced two-year-plus outages. Though these reactors were shut down before they experienced a major accident, we cannot assume we will continue to be so lucky. The number and length of these shutdowns testif[y] to how serious and widespread the problem is." (The Union of Concerned Scientists as written in Rosenbaum 2011:295)

Like the numerous scientists on this council, a feeling of vulnerability is not an unfamiliar one with nuclear power because of the technology's potential unpredictability.

Other vulnerabilities associated with nuclear energy include the risks of terrorism and natural disaster. The concern of terrorism was greatly strengthened after the events that occurred at the World Trade Center in New York, NY on September 11,2001. Many worried that day that the Indian Point facility, which is located very near to New York City and under the flight path of many New York City flights, was a potential target of Al Queda with hopes to release radioactive material in that area. To help mitigate this problem, the NRC has worked hard to enforce stronger and more efficient emergency planning requirements (Holt 2011:9). An area that is out of human control is Mother Nature, which can make nuclear technology extremely vulnerable to risk. Natural disasters pose a huge threat as they can be extremely powerful and their consequences are

extremely grave, as shown with the events in Japan at Fukushima with the forces of an earthquake and tsunami. With the increase of climate change evidence and more intense weather patterns and storms, the risk of impact is increasing, especially because many of the plants were built around thirty years ago.

Conclusion

In sum, there are numerous sides and factors involved in the nuclear power story. Elements of the technology are considered to be so great, however extremely dangerous and risky at the same time. The various pros and cons of the subject lead to the question of "is it worth it?" Is the fact that nuclear power is a sizeable power source and emits virtually zero carbon emissions enough to outweigh the various radiation dangers, environmental risks, and vulnerabilities the technology can create?

Nuclear power once was considered a very cheap source of electricity, mainly prior to the days of Three Mile Island. During the 1960s, nuclear power was predicted to be extremely cheap leading to heavy investment and development of the industry. However the cheap costs soon heightened due to "engineering changes, production delays, and cost overruns" (Graetz 2011:66). Nuclear power is known to provide relatively cheap electricity, but that is after the very high cost of the plant and government subsidies. To put billions of dollars into a project that could potentially be destroyed within a matter of hours deters investors from agreeing to provide the funding. According to Rosenbaum, the fact that "the cost of constructing and maintaining commercial nuclear power plants climbed so steeply between 1980 and 2000 that investment capital has been scarce and costly", leads to a negative outlook on the technology (Rosenbaum 2011:293). Furthermore, the end of a plant's life also comes

with a hefty price tag: decommissioning, which tends to be in the range of hundreds of millions of dollars.

More recent views from the nuclear power industry are confident that future plants have the potential to be built in a way that costs less, if plants were built in a series identically (Holt 2011:3). It would be beneficial to the industry if there was less of a variety in design. Not having a standard design may cause complications while investigating the problems with a certain design because comparison between plants cannot be done. Standardization with special designs of a plant to meet its appropriate geographic and climatic needs would be ideal. The largest factor seems to determine whether or not nuclear power is economically feasible depends on the company's willingness to invest in the technology.

Because nuclear power has been a success in the United States, many believe it to be economically justifiable. Nuclear power is a technology that has developed to be one of the largest controversies in current politics. With time the debate is going to become more intense as fossil fuel depletion continues. The discussion of weighing the various pros and cons will continue to develop as more technology will be invented and more science will be discovered. Like the development of nuclear power, the ferocious debate surrounding it, is relatively young and will grow overtime.

CHAPTER TWO:
PATTERNS IN NATIONAL ATTITUDES TOWARDS NUCLEAR POWER

Introduction

Because nuclear power is such a controversial topic, there has been a large debate, including a strong movement against the power source. Factors such as climate change and energy independence lead to support, while nuclear disasters cause people to lose confidence in the technology, leading to a rise in opposition. In the United States, there are many factors which may predict one's views on nuclear power. Factors include gender, political affiliation, and geographic location. In this chapter, I look at attitudes toward nuclear power in the United States, as well as attitudes surrounding nuclear power in Germany and France, two neighboring countries with significantly different nuclear agendas. By exploring these different national perspectives, this chapter addresses the question of what determines people's feelings about nuclear power.

The American Case

Over the past decade, growing concerns about various problems in today's world affect the way that we feel about energy. Climate change science has led people to want to consume less in order to lower emissions. The idea of "peak oil" has led to a surge in exploration for resources other than oil, and the political tension in the Middle East has encouraged American energy independence. The feelings of worry and anxiety seen today about energy are similar to those felt during the 1970s energy crises. During that time the shortage in oil imports disrupted everyday American life as Americans were instructed to consume less, an idea many were not used to because of how cheap oil had been up until then. After the oil embargo, prices of oil dropped and Americans went on with their lives, retreating back to their old behaviors. Energy was no longer a major

concern as people consumed and the economy grew. But most recently with heightening political tension in the Middle East and rising prices, thoughts on energy have begun to shift.

Today, "polls show that concern about the United States' energy situation is as high now as it was during the nation's energy crises of the 1970s" (Bolsen, Cook 2008: 364). The major elements that affect one's attitudes on energy are current economic conditions, because economics affect nearly all aspects of a person's life (Bolsen, Cook 2008: 364). When the nation has a low oil supply and high prices, support for alternative methods of energy is more attractive. During these times citizens are likely to support "policy changes that involve the government encouraging conservation through energy efficient appliances, vehicles, and homes and offices" (Bolsen, Cook 2008: 364). In recent years Americans became aware of the energy issue and state of the environment, as reflected in a 2008 poll showing that Americans believe "gas prices and energy costs" to be the most important economic issue the country is facing (Bolsen, Cook 2008: 365). This poll was published directly prior to the recession, so it is likely some thoughts have shifted. But the question of how to stimulate the economy while being environmentally conscious has come into play within political debate. The state of fossil fuels in the U.S., in conjunction with the events at Fukushima, will also likely rise concern energy in terms of nuclear power because it may not be as good as an alternative to fossil fuels as it may seem.

Many different factors contribute to shaping trends in public opinion about nuclear power. Perhaps the most important driver of opinion is the occurrence of natural

disasters. Figure 6 displays some results from CBS News Polling that shows the major trends in public support for building nuclear plants:

Building More Nuclear Power Plants

	Now	7/08	4/07	6/01	6/91	5/86	4/79	7/77
Approve	43%	57%	45%	51%	41%	34%	46%	69%
Disapprove	50	34	47	42	48	59	41	21

Figure 6. Public support for building more nuclear power plants.
(CBS News Poll 2011:4)

Each date in Figure 6 is significant because it is either before or after a large nuclear event. As one can see, July of 1977 (7/77) marked the high point in support for nuclear power. This was during the energy crisis of the 1970s. As stated before, it was a time when oil supply was low, which likely led to Americans having confidence in other means of energy, particularly nuclear power. People liked that it was a cheap and an abundant domestic source. Americans were in favor of this energy source because it was a way for the United States to have energy without having to import it, giving America energy independence. During this time period, the political tension in the Middle East caused the Organization of the Petroleum Exporting Countries (OPEC) to put an artificial limitation on the global oil supply. Americans were dependent on imports of OPEC, which controlled oil companies, leading to the high prices.

Nevertheless, ideas soon changed as the nation saw what occurred in Pennsylvania at Three Mile Island. In Figure 6, a 23 %age point drop in support can be seen in April 1979, just following the crisis (69% to 46%). Support also dropped after Chernobyl occurred in 1986, from 46% to 34%. After Chernobyl, opposition was at an all time high at 59%.

Despite the drops in support, there are other factors that still lead some Americans to feel confident in nuclear energy. Bolsen and Cook note that support will likely increase when the "public is provided with a rationale for building nuclear power plants", for example "to solve America's energy problems" or "to use nuclear power to generate electricity" (Bolsen, Cook 2008:374). Furthermore, a rise may be seen due to increasing science about global warming. More consciousness about global warming has made Americans open their eyes to nuclear power as a means to help reduce emissions:

> In 2006, 61 % of the public said they would support the "increased use of nuclear power as a source of energy *in order to prevent global warming"*…. When questions go beyond simply asking about nuclear power plants to asking about building nuclear power plants *for particular humanitarian purposes*, the public's support increases (Bolsen, Cook 2008: 376-378).

To many, including environmentalists, the idea that nuclear power does not generate emissions is enough to have faith in it. People may overlook the risk that nuclear power poses and recognize the positives. One environmentalist that is particularly in favor of nuclear power is James Lovelock. Lovelock is known for his unique views and creation of the Gaia Hypothesis, which is the idea that the Earth is a living organism. Even though Lovelock is a huge advocate of the environment, he does believe in nuclear power because he sees it to be not *as bad* as fossil fuels, in terms of emissions. In his writings, Lovelock demonstrates how he sees fossil fuels to be a slow killer with the many pollutants in the atmosphere, and nuclear power is only really bad if an accident were to occur (Lovelock 2009: 108). If more people read writings like Lovelock's and consider nuclear power as a way to help the current state of global warming, then maybe public support would rise.

At this point in time, it seems the factors that drive support down, such as nuclear disasters, have a heavier weight on public opinion. From the information in Figure 6, there is a decrease in public opinion after each nuclear disaster. The rise of concern for Fukushima is also expressed through the use of the Internet, a means of research we did not have accessibility to during the times of Three Mile Island and Chernobyl. Because of the Internet, one is able to learn about any topic instantly, and after the events at Fukushima it is evident that many people were interested in learning about Fukushima and nuclear power. With the use of Google trends, by Google.com, the amount of searches for "Fukushima" and "nuclear power" substantially increased after the disaster. As shown in Figure 7, the spike in search numbers proves that Fukushima and nuclear power were on people's minds.

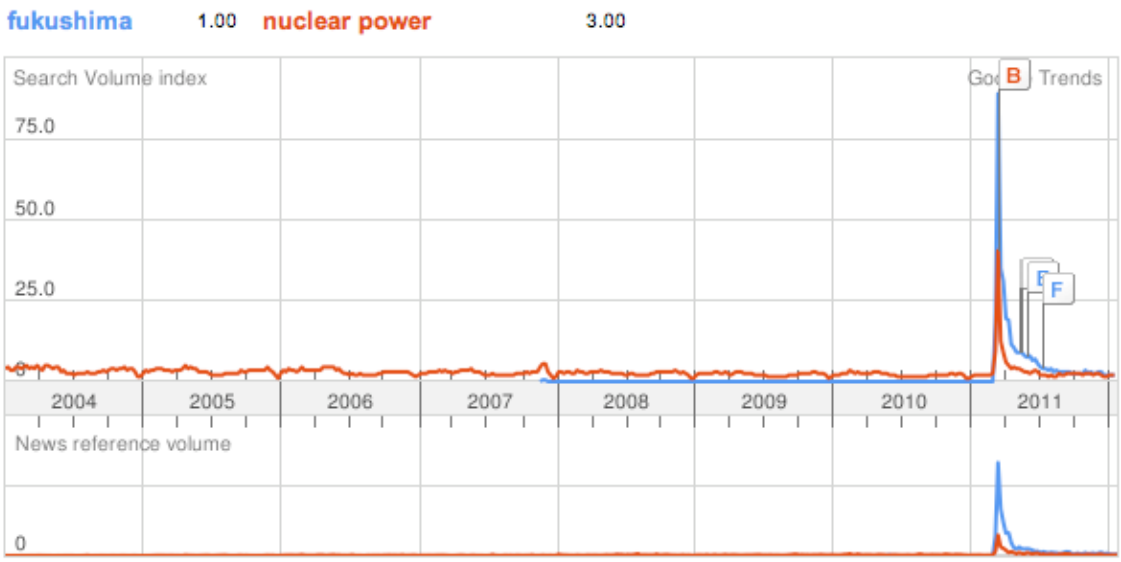


Figure 7: Google Trends Showing Searches for "Fukushima" and "Nuclear Power" (Google 2012)

The CBS News Polling done in March of 2011 also found that about 7 in 10 Americans feel nuclear power plants in the United States are relatively safe; however, about two-thirds of those polled are concerned that a nuclear disaster could happen in the United

States. Along with that, nearly 58% said "they did not think the federal government was adequately prepared to deal with a major nuclear accident" (Cooper 2011: A15). It is likely that concerns over specific nuclear power problems, such as waste or evacuation plans, are high. Figure 8 displays that many American's do not think the United States is prepared for a nuclear disaster.

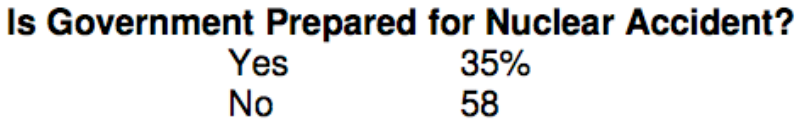


Figure 8. Opinion on Government Preparedness of Nuclear Accident (CBS News Poll 2011: 4)

Evidently there is an overwhelming feeling of uneasiness about nuclear power currently, but if the opinions follow the patterns, it is likely that with time, support may rise again.

Demographics in United States' Attitudes

Gender

Aside from the question of what people think about nuclear power, the question of who thinks what can also be asked. This section explores the factors that may determine one's opinion, starting with gender. A trend in polls stating that women are more likely to oppose nuclear power has existed since before the Three Mile Island disaster. Even though thoughts on nuclear power were generally more positive, during its development in the 60s and 70s, there still was a gap in gender. Polling in 1975 and 1976 discovered that 70-73 % of men were in support, while only 52-54 % of women were in support (Nelkin 1981: 14). Post the Three Mile Island disaster, female support dropped dramatically, which questioned whether or not nuclear power is a feminist issue. Beliefs along these lines have also been expressed in other countries such as Sweden, France, and

Germany (Nelkin 1981: 14). Since the accident at Three Mile Island, women have been extremely involved and have often taken the lead in activism against nuclear power. In some cases, women have been more involved than men. As cited by Nelkin, "one study of the local leadership of the movement found that women outnumbered men by more than two to one" (Roger Kasperson et. al 1997 as cited by Nelkin 1981:15).

Women may be more sensitive to the concept of nuclear power because the technology poses more risks to the female body. According to the National Academy of Science's Committee on the Biological Effects of Ionizing Radiation, "the incidence of radiation-induced human breast and thyroid cancer is such that the total cancer risk is greater for women than for men" (Nelkin 1981: 15). Aside from that, women are at risk of reproductive hazards, especially to a developing fetus, because an unborn child is very sensitive to radiation. Because of these risks, pregnant women and young children are always a top priority to be evacuated from the disaster zone. In addition, the NRC suggests that women working in the nuclear industry should not have children while working closely to a plant because of these risks (Nelkin 1981:15). Ideological concerns may be another reason why women are sensitive to the subject of nuclear power. Women are known to be the "nurturers" or "caretakers of life," leading them to be unsure about such a risky technology (Nelkin 1981: 15). Like the time before Three Mile Island, seen today, there is a large gender gap in support for nuclear power. Today women oppose nuclear power 63% to 26%, while men oppose it 42% to 53% (Pew Center Research 2011: 1).

Female opposition is not only shown at the polls, but also within various organizations involved in the anti-nuclear power movement. Over the course of the past

30 years, many women's groups have established themselves to be strong opponents of the technology. Some examples are Another Mother for Peace, Lesbians United In Non-Nuclear Action, Feminists United to Save the Earth, and Women for Environmental Health (Nelkin 1981: 15). These are just a small population of the many women who are fighting for the end of nuclear power.

On the other end of the spectrum, there are various ideas for why men are likely to be more supportive of nuclear power. Some may suggest they are less sensitive to the subject, or others suggest there are alternative reasons. Charles J. Brody has termed a reason as "economic growth", stating "the 'economic growth' explanation links the more favorable attitudes of men toward nuclear energy to the instrumental concerns of their jobs, the economy, etc." (Brody 1984: 210). In Brody's work he presented Reed and Wilkes argument regarding economic growth:

> People in business, a preponderance of whom are men, are going to be acutely aware of the consequences of economic dislocations and downturns in a growth economy. This will affect them directly, influencing their ability to carry out their responsibilities at work and at home. The specter of massive changes in the economic, political, and technical spheres due to a changed system of allocating and distributing scarce energy re-sources is less likely to convince women of the need for nuclear power. As people largely excluded from positions of consequence in the present system, they would not necessarily be disposed to consider major changes detrimental to the larger society (9-10). (Reed and Wilkes as cited by Brody 1984: 211).

Economic growth as a factor of a man's opinion raises an interesting point about why it is likely a man is more apt to be in favor of nuclear power than a woman. Nevertheless, this idea may be challenged today because of the increasing presence of women in the workforce, compared to when the article was written in 1984.

Age/ Generation

Other factors which may influence one's thoughts on nuclear power are age and generation. The 1960s and '70s were a very progressive time in terms of the environment. A huge environmental movement wave occurred, leading many regulations to be made. It is likely that the numerous people who shared the pro-environmental views of that decade still today have that mindset, giving them sensitivity to the topic of nuclear power. The decade following was a more conservative time period, faced with episodes of deregulation to improve the economy. The economic boost also called for an increase in energy production, putting nuclear power on people's minds. With regards to nuclear power, support was seen, but like after Three Mile Island, after Chernobyl support decreased. Today with changing science, environmentalist ideas are growing in American culture giving a rise in concern about nuclear power. However, also currently, coming out of the 2008 recession, the economy is also a large concern of many Americans, leaving many to wonder which is more important: the economy or the environment?

Political Affiliation

A major factor influencing people's opinion of nuclear power is political affiliation. According to typical stereotypes, Republicans are apt to be energy thirsty, meaning pro nuclear power, while Democrats are more focused on the environment, meaning they are more likely to be against nuclear power. In the large picture, the polls agree with these stereotypes. According to the Pew Research Center, about half of Republicans, 49%, are in favor of nuclear power, compared with 41% of Independents and only 31% of Democrats (Pew Research Center 2011:1). These ideas are supported in an article that was published after the events of Fukushima. Even though there was a lot

of concern regarding nuclear power, Republicans still led in favor for the technology. As of March 2011:

> A slim majority of Republicans said they approved of building more nuclear plants, while majorities of Democrats and Independents disapproved. Republicans were also more likely to see the existing nuclear power plants as safe, and were more likely to say that the federal government was prepared to handle an accident, though most still said the government was not ready for such an emergency (Cooper 2011:A15).

As seen in the history of American politics, the environment has always been an important issue for both sides. However, in current times it seems that the environment is a larger concern for Democrats, as expressed in the Pew Research Center's statistics.

Initially, the environment was a large concern to Republicans as well, but in recent times that environmental concern has been outweighed by economic concern. Republicans and environmental concern were associated during the time of presidents such as Theodore Roosevelt and Richard Nixon; under both administrations major steps were made towards protecting America's environment. Theodore Roosevelt established the National Parks Service, and Richard Nixon established the Environmental Protection Agency. Despite these great accomplishments, in recent administrations regard for the environment has been less, especially under George W. Bush, who as stated previously neglected to recognize the reality of global warming and failed to sign the Kyoto Protocol. Furthermore, in addition to nuclear power, today many Republicans are in favor of oil expansion as seen with the proposed Keystone Pipeline XL plan in 2011. But, in Democratic fashion President Obama denied it, citing environmental concerns.

For many Democratic politicians the environment is a large concern; when elected they often are supported by environmentally conscious voters. Despite his loss in the run for presidency, Democrat Al Gore continued his passion for the environment with

his production of *An Inconvenient Truth* giving insight on the developments and effects of global warming. Al Gore's work towards preserving the environment has given the Democratic party a reputation of being environmentally conscious. Over time, reputations for both parties have evolved, and their reputations are exhibited through their opinion regarding nuclear power.

Geographic Location

Geographic location is likely to influence one's views on nuclear power. Many may feel that living near a plant is dangerous and risky, while others may support it for economic reasons. Some may overlook the negatives of the technology and see the jobs and energy the plant will provide. This issue is currently also seen in the hydrofracking world, as many small towns are considering hydrofracking as a means to help them out of the economic recession, in spite of environmental concerns. However, in the polls, 6 in 10 people said they would not want a nuclear power plant in their community (Cooper 2011:A15). This is from polling done right after Fukushima, so it is likely that the statistics were high because the world has seen the devastation the area around Fukushima was faced with.

Opinion regarding nuclear power is unique, because it is not necessarily a national problem since it is not found in every American state. Some of the states that do not generate any nuclear power include Kansas, Oklahoma, Colorado, Wyoming, Idaho, Montana, New Mexico, Indiana, Kentucky, South Dakota, North Dakota, Nevada, Oregon, and Utah. Most of these states rely heavily on coal, with an exception of Idaho and Oregon, which receive a majority of their electricity from hydroelectric generation (NPR 2011: Visualizing the U.S. Electric Grid). In these states where there are other

energy industries dominating, it is likely opposition occurs in order to keep the current industry, which supplied many jobs, on top.

Geographic location in terms of feasibility for a plant's location is a factor that also affects opinion. Ideally, a location for a plant is to be on a body of water for cooling purposes, and not in an area of any geographic risk, i.e. in a seismically active zone. If a proposed plant is going up in a seismically active area, opposition is likely to be high because of the risk that the location creates. Even if plants are said to be able to withstand earthquakes there still is uncertainty, especially as global warming is causing weather and natural disasters to have a higher intensity. Another concern that may raise opposition is a plant's location near a flood plain. This was seen last spring at the Fort Calhoun Station in Nebraska. Even though everything at the power plant was under control, it is likely that concern grew about the plant because many precautions were made to protect the plant from being affected by the flood, or having a meltdown. Geographic feasibility as a factor is also seen with the waste issue with regards to Yucca Mountain. As discussed previously, there has been a lot of opposition to Yucca Mountain because people feel threatened by its geographic location, due to the possibility of earthquakes and waste leaking into groundwater. If people have opposition towards a waste management plan for nuclear power waste it is likely they are opposed to nuclear power as a whole. If there was no nuclear power, there would be no waste issue, so many feel that there should be no more waste created until a feasible management plan is created. As one can see, opinion about nuclear power in the United States has had various ups and downs with the public's view. Because it is such a controversial topic there are many dimensions to public opinion.

The German Case

Germany is another country that has had a long battle of opinion over the course of its nuclear power history. Currently, Germany receives about 25% of its electricity from nuclear power sources, but if things go as planned that %age will be zero by 2022. Like the United States, opposition towards nuclear power in Germany is and has been greatly affected by nuclear disasters.

From the get-go of nuclear power in Germany, there has been opposition towards the power source. Prior to any major disasters, a large portion of German citizens felt uneasy about nuclear power. The first major demonstration against nuclear power in Germany was in February 1975, where 28,000 people came together to publicly oppose construction of a plant in Wyhl, a small town in the south west of Germany (Hockenos 2011: 24). People were starting to see the development of nuclear power in Germany and reacted quickly, as they felt they did not want reactors in their homeland. In conjunction with negative feelings about nuclear power in general, the various disasters the world has seen have acted as catalysts to strengthen the German movement. The anti-nuclear movement has developed a large position in German politics as well as German society. The German Green Party was created and was eventually elected to power in 1998. Since then, the Green Party has worked hard to move Germany away from nuclear by providing many "subsidies and tax breaks to consumers and producers of renewable energies" leading to the addition of nearly 400,000 jobs in the alternative energy industries (Hockenos 2011: 24). Because of this, Germany is considered to be one of the greenest countries in the world.

Since the days after Chernobyl, Germany has been sensitive to nuclear disaster as it was affected by the disaster due to its proximity. Germany was one of the nations that was affected by the large plume cloud that drifted over Europe from the meltdown in 1986. When the disaster at Fukushima occurred this past spring, the last straw for the German anti-nuclear movement had been pulled. Luise Neumann-Cosel, a member of "X-tausendmal quer" (meaning "X- A Thousand Times Across), a group that blockades transports of nuclear waste, said, "People were angry well before Fukushima. But when Fukushima happened this anger just exploded" (Hockenos 2011: 24). In late March 2011, the largest anti-nuclear rally ever in Germany occurred, where about 120,000 people gathered to protest against the technology (Hockenos 2011:23).

The movement in Germany has been successful in recruiting protestors because a large anti-nuclear culture has been created in Germany; the movement is ingrained into German culture. The movement's slogan can be seen everywhere, which is constantly raising awareness. The slogan reads: "Atom Kraft? Nein Danke!" translating to "Nuclear Power? No Thanks", as shown below.

(Atomkraft? Nein Danke! 2012)

Often one will see the "ubiquitous symbol on balloons, flags, sticker, and faces" (Hockenos 2011: 24).

Change away from nuclear power has always been the main goal of the anti-nuclear movement, and this fall all the hard work and dedication paid off. In the fall of 2011, nearly six months after the disaster in Japan, Angela Merkel, the German chancellor, announced that Germany would be nuclear free by the year 2022. Directly after Fukushima, Germany shut down eight reactors, beginning Germany's phasing out of nuclear power (Gavett 2012: Para 14). This decision has many pros and cons. Even though nuclear power will be done away with within ten years, the nation will rely heavily on coal to fill that demand. Ultimately, the country hopes renewables will be able to supply the electricity that nuclear power once supplied. Moving back to coal makes many nervous with respect to global warming. James Hanson of NASA, while being interviewed on a PBS Frontline titled, *Nuclear Aftershocks*, expressed concern as he stated that Germany's reliance on coal could potentially "result in about 400 million tons of extra carbon emissions" by 2020 (PBS Frontline 2012: Nuclear Aftershocks). Many Germans seem to overlook that and firmly believe that nuclear power is not the answer and are very much in favor of phasing out the energy source by 2022.

The French Case

For the past forty years, the French have been well known for their high use of nuclear power. Currently, the French get about 80 % of their electricity from nuclear power, the highest %age of any nation in the world. That high %age may decrease as a result of Fukushima, which reminded the world how dangerous nuclear power could be. Nevertheless, prior to Fukushima, France has had a rich history with nuclear power. In a 1997 PBS Frontline titled, *Nuclear Reaction*, Frontline producer Jon Palfreman explored

why the French liked nuclear energy. In the report the French expressed their compassion for the energy source and neglected to have negative comments about the topic:

> In France, unlike in America, nuclear energy is accepted, even popular. Everybody I spoke to in Civauz [a rural village in southwestern France] loves the fact that their region was chosen. The nuclear plant has brought jobs and prosperity to the area. Nobody I spoke to, nobody, expressed any fear. From the village school teacher, Rene Barc, to the patron of the Café de Sport bar, Valerie Turbeau, any traces of doubt they might have had have faded as they have come to know plant workers, visited the reactor site and though about the benefits of being part of France's nuclear energy effort (Palfreman 2007: Para 2).

Nuclear power has turned into a reason of pride for many French citizens. France got into nuclear power during the time when the United States was particularly in favor of the technology, during the oil crisis of the 1970s. During the birth of nuclear power in France, there was some protest, but unlike in Germany, it died out as the nation accepted the technology.

Like other places in the world, France was deeply affected by the events at Fukushima last spring. The nuclear disaster led many French citizens to have a sense of uncertainty about their beloved nuclear power in which they had grown to love and depend on. Polling in France after Fukushima revealed that 57% of French people said they believed France should end its reliance on nuclear power. In addition, the "French nuclear safety watchdog said that nobody can guarantee that there will never be a nuclear accident in France" (Beardsley 2011: Para 5). Many find that statement unsettling. Because of this public outcry regarding their nuclear safety, the French government has taken action. As of April 2011, President Nicolas Sarkozy called for stress tests on all 58 reactors in France to ensure their safety (Beardsley 2011: Para 13). Currently, the French

are still known for their large use of nuclear power, however in the future that may change, but time will tell.

Conclusion

Like France and Germany, the United States has had many reactions to the events of Fukushima, leading to a high of opposition seen in the recent polls. Concern has also led to changes in government regulation, making requirements for the plants stricter to ensure safety and preparedness for any potential disaster. Yet, nuclear power in the United States is still a growing industry as plans for two plants were just approved by the NRC. The reactor plans approved are to occur at plants in South Carolina and Georgia. The reactors at these plants are to be Westinghouse AP1000s, which are currently the "so- called advanced passive design" and are designed to be able to handle natural disasters stronger than what was seen last spring (Wald 2011: B6). Despite the gains made in the nuclear engineering industry, many Americans are likely to feel unsure about these new constructions. Like the past of nuclear power, the future of it is likely to remain divided as the nation as a whole has many opinions. As expressed in the next chapter, the anti-nuclear movement has been an outlet for many, as a way to demonstrate their emotion about changes they believe should occur.

CHAPTER THREE:
ANTI-NUCLEAR POWER ACTIVISM NATIONALLY AND LOCALLY, WITH A LOCAL FOCUS ON INDIAN POINT AND VERMONT YANKEE

Introduction

The emergence of a social movement is often caused by a reaction to an event or a series of events. The event causes a grievance, which the activists want to address. This phenomenon can be seen in the environmental movement, particularly, with the anti-nuclear movement. Since World War II, there has been an active anti-nuclear movement in the United States. In its history, there have been waves of activity, usually surging directly after a disaster involving the technology. The environmental crises work as reinforcements of the movement as they remind Americans about the risks of nuclear power. The United States is currently seeing a moment of strong opposition, as the debate of nuclear power gains importance due to rising interest in clean energy, a need for energy independence, and the events of Fukushima last spring. Some Americans push for nuclear power, as they believe it will give America unlimited emission-free energy, while others worry its existence may severely impact the environment. The anti-nuclear movement has had an active and rich history, and is still very apparent today. This chapter focuses on some of the large players in the American anti-nuclear movement, both on a national and local level.

There is a discrepancy between the objectives of national organizations compared to those of local campaigns. National agendas advocate changing policy by identifying major issues while the local agendas are fighting against specific problems. Large national organizations are more likely to have broader agendas towards nuclear power policy. They are fighting for a change in policy that will either do away with nuclear

power or make the Nuclear Regulatory Commission (NRC) and government stricter with legislation. However, if some cases are getting national attention, it is likely national organizations may step in to give input about the situation. Having support from a large organization will likely strengthen the activism fighting against the issue. Later on in this chapter, I explore the roles and impacts of these many organizations to understand how they shape nuclear power in America. I try to understand the hard work and impacts of the anti-nuclear movement, both nationally and locally.

Greenpeace

Greenpeace prides itself on being the largest international independent direct-action environmental organization on Earth (Greenpeace 2012: About). Founded about 40 years ago, Greenpeace has established itself as one of the most influential forces in the world of environmental activism. The organization is very involved with numerous environmental issues, but one that they are particularly passionate about is eradicating nuclear power. Due to their work, Greenpeace has a very powerful campaign against nuclear power because it is a technology that has the potential to drastically impact a life. A major element to Greenpeace's fight is remembering the events of Chernobyl, and in the future it is likely Fukushima will play a large role as well. Greenpeace has published numerous pamphlets and videos presenting the story of Chernobyl as a way to spread awareness of the potential consequences of nuclear development. Despite the fact that 25 years has passed since the disaster there, the thousands of people who still live in proximity of the plant face many health problems. Around the time of the 25th year anniversary, many Greenpeace scientists and campaigners traveled to Chernobyl to understand life there today. The horrible consequences of nuclear power are put on

display through the many health issues and dangerously high levels of radioactivity Greenpeace saw first hand. Greenpeace hopes to spread their story and show the world the impact nuclear power can make, which in their minds will lead people to decide nuclear power is not the answer. Aside from their present day work, Greenpeace has had a rich and active past, playing a role in the anti-nuclear movement since September 15, 1971. That day a group of Greenpeace activists decided to set sail to Amchtika Island, Alaska to protest nuclear testing, and "although the bombs went off that day, the public outcry that followed caused the United States to abandon its nuclear program altogether five months later" (Greenpeace 2012: Nuclear Victories). Since the very beginning Greenpeace has been an effective organization, influencing American views on nuclear technology.

When Greenpeace first emerged, they considered themselves different, as they were a centralized organization, unlike other "leaderless" active groups of the time period, such as No Nukes (Weyler 2004: 510). Greenpeace's establishment helped the development of the anti-nuclear movement because the organization had substantial resources and many volunteers, and could sometimes attract a media presence (Weyler 2004:510). This strength in numbers and media presence helped the anti-nuclear movement to raise and spread awareness through word of mouth and through the news. In addition, by the mid 1970s, Greenpeace had begun publishing a monthly newspaper titled the *Greenpeace Chronicles* as a means of spreading views on environmental issues. Sometimes in the newspaper, they included scientific reports prepared by No Nukes and local contact information to spread awareness and facilitate communication among the activists (Weyler 2004: 510).

In addition to educating people about the disadvantages of nuclear power, Greenpeace has also been very active in organizing protests. Because Greenpeace is an international organization, a lot of work aimed towards stopping nuclear technology has been done in various regions of the world, particularly in France. Throughout the 1970s and 1980s, Greenpeace had many victories, including the banning of French nuclear testing through protests and petition signing; one petition in particular procured over seven million signatures (Greenpeace 2012: Nuclear Victories). More recently, Greenpeace has had various victories stopping nuclear power expansion in Turkey, Spain and the United Kingdom. In 2000, Greenpeace helped influence the cancellation of plans by Turkey to construct 10 reactors by 2020. In 2006, Greenpeace protesting led Spain to announce their future phasing out of nuclear energy, and in 2007 Greenpeace helped stop the United Kingdom's plans to "reinvigorate" nuclear power (Greenpeace 2012: Nuclear Victories). Greenpeace is not only active abroad, but also active in the United States. As discussed later in this chapter, its influence has been especially seen on a local level.

Sierra Club National

The Sierra Club, founded in 1892 by John Muir, has been actively involved in a range of environmental issues in the United States since its founding. In addition to being an outdoor recreation club with many outings, the Sierra Club is also a very influential political force with lobbying and grassroots activism efforts. The Sierra Club is currently heavily interested in energy policy in the United States. During recent years, the club has created a "Beyond Coal" campaign, pushing for natural gas and alternative energies. With regards to nuclear power, the club's national agenda is quite broad, as they state on their nuclear power webpage, "Nuclear Power is Not the Answer." However, even before

the use of the Internet in the 1960s, the Sierra Club expressed their view on nuclear power. The club's local agenda started during the fight against the construction of a plant in Bodega Bay, California.

Bodega Bay is a fishing village located about 50 miles north of San Francisco which was once a potential site for a nuclear reactor to be constructed by Pacific Gas and Electric Co. Early on, the Sierra Club got involved with the debate around Bodega Bay, most likely because the Sierra Club is headquartered in San Francisco. The Sierra Club fought hard against the plant between 1958 and 1964, managing to halt construction plans (Wellock 1998:17). The Sierra Club helped organize events and gave testimony at hearings about why the plant should not be built. In addition to arguing that the plant would ruin the high aesthetic value of the area, the Sierra Club activists noted that the Atomic Energy Committee had deemed the plant unsafe because it "could not provide reasonable assurance against earthquake hazards (Wellock 1998: 58). This was the beginning of the Sierra Club's achievements in the anti-nuclear movement.

Today, the Sierra Club's fight against nuclear power is occurring more at a local level due to the establishment of its state chapters. State chapters were established with the purpose to focus on state and local legislation. The chapters work to coordinate the movement with the state members, as they are the ones who make up a majority of the activists. The coordination of events, petitions and lobbying are a primary tactic of the state chapters to get the Sierra Club's voice heard. On the Sierra Club national webpage, the organization presents a larger viewpoint on nuclear power as a whole. The local chapters' websites offer information regarding nuclear power as well and usually establish an opposition to a plant in that state, if one exists. The Sierra Club's local

involvement will be discussed further below, in the examples of Indian Point and Vermont Yankee.

Beyond Nuclear

Even though it was only established recently, Beyond Nuclear is an anti-nuclear organization that has made a name for itself in the fight to end nuclear power. Beyond Nuclear is a small organization that works in alliance with hundreds of organizations around the world. They are small but are linked with many other groups that are all fighting for the same thing: to end nuclear power. Beyond Nuclear is located in Maryland and has four staff members. In comparison with Greenpeace and the Sierra Club, Beyond Nuclear focuses primarily on nuclear power rather than having numerous environmental foci. This is expressed in their "About Us" section on their website:

> Beyond Nuclear aims to educate and activate the public about the connections between nuclear power and nuclear weapons and the need to abandon both to safeguard our future. Beyond Nuclear advocates for an energy future that is sustainable, benign and democratic. The Beyond Nuclear team works with diverse partners and allies to provide the public, government officials, and the media with the critical information necessary to move humanity toward a world beyond nuclear. (Beyond Nuclear 2012: About).

Beyond Nuclear sees nuclear power as a human rights issue, because the technology can put a human's right to live at risk. Due to their close location to Washington, D.C., most of their action involves advocacy to change American policy on the regulation of license renewal, the development of new plants, and waste storage.

Most recently, after the events at Fukushima, Beyond Nuclear has begun a campaign titled "Freeze Our Fukushimas." In the United States there are 23 General Electric Mark 1 Boiling Water Reactors, the same design of the reactor that was used at the Fukushima Daiichi plant. Beyond Nuclear and many anti-nuclear organizations feel it

is crucial these reactors in the United States are shut down immediately (Beyond Nuclear 2012: Freeze our Fukushimas). The world saw how the GE Mark 1 responded a tsunami, giving an uncertainty to how the reactor design would react to other natural disasters As a part of the "Freeze Our Fukushimas" campaign, the organization has created "March Against Nuclear Madness" for the spring of 2012 to promote anti-nuclear activism. Beyond Nuclear has planned and coordinated numerous events in all parts of the country, for example in New York City, Washington, and Texas, in addition to events internationally in France, Canada and the United Kingdom. As will be discussed further below, Beyond Nuclear has planned some events in Vermont focused on the Vermont Yankee plant.

Friends of the Earth

Another group that has achieved a place in the anti-nuclear movement is Friends of the Earth, a network of organizations active in over 76 countries around the world (Friends of the Earth 2012: About Us). A majority of Friends of the Earth's work is grassroots activism, education, and political action such as advocacy and lobbying. Like Greenpeace and Sierra Club national, Friends of the Earth has many focuses. Currently their four main "projects" are Climate and Energy, Food and Technology, Oceans and Forests, and Economics for the Earth. Friends of the Earth was established during the late 1960s, in response to the 1969 Santa Barbara Oil Spill. (Friends of the Earth 2012: Achievements). That event was a catalyst for their fight to protect the environment from further disaster.

For the over 40 years that Friends of the Earth has been active, the organization has undertaken many efforts dealing with the issue of nuclear power, within the Climate

and Energy Project. Their fight towards nuclear power is on both local and national levels. Locally, Friends of the Earth looks a stopping specific plant's construction or relicensing. These efforts are more so done by activists. Often the organization targets waste issues during the planning process as the ultimate reason for why the plant should not be built (McLaren 1992). Nationally, the main goal of the organization is to change policies through protest and advocacy. After the Fukushima disaster, Friends of the Earth became very involved in the anti-nuclear movement. They soon found success as they "stopped the U.S. nuclear industry from raising electricity rates in Iowa in order to fund the construction of new nuclear reactors" (Friends of the Earth 2012: Achievements). Even though what they did only pertained to one state, Friends of the Earth is an example of an organization's impact on nuclear power policy in the United States.

As demonstrated on the Friends of the Earth's website, the organization has a very impressive and elaborate outreach program to spread awareness about the environmental issues of today. It does this by publishing various materials such as an annual report, newsmagazines, fact sheets and running advertisements to educated people of environmental affairs (Friends of the Earth 2012: Ads and Brochures). With their efforts of awareness and education, Friends of the Earth has found great success largely due to its dedicated activist members.

The next two sections in this chapter examine the anti-nuclear movement's organizational activity and impact on a local level. Indian Point and Vermont Yankee are two of the largest controversies on a local context in the United States. Many of the organizations previously discussed have taken action in these local matters. The organizations have been able to adjust their national agenda to a local agenda focusing on

the livelihood of the local area around Indian Point and Vermont Yankee. Additional insights will be gained from looking at two local controversies, because specific examples of organization, tactics and impact on nuclear power will be explored.

Indian Point Energy Center

One plant that has been in the news spotlight for many years is the Indian Point Energy Center, owned by Entergy Nuclear Operations, Inc. The plant located in Buchanan, NY, is about 25 miles north of the New York City boundary, and 35 miles north of mid-town Manhattan, the most densely populated area in the United States. Nearly 20 million people live within the 50 miles of Indian Point, which makes Indian Point in close proximity to more people than any other plant in the United States. An enormous number of people would be at risk if a disaster at the plant were to occur. (PBS Frontline 2012: Nuclear Aftershocks). The plant consists of two reactors, Unit 2 and Unit 3. Both reactors are Westinghouse Four-Loup pressurized water reactors. Unit 2's operating license was issued on September 28, 1973, and will expire on September 28, 2013; Unit 3's operating license was issued December 12, 1975, and will expire on December 12, 2015 (NRC 2012: Indian Point). In addition, the 2000 Mega Watts (MWe) that Indian Point produces provides about a quarter of New York City and Westchester County's electricity, which means there is a huge dependency on the plant's function. In the wake of the events that occurred last spring in Japan at Fukushima Daiichi, controversy surrounding nuclear power from Indian Point has greatly heightened.

A major concern surrounding Indian Point is the issue of waste. Being on the Hudson River, which is a commonly used water way and spans a vast distance of New York state, citizens fear leakage of radioactive material. In addition, because it is in close

proximity to New York City, many fear radioactive material could potentially impact its eight million residents if a disaster were to occur. This fear is justified by the fact that all of Indian Point's spent fuel from the past 30 years of operation is still on site in storage containers (Wald 2004:38). To many, having a large quantity of radioactive spent fuel in one area may act as a vulnerability to terrorism. Concern exists that terrorists may plan to attack Indian Point with hopes to release large amounts of radioactive material into the environment. This is one fact that many people who live near the plant find unsettling. As time progresses, Indian Point will continue to be apparent in the news and decisions regarding policy of nuclear power as its license expiration nears. If the decision is made against an extension, the city of New York is going to have to seriously reevaluate where they get their electricity and how the demand is going to be supplied.

Opposition towards Indian Point has existed since the plant's construction in the 1970s due to the various environmental problems that have been associated with the plant. Other issues with the plant are environmental degradation in the Hudson River, the current weak emergency evacuation plan, and the location of Indian Point in a moderately seismic zone. Furthermore, in April 2007, when Entergy, the firm that operates Indian Point, applied for license renewal, the plant came on many tri-state area citizen's radars. That application is still currently under review and the commission decision is still to be determined. Many local inhabitants are anxiously waiting to see what will happen. In the meantime, this topic will continue to become more important as the expiration dates for Indian Point's two reactors are nearing.

Within the New York State government there has been a lot of talk about Indian Point. One of Indian Point's biggest opponents is Governor Andrew M. Cuomo. He has

famously stated that Indian Point is a "catastrophe waiting to happen" leading to his desire to shut down Indian Point (Tiku 2011: Para 1). His opinions on Indian Point, which he has had for numerous years, were reinforced after he saw what occurred in Japan. Frank Murray of NYSERDA stated that Governor Cuomo might not necessarily be against nuclear power as a whole, but that he was definitely against nuclear power at Indian Point. He sees its construction back in the 1970s as a big mistake due to the many environmental concerns and risks its function creates (Murray 2012). Cuomo has taken action on his stance regarding Indian Point by setting up meetings with Entergy. Prior to the first meeting between the two parties last June, Governor Cuomo had only expressed his concern for Indian Point through speeches. As Danny Hakim, of the *New York Times*, writes "… his administration had not delivered the message so directly to the company [before], or in such strong words, and company officials left the meeting alarmed" (Hakim 2011: A1). Governor Cuomo has a strong view about Indian Point that he is not giving up on.

In addition to his speeches and recent meetings with Entergy, Governor Cuomo has done some political work expressing the idea to shut down Indian Point, dating back to 2007, when he was still the Attorney General for the State of New York. After Entergy submitted its application for the license renewal of Indian Point, Cuomo collaborated with Alexander B. Grannis, at the time Commissioner for the New York State Department of Environmental Protection (DEC) and Joan Leary Matthews, at the time Senior Attorney for Special Projects of the DEC to produce the "New York State Notice of Intention to Participate and Petition to Intervene", which they filed on November 20, 2007. This document was addressed to the NRC. In the document 32 different

contentions were made regarding Indian Point, with the overarching purpose for the State of New York to participate in the discussion of whether Indian Point receives or does not receive license renewal. The document uses a lot of language that is powerful and demonstrates that New York is preparing to take a strong stand on the issue. Below is an excerpt from the piece:

> Because of the unique safety, health and environmental problems posed by these plants and raised by Entergy's relicensing application, the State of New York has a compelling interest in ensuring that these significant issues are fully aired and addressed through hearings in this process in which the State can fully participate…The State's goal is not only to ensure public safety but also bring transparency to bear on a process that for too long has excluded the public and stifled debate on the most critical issues related to the risks posed by Indian Point. If the federal government will not take adequate steps to ensure public safety with respect to the Indian Point power plants, the State of New York will step into this void and use every legal tool and resource to force a full consideration of these issues (New York State 2007: 3).

It is likely that the State of New York does not want to find itself in a similar situation as the State of Vermont. The state of Vermont faced a lawsuit with Entergy about the relicensing of Vermont Yankee after the NRC granted the plant's license extension, as discussed further this chapter.

Governor Cuomo is joined in his hope for the denial of license extension for Indian Point from the NRC by a coalition of many environmental organizations. Some are national organizations that have become involved with Indian Point, and some are local grassroots efforts from the surrounding area. Many of these organizations have aligned themselves with the Indian Point Safe Energy Commission (IPSEC). ISPEC is a "non- partisan coalition comprised of public interest, environmental and civic groups", including, for example, Greenpeace and the Sierra Club Atlantic Chapter, among many others. (IPSEC 2012: Member Organizations). After the events on September 11th, 2001,

membership of ISPEC greatly increased, as concern surrounding Indian Point's vulnerability to terrorism was recognized, considering many of the flight paths used flew over Buchanan, NY (Dengler 2004: 1). This coalition works to help organize and coordinate numerous groups' efforts into one large fight for the end of operations at Indian Point.

A national organization that is involved with Indian Point is the Sierra Club, specifically the Sierra Club Atlantic Chapter (SC Atlantic Chapter), headquartered in Albany, NY. It is New York State's chapter, with nearly 37,000 members and divided into numerous regional groups. A lot of the group work in the tri-state area focuses on shutting down Indian Point because that is the area of the state that would be most affected by a disaster. A main aim of the SC Atlantic Chapter is to spread awareness about the risks of Indian Point. Often, members of the club will speak at public spaces such as libraries to lecture about the issue. In addition, members of the SC Atlantic Chapter, such as Marilyn Elie from the Rockland group, manage to stay involved with decisions regarding Indian Point. Her involvement has labeled her as a "NRC watchdog" because she keeps a close eye on the NRC as she regularly attends meetings and stays current with NRC reports and policy discussions (Demarest 2010: Para 3). In addition, the SC Atlantic Chapter is very involved with the New York State government due to it being a powerful lobby organization. Specifically, the club is allowed to submit comments on the New York State Energy Plan and distribute memos about certain bills or topics, in the natural fashion of any lobbyist organization. One of the issues the club has targeted is that NRC has given exemptions with regards to the plant's fire safety, which makes the public very vulnerable to problems (Sierra Club 2012: Indian Point). In

addition, most recently in the summer of 2011, the Sierra Club also created an Indian Point Task Force to combat the issue (Sierra Club 2012: Indian Point).The many hours of effort give the activists hope the NRC's decision will be in their favor and lead to the decommissioning of Indian Point.

Another focus where there is a lot of activism is on the environmental safety of the Hudson River ecosystem, the river on which Indian Point sits. One of the largest problems these organizations have with Indian Point is the water pollution the plant's function creates. Daily, billions of gallons of water are used, and when the water is returned the river, it is often much warmer than it was previously. Furthermore, Indian Point has had a history of radiation leaks into the groundwater and Hudson River which angers these organizations. The pollution on the habitat was recognized in 2007, when Riverkeeper found that four of twelve fish from the Hudson River contained radioactive toxins (Riverkeeper 2012: Radioactive Waste & Pollution). Two of the large organizations are Riverkeeper and Hudson River Sloop Clearwater Environmental Organization.

Riverkeeper, which has named itself New York's clean water advocate has been involved with many aspects of helping the Hudson stay a safe habitat, and helps ensure that the state's water is protected. Their campaign against Indian Point falls under a larger campaign of theirs titled "Stop Polluters." In 2006, the campaign against Indian Point took flight when the organization "launched is Reenergize New York initiative," with hopes to "encourage state leaders to invest in clean replacement power and to encourage New Yorkers to use energy more wisely" (Riverkeeper 2012: Close Indian Point, Para 1). Riverkeeper started as a fisherman's organization, and still today, aligns with its earliest

initiative: ensuring a healthy habitat for the aquatic species found in the Hudson River. With that, Riverkeeper combats the issues that create environmental problems such as water used for cooling and radioactive leaks. Riverkeeper has been fighting for Indian Point to use a closed-cycle cooling system. It is favored because it will recycle the water and significantly lower the plant's impact on aquatic life (Riverkeeper 2012: How to Close a Nuclear Power Plant). Like the Sierra Club, Riverkeeper aims to spread awareness by organizing many events so the voice of the organization can be heard.

Simultaneously, Clearwater has been working hard in opposition to Indian Point. The organization has a rich history of various achievements in favor of protecting the Hudson River since its establishment in 1966. Like the previous organizations discussed, Clearwater aims to educate about the harms and problems associated with Indian Point. Furthermore, Clearwater demonstrated its impact in the law world taking a stance to defend the Hudson River Ecosystem. In November 2003, Clearwater's efforts in a lawsuit led to a DEC decision to issue a permit that called for a closed cooling system at Indian Point (Dengler 2004:1). In addition, most recently Clearwater has also submitted a statement to the NRC's Atomic Safety and Licensing Board, comprising a statement defending why Indian Point should be closed (Clearwater 2012: Indian Point Campaign Documents and Filings). Along with that submission, the organization submitted various pieces of testimonies as a tactic to have their voice heard by the NRC.

Another organization that has done a lot of work on promoting awareness about the risk of Indian Point is TIME'S UP!, located in New York City. TIME'S UP! calls themselves "NYC's Direct Action Environmental Organization" as displayed on their website (TIME'S UP! 2012: Home). TIME'S UP! is a "grassroots organization that uses

educational outreach and direct action to promote a more sustainable, less toxic city" (TIME'S UP! 2012: Home). Most of its work is through protest and demonstration to express the organization's view. For example with regards to Indian Point, TIME'S UP! teamed up with Clearwater and coordinated a bike ride and sail action day from Manhattan to near the site of Indian Point. The day began in Manhattan with protest in front of Grand Central Station, where the group was dressed in white hazmats suits with anti-nuclear slogans painted on them. TIME'S UP! activists also carried a large sign with the words " YOU ARE 35 MILES FROM INDIAN POINT. WHAT WOULD YOU DO IN A MELTDOWN?" written across, and asked the question with a loud speaker (TIME'S UP! 2012: Shut Down Indian Point Action). Next, the activists started their journey to Indian Point. They got on the train headed to Peekskill, NY, where they then road their bikes to the plant site. After, the activists rode bikes to where the Clearwater's vessel, the Clearwater Sloop, was docked. The day concluded with the boat ride in the Hudson River near Indian Point and back to New York City. The vessel proudly presented a banner that read "NO FUKUSHIMA ON THE HUDSON" (TIME'S UP! 2012: Shut Down Indian Point Action).

In a blog written by Ben Shepard, a member of TIME'S UP!, there was an interesting comment regarding the day of action. In addition to spreading awareness and concern about New York City's evacuation if disaster were to occur at Indian Point, Shepard made it clear doing an action out of the ordinary would attract media attention:

> While the crew on the Clearwater Sloop hung the banners, members of media arrived and I gave interviews, reiterating the message from our banners. This is not a safe place. The times for nukes is over. I have two kids who I hope will be able grow up happy and healthy without a melt down on the Hudson. This plant is like a beaten up old car. Not many of us drive cars built in the late 1960's anymore. And we certainly should not

> depend on decades old machinery, with no possibility for disposal of waste, to fuel whole cities. Much of this message would find its way into several media outlets. That, after all, was a big reason for the action (Shepard 2011: Para 28).

Just like any grassroots organization, gaining the media's attention is usually perceived to be a good thing. Even if the activists do seem radical in their actions, the media does help because it makes the public aware of the issue. People may not necessarily agree with them, but seeing action will make them question the reasons for why the activists are protesting.

Activism towards Indian Point is a strong effort. The biggest advantage of the movement is that all the organizations are working towards one common goal: the shut down and decommission of Indian Point Energy Center. The number of organizations is constantly growing and this chapter only discusses a fraction of them. The important point is that these various organizations work together and have gotten themselves involved in the movement through educational outreach, protests, and lobbying.

On the other side of the spectrum, there is a movement to keep Indian Point running for another 20 years. The pro-Indian Point effort is dominated by Entergy, its owner, and its employees. Entergy can be seen in a positive light as it provides about 2,000 jobs in New York State (Entergy 2012: Indian Point). Entergy is the primary proponent because the company owns both reactors and would like to continue the revenue from the plant's function. One of Entergy's largest tactics to promote Indian Point in a positive light by the hiring as their spokesperson, the former Mayor of New York City, Republican Rudy Giuliani. Giuliani has appeared in numerous advertisements for Indian Point, discussing how the plant is clean, reliable and cheap. In his advertisement, Giuliani states how Entergy has invested about $1 Billion towards

upgrades, and closes stating, “Indian Point is right for New York” (Indian Point Energy Center 2012: Home). Even though Entergy claims their many investments in Indian Point, it clearly is not enough to change the many anti-Indian Point activists’ minds. Currently there is a battle over whether or not Indian Point licenses should be renewed, and only time will tell what side has been able to influence the NRC to neglect or reward Entergy of a license extension for their nuclear reactors at Indian Point.

Before any decision can be made, the issue of alternatives to the plant must be considered. There are various alternative methods of energy that are being investigated that could potentially fill the energy supply the 2000 MWe of electricity that Indian Point would have provided for New York City and Westchester. If the demand is not met, New York City and Westchester will be vulnerable to energy blackouts and price increases. To alleviate this issue, a large interest in renewables such as wind and solar has erupted. Activists are optimistic that renewables can feasibly meet the demand of the areas that are dependent on Indian Point. Frank Murray, the President and CEO of New York State Energy Research and Development Authority (NYSERDA), is an optimist when it comes to that, as he stated there would be no problem to make solutions to fill the energy supply, and that he was very convinced it was feasible (Murray 2012). He did also mention though, that timing was a critical factor in making the plan feasible. Plans need to be set in place by the time of the NRC hearing, so that by the time Indian Point is shut down, the new infrastructure is in place and ready to deliver the electricity. Murray admitted he currently did not know what exactly the plan would be, but he is confident one can be created. Increased efficiency and upgraded transmission lines are two elements he does foresee to be a part of the plan. Another belief that Murray shared on

alternatives plans to Indian Point electricity is that this will be the time when as he stated it "who comes out of the woodwork", suggesting there are developers out there conjuring up plans; however, they are keeping them private until a decision is made. If the decision is looking like it is going to turn out negative for Indian Point, renewable energy companies are going to try their hardest to create the best and most efficient plan to meet the demand that Indian Point would have supplied.

Even though a lot is still up in the air, one alternative to Indian Point that the government has been researching is the "Energy Highway." Governor Cuomo is a big supporter of this as he mentioned the need to strengthen and improve it, in his State of State this past January. The purpose of developing the "Energy Highway" will be to efficiently transport wind and hydropower from Upstate and Western New York and north of the border in Quebec, to the downstate area where the energy demands are the highest (Cuomo 2012). Developing this piece of infrastructure is crucial because it is essential that New York State convert to more renewable energy sources. Within the "Energy Highway" project is the Champlain Hudson Power Express project, which could potentially bring around 1000 MWe of clean electricity downstate. In addition to the major environmental benefit of this project, being clean energy, it will increase the security of New York State energy grid, provide over 300 jobs during the 3.5-year construction period and reduce energy costs for consumers (CHPExpress 2012). Regardless of what decision is made, the future of renewables in New York State and around the nation is going to continue to be developed.

Vermont Yankee Power Station

Another local controversy that has received a lot of attention is in Vernon, Vermont. Located in Vernon, Vermont Yankee Nuclear Power Station is situated on the Connecticut River five miles south of Brattleboro, Vermont (NRC 2012: Vermont Yankee). The plant consists of a General Electric boiling water reactor that has an electrical output of 605 MWe (Entergy 2012: Vermont Yankee). Just recently, the plant, also owned by Entergy Nuclear Operations, Inc. received an extension on its license, adding another 20 years of operation. Entergy bought the plant from the Vermont Yankee Nuclear Power Corporation in 2002 for $180 million dollars (Smith 2002). The plant's license was granted March 21, 1972, and will now expire March 21, 2032 (NRC 2012: Vermont Yankee).

Vermont Yankee has been running since 1972, and like Indian Point, it receives a lot of attention from the anti-nuclear movement. Controversy surrounding the plant has existed since its construction in the 1970s. Many people were hesitant about the idea of a nuclear power plant with fear of harming the surrounding environment, specifically with thermal pollution. Vermont Yankee Nuclear Power Corporation proposed their design of a "once-through cooling" system, where water from the river would be used to cool the steam from the plant then returned to the river (Duffy 1997:56). Even though engineers were working hard to design a plant that would not harm the local marine environment, the idea still gained concern:

> A group of local citizens, joined by the Vermont Department of Fish and Game, the state's attorney general, and the neighboring states of New Hampshire and Massachusetts, intervened in the construction permit proceeding, arguing that the proposed discharge of water into the river would raise the water temperature and irreparably harm fish and plant life (Duffy 1997:56).

Like the efforts of the Clamshell Alliance, the demonstrations were overlooked, and Vermont Yankee was built and began operation in 1972.

For the most part, over the past 30 years the plant's operation ran relatively smoothly. This was seen until the plant began to release statements that problems had in fact occurred, which angered many. The controversy surrounding the plant's operation consists of "leaks of radioactive tritium, the collapse of a cooling tower in 2007, and inaccurate testimonies by [Entergy]" (Wald 2010: A14). News of these problems led to many Vermonters to feel very concerned. Wald also writes " plant officials had testified under oath to two state panels that there were no buried pipes at Vermont Yankee that could leak tritium, although in reality, there were. No tritium has turned up in drinking water, but even plant supporters expressed dismay at the leak and the misstatements" (Wald 2010: A14). The people of Vermont were not only concerned about waste but also concerned about the authority in charge of the plant's operation, Entergy.

When Entergy bought Vermont Yankee in 2002, they "signed a memorandum of understanding with the state agreeing that it would need a state 'certificate of public good' as well as the federal license extension to operate after March 21, 2012, when the license expires" (Wald 2012: A14). When the NRC granted the plant's license extension, many in Vermont were not pleased, leading the Vermont Government to enact the memorandum Entergy previously has signed. The Vermont Senate voted on whether to grant the plant the "certificate of public good" and the result was negative in a 26- 4 vote, leading to the lawsuit with Entergy. Just recently, in January 2012, Federal Judge, J. Garvan Murtha of the United States District Court in Brattleboro, VT ruled that Vermont is unable to stop Vermont Yankee from shutting down. However, the efforts to turn the

plant off have not seized, as many believe the state of Vermont is going to appeal the decision (Wald 2012: A14).

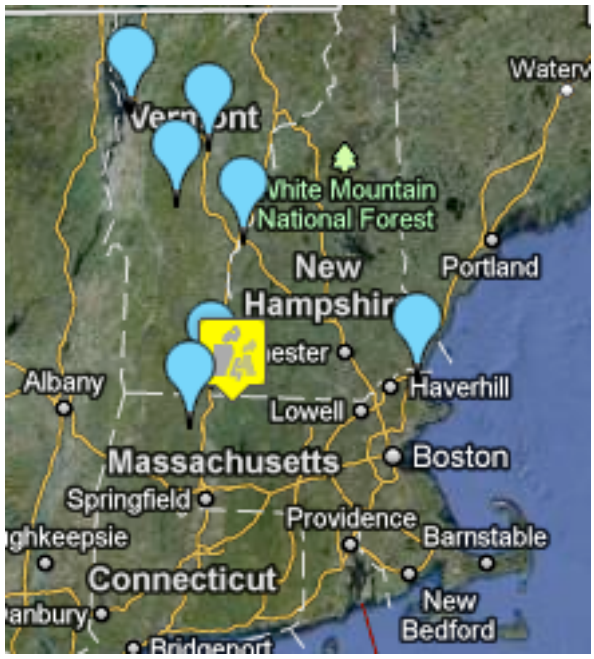
Like in New York, there is a lot state opposition for the nuclear reactor. A large opponent to Vermont Yankee is also the current state Governor, Governor Peter Shumlin. After Shumlin learned of the decision by Judge Murtha, he publicly expressed his emotion towards the issue:

> I am very disappointed in today's ruling from the federal court. Entergy has not been a trustworthy partner with the state of Vermont. Vermont Yankee needed legislative approval 40 years ago. The plant received approval to operate until March, 2012. I continue to believe that it is in Vermont's best interest to retire the plant. I will await the Attorney General's review of the decision to comment further on whether the state will appeal (Shumlin 2012).

Despite his regret about the outcome, Shumlin is optimistic, noting that appealing the case is a possibility. Furthermore, Shumlin's reaction to this decision is not very surprising because he has been a long time opponent of the plant, expressing his position during his candidacy for state governor in 2010 (Peter Shumlin For Governor 2012).

Aside from governmental action, activism from numerous local organizations has played a major role in the movement against Vermont Yankee. In order to coordinate the movement into one effort, the Safe and Green Campaign was created, along with the SAGE Alliance. The SAGE Alliance is a coalition of various organizations with one common goal, similar to ISPEC fighting against Indian Point. Activists from Vermont, New Hampshire and Massachusetts all participate in the campaign, due to Vermont Yankee's geographic location. Being in the southwestern corner of Vermont, the plan lies in close proximity to where the three state's borders meet. Vermont Yankee also attracts attention because it is on the Connecticut River, a river that travels through many New

England states before it reaches the Atlantic Ocean. The alliance is organized into regional groups, some of which include the Sierra Club Vermont Chapter, Beyond Nuclear, and VT Citizen Action Network (SAGE Alliance 2012: Who We Are). Below is a map displaying the large area in which activists are fighting against Vermont Yankee.



(SAGE Alliance 2012: Who We Are)

A major aspect of the SAGE Alliance's work is to organize events, mainly action and training events. Some examples of the action events that are planned for March 2012 are a mock evacuation walk and rally with legislators. These events are a part of the alliance's "March is Action Month" Program. Many organizations are eager to be very active in March of 2012 because March 21, 2012 is the day that Vermont Yankee's original license was to expire. Training events are crucial for the SAGE Alliance because the organization wants to train the activists in nonviolent means of protest.

The Sierra Club Vermont Chapter provides a great example of activism against Vermont Yankee through their efforts of lobbying. SC Vermont has lobbied on various

bills which have to do with Vermont Yankee's future. One of the biggest achievements of the chapter was from their efforts on S.289 (Permission for Entergy to Operate the Vermont Yankee Nuclear Plant Beyond 2012), the bill that decided if Vermont was to grant Entergy the "certificate of public good" needed for the continuation of Vermont Yankee's function. The Sierra Club lobbied heavily for Vermont Senate members to vote on the bill. They found success as the Senate voted against granting the certificate. In addition, the club established Safe Power Vermont, commonly referred to as SPVT. "SPVT has been energetically advocating AGAINST relicensing of VY" (Rydjeski, Eldredge 2010: Para 2). The Sierra Club is putting its best foot forward and addressing the issue through the political spectrum with lobbying.

Two other activist organizations that have become involved with Vermont Yankee are Greenpeace and Beyond Nuclear. The work done by Greenpeace falls more along the lines of rallies and events to spread awareness about the issue. One of their most notable actions to fight Vermont Yankee was in November 2010. The organization protested from the air in their blimp. On the side of the airship read a banner stating "SHUT DOWN VERMONT YANKEE." On that day in November, they flew in the area near the plant (Greenpeace 2010: Vermont Yankee Message). Beyond Nuclear also is notable for their efforts to plan events and rallies. Like the SAGE Alliance, Beyond Nuclear is campaigning March to be a month of action. On Beyond Nuclear's website, they are promoting "March Against Nuclear Madness." They are planning to participate in many events in conjunction with the SAGE Alliance directed towards the shut down of Vermont Yankee.

Adding to the many similarities that the cases of Indian Point and Vermont Yankee share, the largest advantage of the activists' fight is the common goal. In this case, it is to shut down Vermont Yankee. This commonality works to their advantage because the organizations have been able to effectively unite together. Even though court decisions have been made, it is important that the activists need to not give up if they want the fight end in their favor.

In the case of Vermont Yankee, Entergy again plays a large role of the side in favor of Vermont Yankee. On Entergy's website for Vermont Yankee, *safecleanreliable.com*, the main points the company presents are that the plant is safe, clean and reliable. Entergy also makes a point on the website that the plant's function helps employment by offering 650 local jobs. In addition, Entergy states that Vermont Yankee's function has saved their New England customers nearly $330 million dollars and simultaneously gained Vermont $100 million in economic benefits (Vermont Yankee 2012). But against, these bias positives are not enough to change many activists' opinion on the plant's future. Vermont Yankee may have some benefits, but they are clearly not enough to convince the thousands of activists that are against Vermont Yankee having a future.

If the decision regarding Vermont Yankee's future were to change, there has been some thought on alternative solutions. If Vermont Yankee were to be shut down, the state would need to plan a way to meet the 620 MWe that the plant produced. Like New York, a lot of thought and consideration has been given to renewables, specifically hydropower. The state of Vermont currently gets a portion of energy from Hydro Quebec, which provides hydroelectricity. Vermont would possibly inquire about increasing imports from

Hydro Quebec delivering clean and renewable energy to many Vermont residents (Jesmer 2010). But as in the case for Indian Point, time will only tell the future of Vermont Yankee.

With both cases of Indian Point and Vermont Yankee, it is apparent that the local citizens in the areas of these plants have an opinion about their function. Whether it may be for or against, what they believe is there and matters. The immediate future is going to be a very active time for nuclear power activism because the scenarios seen at both Indian Point and Vermont Yankee will continue to develop. In some sense what is occurring with Vermont Yankee currently might happen with the fight over Indian Point, if the NRC grants Indian Point an extension. But as stated before, the future of these two plants lie in the hands of the future and only time will tell what will occur.

Through the analysis of the anti-nuclear movement in the United States, there is an apparent difference between national and local activism. The most change has occurred on a local level. Until major United States national legislation occurs it will remain that way. Looking at the cases of Indian Point and Vermont Yankee, there is insight on the efforts. In the grand picture looking at the whole of the United States, the activism has not made that large of a difference, but on a local level activism can make a huge difference. When organizations are successfully able to stop the building of a plant, they are protecting the area from a potential nuclear disaster. No one saw Three Mile Island, Chernobyl, or Fukushima coming, and no one wants the plant closest to them to be the next major nuclear disaster site.

CHAPTER FOUR:
CONCLUSION- WHAT NUCLEAR POWER SHOULD BE

The study of nuclear power is very unique because nuclear energy is a topic that is able to affect various aspects of life. It can provide electricity to carry out everyday activities, while simultaneously it can pose a huge risk to human health. To fully understand it, one needs to look at the energy source through various lenses: a scientific lens, an economic lens and a social lens. In some sense nuclear power is an amazing scientific breakthrough because it defeats the problem of harmful carbon emissions that speed global warming. However, in another sense nuclear power is a horror as it can release radiation that can cause childhood thyroid cancer and leukemia. Due to the three major nuclear disasters we have seen, Three Mile Island, Chernobyl, and Fukushima, a negative stigma is often associated with the power source. These events have caused an emotional response, especially the most recent event, Fukushima. With the use of the Internet, people from any part of the world were able to see what exactly was happening in Japan. Rather than only reading the news, people were able to see the images with their own eyes. People were researching Fukushima, as demonstrated by Google Trends, discussed in Chapter Two. We could see photographs of the plant's explosions, distressed families forced from their homes, and workers going in to clean up the plant not knowing if they would be coming out. Images like these caused people to imagine what it would be like if they had lived near Fukushima themselves.

During such moments of disaster, morale about nuclear power is extremely low because people have lost faith in the power source. However, it is important to remember the big picture. In the end, every power source does have its negatives, even renewables. The burning of fossil fuels may be considered the worst, but it can be just as harmful, or

even worse than nuclear power. Huge nuclear power disasters may occur every twenty-five years and cause a huge stir, but the burning of fossil fuels and contamination of our environment happens every day. We must not forget about the destruction acid rain has caused to our environment. Even though polluting industries have undergone various technological advances to lower and clean their emissions with instruments such as filters and scrubbers, the pollution still has its effects harming some of the Earth's most precious carbon ponds. When comparing nuclear power to other energy sources, it seems that the over 30,000 annual coal emission deaths go ignored; and this does not include the of deaths caused from oil pollution (Graetz 2011: 92). Has forgetting the harmful consequences of the burning of fossil fuels caused our oil thirsty behavior to be perceived as acceptable?

A professor of mine brought up an interesting point, comparing views on nuclear power and transportation. The fear of flying is common because dying in a plane accident is considered to be much more tragic than dying in an automobile accident. This has caused people to have a huge fear of flying even though the chances of a car accident are substantially higher, and people drive their cars everyday. This relates to nuclear power because we fear the technology so much more than the burning of coal and oil. Even though thousands of deaths are caused by the of burning fossil fuels every year, people still have a huge fear of the very rare nuclear reactor accident. Before opinions can be made about nuclear power, is it essential those making an opinion are aware of all the aspects of the technology. Understanding nuclear power through the various lenses is the correct way to form an opinion. Through my research, I have found a lack in perspective of the large picture can sometimes occur (myself included).

Prior to writing this thesis, my own opinion on nuclear power was unformed, which largely is the reason I decided to explore the topic. Looking back at my time in Germany, and seeing the anti-nuclear movement, I wanted to understand why people felt the way they did about nuclear power. Even though Germany is beginning to phase out the power source, I do not believe it is something that the United States will be able to do, at least not in the near future. The demand for energy in this country is simply too high. Within that, we are too dependent on nuclear power to phase it out abruptly. Before any changes can be made with the energy sources we heavily depend on, change within the American culture needs to happen. It is essential Americans learn to conserve their energy and reduce demand. We should be ashamed that we have about 5% of the world's population and selfishly consume a large portion of the world's electricity. Americans are stereotyped as being wasteful and that needs to change.

The anti-nuclear movement in the United States has become a major element of the environmental movement of today. Because so many utilities are applying for license renewal or new plants, the efforts of the movement are very active. Over the course of the movement's history there have been many victories, however they are mostly at a local level, regarding stopping plans for a particular plant or changes in state legislation. A major accomplishment of the anti-nuclear movement has been education and raising awareness about the risks associated with nuclear power. These organizations work to inform people about the negativities, so that an educated opinion can be formed about the energy source. In addition, many organizations that focus on nuclear power also want to help to change American energy dependence. Lowering energy demand is a primary goal,

which will also help their fight against nuclear power because one day the demand for energy may not require it.

In the meantime, there are also crucial changes in American nuclear power policy that need to occur, if we want to see nuclear power in our energy future. Before further expansion of the source, the negatives associated with nuclear power must be addressed and approval for no new plants should be granted until that time. This is necessary because the more plants that get approved, the larger the problems with nuclear power are, particularly the waste issue.

The waste issue is the primary problem that needs to be changed. It is essential that research and development funds focus on nuclear power waste. It may not necessarily have to focus on exploring the potential to have a waste site at Yucca Mountain, but we do need to have a waste site, somewhere. This is essential even if nuclear power is phased out eventually because of the large amount of waste that has already been created. For the benefit and safety of the United State one secure spot for the radioactive waste is needed, but until a storage center is constructed we should not be adding to the pile. Another recommendation regarding nuclear waste is continuing research on the potential of fuel reprocessing. This would be beneficial because it would hopefully limit how much storage space would be needed, and require less uranium to be mined. It is hopeful that changes in the current state of nuclear waste are made because it will benefit those who are for and against the technology. It will give those who do not support nuclear power some sense of security because the waste will be stored in a single location, rather than in various spots throughout the country. Those who are in support of

nuclear power will also be put to ease, because the waste will have somewhere to go, and planning for on-site storage will not be necessary.

For nuclear power to have a secure and safe future, many policy adjustments need to be made within the Nuclear Regulatory Commission (NRC), focusing on regulations and monitoring. In order for the many Americans who are unsure about nuclear power to be more accepting, the NRC must be a much stricter government commission. One recommendation is uniform design. Uniform design would improve the industry because currently there are so many different designs. If all the plants in the United States were the same, it would be easier to improve the industry because engineers would be able to identify the changes that would be needed, and apply them to all the plants. Uniform plant design would allow for the industry to run smoother, which would help improve public opinion.

That being said, plant design in general needs to become stricter. Because of climate change, weather patterns have become more intense, and are likely to continue to do so. The warming of the Earth is causing more energy to exist within weather systems leading storms to be very powerful. Due to the potential intensity of weather patterns in the future, nuclear power plants must be prepared for them in order to prevent being damaged, more so preventing a nuclear disaster from occurring. Luckily, during the events of the nefarious Hurricane Katrina, Waterford Nuclear Generating Station was successfully shut down before the storm hit land. Waterford is located in Killona, LA about 25 miles west of New Orleans (NRC 2012: Waterford Steam Electric Station, Unit 3). During the spring of 2011 the concerns of flooding near the Fort Calhoun Station in Nebraska raised nervous feelings about nuclear power. Even though, everything turned

out to be okay, many precautions had to be made in order to ensure the safety of the plant, which brings in the need to strengthen the role of the NRC.

With regards to Fort Calhoun, after a study on the plant, the NRC mandated that the nuclear plant must take action to prepare in case a flood were to occur. Primarily the utility that owns the plant was hesitant to take precautionary measures as they felt the chances of a flood extreme enough to harm the plant was too rare, but the NRC stepped in and mandated changes. The plant was required to install pumps, flood barriers and watertight doors (PBS Frontline 2012: Nuclear Aftershocks). The pressures of the NRC in this case are an ideal example of what their regulation should be like, preparing for the worst, because in this case the worst did occur. Stricter regulations and precautionary measures need to be instilled because with the future of global warming, there is an increased chance of natural disasters causing a nuclear crisis.

Even though the NRC was successful at Fort Calhoun with protection against floods, there are many other potential natural disasters that still pose a large threat to numerous plants in the United States. With regards to earthquakes, regulations are not where they need to be. In the 1990s, the NRC conducted a study that concluded 27 reactors were considered under designed to withstand an earthquake, leading to the most disappointing point, being that the NRC "took no corrective action" (PBS Frontline 2012: Nuclear Aftershocks). However, on a positive note, some plant owners independently made the decision to take measures to appropriately upgrade the plant for seismic activity. The decision to upgrade by Virginia Electric & Power Co., who owns the North Anna Power Station, Units 1 and 2, in Louisa, VA (located about 40 miles northwest of Richmond), was particularly beneficial when a 5.8 magnitude earthquake struck the east

coast during August 2011 (NRC 2012: North Anna Power Station). Because of the upgrades in seismic protection devices, the plant was able to successfully withstand the earthquake whose epicenter was only 11 miles from the plant's location (PBS Frontline 2012: Nuclear Aftershocks). Even though the plant was safe, a large issue still exists with this example, being that the utility made these upgrades voluntarily, and not every plant owner is willing to do that. For a safe future, the NRC needs to require that plants are able to handle seismic activity, especially if the plant lies in an active zone. The NRC needs to make these rules, and if companies do not comply, the NRC should have the right to revoke the plant's license because they are putting citizens' lives in danger.

As time goes by, and the nuclear plants in the United States continue to age, it is essential that the NRC establish stricter regulations for upgrades. When plants age, the equipment becomes less safe and erodes, leading to higher risks of leaks or accident. A recommendation is that the NRC must require that utilities invest more into plant maintenance. With that, the NRC has to have a stronger enforcement to make sure adjustments are being made. Like safety regulation, maintenance regulations should be subject to fines, or license revocation. It may seem radical, but if a plant is deemed unsafe, the environment and people's lives are at risk.

With regards to license renewal, some changes should also be made. Primarily, the 20-year extension needs to be changed. Rather than guaranteeing the plants function for another 20 years, plants should be granted extension for a shorter time horizon, more like five or ten years. This is important because the shorter license lengths will require the NRC to review the plant more frequently, rather than giving it the "Okay" for another 20 years. Shorter horizons, will require more work from the NRC as plants will become

under review for license extension often, but it will likely lead to safer reactors as they will be routinely investigated. Alongside shorter horizons, local community participation with decision making needs to increase. Currently, the NRC often holds hearings where the local community can participate, which is a great. It is important that the local voices continue to be heard, and taken into consideration when the NRC is making a decision regarding a plant's license renewal or construction.

Ensuring the safety of the American people is one of the NRC's main goals, which needs to continue. Safety is largely considered with the function of the plant, but must also be considered in of the event that a disaster were to occur. It is essential that for every plant, a feasible and reliable disaster evacuation plan must exist, especially in urban areas where large populations live within 50 miles of the plant. With regards to populations being at risk, no new plants should be constructed in an area with such vulnerability. It is essential that if there are new plants to be constructed in the future they are placed in rural area. Even if building new transmission lines are required, this is essential because the protection of human life is more important.

Through my research I have been able to analyze the many costs and benefits of nuclear power leading for my view on the power to be at a midpoint. Even though I evidently feel there are many things that need to be changed, I do recognize the power source is reliable and helps our air quality, as it virtually has no emissions. However, the risks it does pose cannot be ignored, leading to my view being that the United States should not build any new plants until a place for waste is established, and a uniform, efficient, and safe design is available. With that, because we do have a dependence on the power, plants that currently are functioning should function until their licenses expire.

The plants that are close to expiration at this time should have license renewal, if the energy they provide is a source depended on by many people. License extension for these plants should be about five or ten years giving time for development of alternative energy sources, so that by the time the plant goes offline, the new source to feed the demand will be in place. If the waste problem is effectively addressed during that five to ten year period, and maintenance of plant updates have been done, the plant should resume function. I do have faith that nuclear power can have a future, but only if changes and new developments are made which address the problems with the technology we see today.

With regards to Indian Point, I do not believe the plant is ready to be shut down, due to high demand of electricity from New York City and Westchester. If I can be proven wrong in that there is a plan out there that will appropriately fill the 2000 MWe of electricity that Indian Point produces, then I believe the reactors should be shut down in 2013 and 2015. I do believe that a plan can and will be created to meet the demand, but I do not believe it will successfully be in place at the time of license expiration. It would be beneficial if the NRC moved away from the traditional 20- year extension and gave Indian Point a ten-year extension. In a way, this would "buy the time" to have an alternative to Indian Point put in place within ten years. Given its location, I believe Indian Point does pose too high of a risk to the millions that live in the tri-state area and it should be turned off line within ten years, at the latest.

Vermont Yankee is an entirely different story as it is located in Vermont where the population is much smaller than that of the metropolitan New York. I believe that Vermont Yankee should be turned off for various reasons. Primarily, the majority of

people in Vermont are not in favor of the plant's function. Entergy, who is based out of Louisiana, is the one who primarily wants Vermont Yankee to continue function for business purposes, as displayed in their lawsuit with the state. Because Vermont Yankee is responsible for 620 MWe, I feel meeting alternatives for the plant is much more feasible, when compared to the 2000 MWe Indian Point supplies. If the State of Vermont decides to appeal to decision by Judge J. Garyan Murtha, that will give hope to the many Vermont residents and myself who are in favor of the plant's shut down.

Nuclear power has not been around for that long of a time, but it does have an exceedingly rich history. As demonstrated in this thesis, nuclear power has always been a subject in the news and political debate due to its controversial characteristics. Over the past half-decade, different politicians have had varying ideas of the role nuclear power should play. Differing views have most recently occurred with comparisons of the Bush administration and the Obama administration. Nuclear power played a dominant role in President Bush's energy plan, whereas President Obama is much more hesitant with the energy source. Along with politicians, American citizens also have input on the energy source as investigated in Chapter Two. Location, gender, and political affiliation are common factors that often shape one's opinion on nuclear power. For those who are opposed to nuclear power, the anti-nuclear movement in America has developed and had many successes in stopping plants from being built.

The controversy surrounding nuclear power is going to continue to grow in the United States. With oil reserves depleting, increased negativity surrounding coal, and doubts about the reliance of alternative energy, nuclear power is going to be heavily considered. As I have stated before, nuclear power is still relatively young, so it will be

interesting to see what occurs with the future of the power source. With regards to Indian Point and Vermont Yankee, it will also be interesting to see what will happen. Will the State of Vermont appeal? Will the NRC grant Indian Point an extension? These are all questions that will be answered in time. Until then, we shall wait and continue to educate others and ourselves about nuclear power because one day we may be faced with a nuclear disaster of our own.

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