Competition and the Electric Utility Industry: An Evaluation

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Electric utilities have historically been granted monopoly franchises to take advantage of the cost benefits of centralized production. In return for the monopoly franchise, the utility gave the state the right to regulate price and quality of service. In recent years, many have begun to question whe-ther cost advantages of centralized production continue to exist in the electric utility industry. Legislation has been proposed that would deregulate the industry and allow greater competition.

This article argues that cost benefits of centralized production continue to exist in the electric utility industry. Even if scale economies are exhausted in electricity generation, as some argue, that fact alone would not mean the absence of natural monopoly. The electric utility industry continues to be a natural monopoly because of the benefits of economies of scope and vertical integration. The authors conclude that although some problems may exist with regulation in the electric utility industry, deregulation is not the answer. These problems are better solved through various alternative reform proposals than through radical restructuring of the industry.

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Introduction

For most of the twentieth century investor owned electric utilities (IOUs) have been regulated by state regulatory commissions with the authority and responsibility to balance consumer and stockholder interests. Typically IOUs were granted monopoly franchises[1] within their service area because centralized production of electricity was believed to yield lower unit cost. In return, the monopolist gave to the state the right to restrict profit rates, regulate the price of the service, and veto investment decisions of the firm. All of this would occur in an environment of a prescribed level of service quality.

In the late 1970s the practice of monopolist IOUs was disrupted. As the public began to perceive a worldwide "energy crisis," Congress and the President took a number of steps to respond to this problem. The Public Utility Regulatory Policy Act of 1978 (PURPA) was one such Congressional response.[2] PURPA marked the beginning of a radical change in the status quo

1. Utilities receive certification from a regulatory commission that the monopoly grant received is "for the convenience and necessity of the public." In the parlance of regulation, they receive a "certificate of convenience and necessity," also called a CCN.

2. 16 U.S.C. § 2602 (1988).

for IOUs and electric utilities in general. Partially as a response to rapidly rising input prices, PURPA attempted to encourage fuel conservation as well as more efficient pricing by, in effect, relaxing restrictions on entry into the former monopolist's service area.

There are at least two schools of thought that purport to justify easing entry restrictions: (1) the cost advantages of centralized production technology have been exhausted; and (2) typical rate of return regulation is inefficient. Moreover, implicit in these justifications is the notion that restructuring the industry so that traditional regulation will no longer be necessary is less costly and more politically palatable than merely altering the traditional form of regulation. For example, in October of 1992 Congress passed the Comprehensive National Energy Policy Act of 1992 (CNEPA) to restructure the industry by facilitating entry.[3] Title VII of this law amends the Public Utility Holding Company Act (PUHCA)[4] and creates a new class of electrical generators called Exempt Wholesale Generators (EWG). The "exempt" status releases EWGs from certain corporate prohibitions under PUHCA as administered by the Securities Exchange Commission. The law facilitates the establishment of independent power generating stations by Independent Power Producers (IPPs) and electric utilities.

The new law further reforms PURPA's restriction on entry of electric utilities into the non-utility generating sector of the market. PURPA originally established a class of non-utility generators called "qualifying facilities" (QFs). If a generating facility met certain technical definitions of thermal efficiency, it could become a QF. A facility's primary product must be something other than electricity in order to qualify for QF's non-utility status. The local electric utility would be required to purchase excess power generated by the QF at rates based on the utility's avoided cost[5] as specified by the state regulatory commission. However, definitions of "public utility" under PUHCA restricted the entry of electric utilities into the non-utility generating sector of the market. Under CNEPA, utilities can now own EWGs, and even purchase power from affiliated EWGs. Perhaps more important given the new class of generators, title VII gives the Federal Energy Regulatory Commission (FERC) authority to require a utility to transfer power from an independent generator to another utility.[6]

It is fairly certain, with the adoption of the new law, that the pressure to compel transmission access and mandatory transfer of electric power between utilities (mandatory wheeling) will become intense. Indeed, the Federal Energy Regulatory Commission (FERC) has not been idle on the issue of competition. In a series of decisions concerning mergers and market based pricing, FERC

3. Pub. L. No. 102-486, 106 Stat. 2776 (1992).

4. 15 U.S.C. § 79 (1988).

5. Avoided costs are the incremental costs not incurred by the utility as a result of purchasing the QF's excess power.

6. This is referred to as "wheeling" power.

has indicated its intention to compel competition in generation and to open access to utility transmission lines.[7]

Ironically, all of these legislative and regulatory activities, combined with the turmoil in the utilities industry, the resultant social transactions costs, and uncertainty for investors and industrial planners come after a period when the actual experience is rather different than the perception of energy crisis. The real price of electricity between 1970 and 1982 increased only 52.5%, and has decreased since 1982, so that in 1990, it stood only 25% above the 1970 figure. In the same period, the real price of natural gas increased 238%, crude oil 122%, and coal 55%.[8]

In this article, we will consider if and when electric utilities should still be considered natural monopolies. We will further address the nature of the markets for electricity that are likely to evolve in the EWG environment, and provide an outline of the reforms that might take place within traditional regulation that provide reasonable alternatives to radical restructuring.

Part One provides an economic definition of natural monopoly in the single product firm, discusses the nature of economic efficiency in this context, and presents an overview of empirical research questioning the exhaustion of scale economies. Part Two points out that electric utilities are multiproduct firms and that the criteria for natural monopoly for multiproduct firms are quite different than for single product firms. The case for the continued existence of natural monopoly in this industry is even stronger in the multiproduct context. Part Three discusses "weak" natural monopoly, a condition in which the cost conditions required for natural monopoly remain, but in a context in which the monopolist, absent assistance, cannot defend itself from market entry.

Part Four explores economies of vertical integration. We analyze why the electric utilities vertically integrate initially and the benefits of this arrangement. Part Five considers the costs and benefits that plausibly may derive in an expanded EWG environment and the precise circumstances that must exist for the touted benefits to arise. Finally, Part Six presents alternatives both to a continuation of traditional regulation and to radical restructuring.

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7. *See, e.g.*, Public Service Company of New Mexico, 52 F.E.R.C. ¶ 61,068 (1990); Nevada Sun-Peak Limited Partnership, 54 F.E.R.C. ¶ 61,264 (1991); Utah Power & Light Co., 45 F.E.R.C. ¶ 61,095 (1988); Northeast Utilities Service Company, 53 F.E.R.C. ¶ 63,020 (1991).

For summary observations on FERC guidelines see Bernard W. Tenenbaum and J. Stephen Henderson, *Market-Based Pricing of Wholesale Electric Services*, ELECTRICITY J., Dec. 1991, at 30.

8. 1990 DEPT. OF ENERGY ANN. ENERGY REV. 155, 179, 199, 225 (calculated from Table 100, Retail Prices of Electricity Sold by Electric Utilities 1960-1990; Table 88, Coal Prices, 1949-1990; Table 80, Natural Gas Prices by Sector 1967-1990; and Table 70, Crude Oil Refiner Acquisition Costs 1968-1990).

I. The Single Product Natural Monopoly

In this Part we provide a general economic definition for natural monopoly and discuss the implications of that definition for the single product firm. Furthermore, we clarify the efficiency conditions which are implied by such a definition and present an overview of empirical work analyzing the extent of natural monopoly for the single product firm in the electric utility industry.

A. *Natural Monopoly Defined*

A natural monopoly exists when a single firm can produce a desired level of output at lower total cost than any output combination of more than one firm. This is the condition that William Baumol called subadditivity.[9]

> [Subadditivity] surely, is what anyone has in mind, at least implicitly, when speaking of a monopoly's being "natural," and that is what economists were undoubtedly groping for when they (as it turns out, mistakenly) identified natural monopoly with economies of scale.[10]

The issue of economies of scale arises because such a cost condition is a sufficient but not necessary condition for natural monopoly in the single product firm. A single product firm exhibits economies of scale if its longrun average cost function is decreasing. While it is true that a production process which exhibits economies of scale is subadditive at that output level, a production process may also be subadditive even though it exhibits increasing average cost.[11]

It is a stronger condition to require decreasing average cost than to require only that costs be subadditive while allowing for increasing average cost. A firm that exhibits decreasing average cost is called a strong natural monopoly. A firm that exhibits increasing average costs but whose costs are subadditive is a weak natural monopoly.

A weak natural monopolist may not be able to prevent another firm from entering the monopolist's market and taking away a portion of the sales. However, because costs are subadditive, society may prefer a single firm producing that output rather than a multiplicity of firms producing the same

9. William J. Baumol, *On the Proper Cost Tests for Natural Monopoly in a Multiproduct Industry*, 67 AM. ECON. REV. 809 (1977).

10. WILLIAM J. BAUMOL ET AL., CONTESTABLE MARKETS AND THE THEORY OF INDUSTRY STRUCTURE 170 (1982).

11. For a formal proof, see SANFORD V. BERG & JOHN TSCHIRHART, NATURAL MONOPOLY REGULATION: PRINCIPLES AND PRACTICE 22-24 (1988).

output. To fulfill this societal preference, the regulator must prevent entry into the weak natural monopolist's market, and, of course, regulate price.

B. *Efficiency Requirements in Strong Natural Monopoly*

Economic theory insists that efficiency is achieved when prices equal incremental cost. However, a strong natural monopolistic firm, whose incremental cost is less than its average cost, is not viable when prices equal incremental cost. It is necessary to allow the strong natural monopoly to recover at least the average cost of the product. This may, however, cause additional inefficiency, such as when the economically "incorrect" signal is sent to consumers.

How can we achieve the greatest efficiency possible in the presence of an overriding revenue constraint combined with economies of scale? Baumol and Bradford seek to answer this question by analyzing the implications of the "Ramsey Rule" for allocative efficiency.[12] The Ramsey Rule maximizes well-being subject to a break-even constraint,[13] choosing the set of prices which minimize distortions in output. The most efficient solution possible is one in which those consumers who have the fewest alternatives, that is, relatively low demand elasticity, receive the greatest mark-up over marginal cost. Consumers who have the greatest number of viable alternatives, that is, relatively high demand elasticities, receive the smallest mark-up over marginal cost.

Determining what prices are efficient also may be affected by the growth of firms which employ greatly differing technologies to provide services which can be viewed as imperfect substitutes for one another.[14] This condition is referred to as intermodal competition. For example, allowing a gas-fired EWG into the market of a coal or nuclear based utility might be considered intermodal competition.

Ronald Braeutigam analyzes efficient pricing where there is intermodal competition. Braeutigam uses the model in which railroads offering freight transportation services are the strong natural monopolist and motor and water carriers are competitive industries offering different modes of services that are close substitutes for rail transport. With the alternative modes of service, the demand elasticities for each customer class facing the regulated firm will be

12. William J. Baumol & David F. Bradford, *Optimal Departures from Marginal Cost Pricing*, 60 AM. ECON. REV. 265 (1970).

13. Economy-wide well-being is given a mathematical specification to be maximized. But this maximization problem is constrained by an additional specification that the utility firm's total revenues must equal its total expenses. The constraint, given economies of scale, prevents the "first-best" result, i.e., price = incremental cost. The Ramsey Rule is a "second best" result.

14. Ronald R. Braeutigam, *Optimal Pricing with Intermodal Competition*, 69 AM. ECON. REV. 38, 40 (1979).

affected. From the perspective of the regulated firm, Ramsey prices are now efficient only if firms providing the close substitutes adhere to them as well. Otherwise the competitive nature within these firms in the other industries drives price down to marginal cost, and the set of Ramsey prices charged by the regulated firm is no longer desirable.[15]

Braeutigam's result suggests that in order to insure allocative efficiency the regulatory body must regulate all rival firms as well. The recent push for competitive entry into utility generating markets may, therefore, require an even greater expansion of regulation in order to obtain efficient outcomes.

C. *An Overview of Empirical Investigations*

Whether electricity generation is a natural monopoly has been questioned because electricity generation may have exhausted scale economies. Economies of scale are exhausted in the single product firm if production costs rise as fast or faster than output. Since the range of cost subadditivity extends beyond the point at which economies of scale are exhausted, the absence of scale economies does not necessarily indicate the viability of competitive firms. In examining the cost characteristics of electric utilities in the U.S., Christensen and Greene, for example, have concluded that economies of scale in electric generation continue to exist up to about 4000 megawatts (MW) of capacity.[16] Focusing on firm-level rather than plant-level economies of scale,[17] these economists found there were 180 IOUs possessing their own generating capacity in the U.S. Of these, approximately fifty-five percent had generating capacity of 2000 MW or less, well within the estimated range of declining average costs. Only twenty percent possessed over 6000 MW of capacity, the condition in which Christensen and Green estimate average costs are constant to slightly rising.[18]

The patchwork quilt of regulation and the regional development of electric utilities in the U.S. has created many firms that are too small to benefit from economies of scale, and therefore, probably will fail. Thus, free entry would be expected to decrease the number of utilities.

Atkinson and Halvorsen adjust for the possible existence of an over-capitalization bias[19] and conclude that scale economies continue to exist at the firm-

15. *Id.* at 38-48.

16. Laurits R. Christensen & William H. Greene, *Economies of Scale in U.S. Electric Power Generation*, 84 J. POL. ECON. 655 (1976).

17. Plant-level economies of scale involve those economies which are exclusively associated with the operation of a single production plant. Firm-level economies involve the additional economies associated with operating several plants under one management. Such additional economies include coordination and scheduling, downtime maintenance, spinning reserve, for example.

18. Christensen & Greene, *supra* note 16.

19. According to the Averch-Johnson hypothesis, because utilities may earn income for stockholders only on capital invested in plant and equipment, they may utilize an inefficiently large amount of capital to produce a given amount of output. Harvey Averch & Leland L. Johnson, *Behavior of the Firm Under*

level up to 12,000 MW of capacity.[20] Nelson and Wohar could find no evidence that economies of scale diminished at all as average firm size in the U.S. increased between 1950 and 1978.[21]

On plant level economies of scale for electricity generation, Joskow and Schmalansee observe:

> On average the industry's existing capital stock for generation. . . does not appear to embody full exploitation of available plant-level economies of scale. . . . In any case, over time, as old plants are replaced by efficient new ones, we can expect a substantial increase in plant-level concentration in bulk power markets. Competitive problems associated with deregulation may thus worsen over time as the generation capital stock turns over.[22]

Joskow and Rose cite evidence that a doubling of capacity on subcritical coal-fired units from 350 to 700 megawatts lowers unit per megawatt costs of construction by 20%.[23] In contrast, average plant availability declines from about 76% to about 67.6%, representing an average availability decline of only about 11%.[24]

In the primary coal technology, then, scale economies in construction are not outstripped by availability problems on plants with capacity of up to 700 megawatts. Plants with even as little as 500 megawatts capacity are not small plants. "Mom and Pop," ready-to-enter-any-market operations are far from being able to benefit from the scale economies available for base load technology. FERC's Office of Economic Policy Staff (OEP) report indicates that average non-utility capacity was approximately forty-one megawatts.[25]

Regulatory Constraint, 52 AM. ECON. REV. 1053, 1053-1069 (1962).

20. Scott E. Atkinson & Robert Halvorsen, *Parametric Efficiency Tests: Economies of Scale and Input Demand in U.S. Electric Power Generation*, 25 INT'L ECON. REV. 647 (1984).

21. Randy A. Nelson & Mark E. Wohar, *Regulation, Scale Economies, and Productivity in Steam Electric Generation*, 24 INT'L ECON. REV. 57 (1983).

22. PAUL L. JOSKOW & RICHARD SCHMALANSEE, MARKETS FOR POWER: AN ANALYSIS OF ELECTRIC UTILITY DEREGULATION 54 (1983).

23. Paul Joskow & N.L. Rose. *The Effects of Technological Change, Experience, and Environmental Regulation on the Construction Cost of Coal-Burning Generating Units*, 16 RAND J. ECON. 1, 19 (1985).

24. *Id.* at 23.

25. OFFICE OF ENERGY POLICY, F.E.R.C., REGULATING INDEPENDENT POWER PRODUCERS: A POLICY ANALYSIS 28 (1987) (unpublished staff paper). The 41 MW number was computed from figures cited in the report as follows: 17313 MW/ 380 facilities = 45.6 MW per facility; 1761 MW / 40 facilities = 44 MW per facility; and, 3390 MW / 126 facilities = 26.9 MW per facility. A weighted average of these various (non-exclusive) observations is 41.1 MW per facility.

The point is simply that existing and proposed non-utility generating units do not even begin to achieve a size which would permit the existence of scale economies.

D. *Conclusions Regarding the Single Product Natural Monopoly*

In short, a large body of evidence indicates that the electric utility industry has not exhausted economies of scale. Regulators cannot justify a policy to encourage entry into the electric utility industry solely on the basis that economies of scale in generation have been exhausted.

Our conclusions from the arguments advanced in this Part may be summarized as follows:

(1) Economies of scale is a sufficient but not necessary condition for natural monopoly in the single product firm;

(2) Intermodal competition with a strong natural monopolist may not necessarily be efficient, and in any event may require an expansion of regulation, not a contraction thereof;

(3) While empirical evidence is conflicting, there is a substantial body of empirical literature indicating that economies of scale have not been exhausted in any but the very largest electric utilities in the U.S.

II. The Multiproduct Natural Monopoly

In this Part we introduce the notion of the multiproduct firm and explore the cost conditions under which multiproduct firms are natural monopolies. Next we consider the vertical integration of electric utilities in the context of their multiproduct nature. The integrated nature of electric utilities internalizes various externalities. Finally, we consider how horizontal integration promotes an efficient multiproduct service.

A. *Natural Monopoly and Economies of Scope*

The electric utility industry is likely to be a multiproduct natural monopoly. In the previous Part we stated that the existence of economies of scale is a sufficient but not necessary condition for natural monopoly in the single product firm. Likewise, in a multiproduct industry, economies of scale are unnecessary for the natural monopoly condition. Electric utilities supply a wide variety of services including varying proportions of generation, transmission and distribution of various voltages, reliability and load stability. With multiple outputs, economies of scale are neither necessary nor sufficient to create a natural monopoly.[26] A firm is a natural monopoly even if it experiences increasing unit costs for each output in isolation, so long as it experiences decreasing total costs when coordinating the production of all industry services. Economies of scope exist if it is less costly to produce a given combination of outputs in a

26. WILLIAM SHARKEY, THE THEORY OF NATURAL MONOPOLY 66 (1982).

single multi-product firm than to produce the same level of each of the distinct outputs in respective specialty firms.

Preliminary research on economies of scope indicates that cost may decrease from vertical integration. Frank Gollup and Stephen Karlson, as well as Alan Finder, estimate multiproduct cost functions by separating output into wholesale, industrial, commercial and residential services.[27] Both studies find strong evidence of natural monopoly for even the largest of IOUs.

A multi-product firm becomes a natural monopoly when economies are realized by joint production. It is "jointness" that distinguishes multi-product from single-product natural monopoly. Examples of factors that may contribute to economies of joint production are specialization and indivisibilities in inputs. That is, there are economies of jointness in coordinating production activities within a single firm. Berg and Tschirhart add that:

> Here, we would expect that two (or more) outputs could share an accounting, marketing, or other administrative department and incur less cost than if each output utilized a separate department. Or, there may be some externality that becomes internalized when two (or more) outputs are brought into the same production process. Producing beef and cowhide is one classic example of shared inputs, and daytime and nighttime uses of electricity provide another example.[28]

Electric utilities provide a variety of services. A power system maintains equilibrium by balancing the amount of the power demanded and the amount of the power generated. Failure to maintain this balance at any instant can result in system failure. This necessity for continuous balancing requires vertical coordination, which creates an externality. The externality stems from the fact that decisions made at any stage dramatically can affect system viability and reliability.

B. *Vertical Integration and the Problem of Externality*

An externality exists if a firm engages in an activity without incurring the full cost or enjoying the full benefits of its consequences. The standardization of equipment and materials, the coordination of production activities and the pooling of facilities all create positive externalities. Institutional arrangements that force a firm to bear the full costs imposed on other firms or that allow the

27. Frank M. Gollup & Stephen H. Karlson, Returns to Scale in Multiproduct Firms: An Application to the Electric Power Industry (1980) (unpublished working paper, on file with Social Systems Research Institute, University of Wisconsin-Madison); Alan E. Finder, Empirical Tests of Cost Subadditivity in the Investor Owned Electric Utility Industry (1984) (unpublished Ph.D. dissertation, Indiana University).

28. BERG & TSCHIRHART, *supra* note 10, at 42.

firm to realize the full benefits it renders to other firms are said to internalize the externality. With vertically integrated electric utilities, internalization is ensured because the single firm bears all of the consequences of each activity. Vertically deintegrating the generation, transmission and distribution functions among a multiplicity of firms, while maintaining current levels of system reliability and stability, increases the number of firms owning the components of the system as well as the diversity of interests among these firms. In such a case internalization is no longer guaranteed and the transactions costs associated with coordination via contractual agreements would increase.

Perhaps the most crucial potential externality the EWG environment will create in the electric utility industry is loop flow. As between any two nodes on a transmission grid, assuming they are the only two interconnected positions, power flows smoothly so long as generation reductions at the receiving node match the increases at the sending node and there is no, *ceteris paribus*, changes in electricity demand. Two contracting parties will contract for an exchange in power at the rate required by demand conditions. In such a case, any difficulties in transmission facilities can be negotiated between the contracting parties. Potential externalities are internalized by the contract. However, such a contract requires assumptions that are altogether too simple in today's complex system of interconnections in which power is not exchanged between a receiving node and a sending node that are uniquely connected. The electric connection system in the U.S. is therefore accurately described as a grid system. Contiguous utility systems are connected together in relationships, with few exceptions, that involve greater than paired transactions. A transaction between any two parties virtually always involves a third party or parties.

Unfortunately, as one professor of electrical engineering has observed, electricity will follow the laws of physics, not the law of the land.[29] Ohm's Law indicates that electricity will move along the path of least resistance (impedance). Thus, power flows over transmission lines which are not part of a transaction. This is an externality. The third party may be forced to rearrange its interchanges of electricity or build additional transmission capacity in order to protect itself from contractual flows of power to which it is not a party, nor derives any benefit.

The problem of loop flow can be substantial. A FERC publication, *Power Pooling in the Western Region*, makes the following observations:

> Recent loop flows in the 300-600 MW range measured between the RMPP [Rocky Mountain Power Pool] area and the Arizona-New Mexico systems have been common. The increasing clockwise loop flows are now and will

29. William H. Kersting, Does the Physical Infrastructure Exist?, Remarks at the Conference of the Center for Public Utilities at New Mexico State University: Deregulation of Electric Generation: Is It Time? (September 1986).

> continue to adversely affect the transmission system in the southern part of the RMPP area and the ability to export economy coal-fired energy to replace southwest oil-fired energy. No practical solution to this problem exists. . . . However, as the growth of RMPP Area coal-fired generation increases to serve firm northwest loads, the clockwise loop flow problem will continue to increase. Possible solutions include the opening of tie lines and the installation of phase shifting transformers. However, none of these solutions appears appropriate at present from an inter-connected standpoint.[30]

Prevention of loop flow is possible from an engineering standpoint. But preventive measures require the expenditure of millions of dollars on such equipment as high voltage DC interties as well as additions to transmission capacity. These investments are specific to the original transaction for which they were intended and are therefore sunk costs. Aside from the fact that such sunk costs constitute virtually impenetrable barriers to entry into a market, they also represent additional substantial sums of money that must be added to the cost of the changes the new law seeks to implement.

The fact that EWG contracts are voluntary does not mitigate the loop flow problem. The RMPP grid is a voluntary system of interconnections. Recently, a utility receiving power from Palo Verde Nuclear Generating System (PVNGS) built a new transmission line with which to receive power from PVNGS. An interconnected utility disputed the power flows asserting that it would have to invest money in transmission protection because of loop flow. The interconnected utility's objection was ruled correct in arbitration. Yet, the original contract was voluntary. The proposed EWG environment will not simplify this problem.

Incremental modifications in legislation clearly will lead to mandatory transmission access. As more players enter the market, the demand for additional legislation to give EWGs even greater access to the utilities transmission grid is likely to become irresistible. Moreover, one might speculate that in an expanded EWG environment an extension of the anti-monopoly leveraging doctrine announced in the *Otter Tail Power* case[31] could lead to courts ordering mandatory wheeling without waiting for new legislation or FERC's case by case approach to reach the same conclusion.

Vertical coordination between generation, transmission and distribution may also create cost savings at the planning stage, through the timing of needed

30. WESTERN REGIONAL TASK FORCE, F.E.R.C., POWER POOLING IN THE WESTERN REGION 89 (1981).

31. Otter Tail Power v. U.S., 410 U.S. 366 (1973). Otter Tail Power Company was a Minnesota generating and transmission utility serving a variety of distribution utilities. When a town sought to end its purchase contract and requested Otter Tail to wheel power purchased from another utility, Otter Tail refused. Otter Tail was convicted of a Sherman Act §2 violation. The Court found that Otter Tail was attempting to "leverage" legitimate monopoly power over the transmission facilities into a market over which it had no legitimate monopoly, power generation.

investments and during operation, by the scheduling of maintenance and the use of energy interchange to meet a given demand with less capacity connected to the load.

C. *Economies in Horizontal Integration*

Horizontal integration may create lower costs by increasing load diversity and lowering the total required amount of reserve capacity (where different utilities may peak at different times of the year or day). Power pools provide this type of coordination. Generally the biggest single benefit of pooling is the reductions in reserve generating capacity, but economic dispatch has proven to generate large savings as well. As Gegax and Tschirhart point out:

> Utilities maintain generating capacity in operating reserve status to meet unexpected increases in demand, equipment failures, and maintenance. The level of reserves needed depends primarily on the size of on-line generating units and the loss-of-load probability the utility wants to achieve. An isolated utility may determine that a particular level of reserves is needed to meet the risk of excess demand; but this level can be reduced through coordination, since the risks confronted by two or more coordinated utilities are less than the sum of risks confronted by the utilities in isolation.[32]

Gegax and Tschirhart also point out that many large utilities in the U.S. are able to avoid power pooling because they can achieve economies of horizontal integration without incurring contracting and coordination costs with neighboring utilities.

D. *Conclusions Regarding the Multiproduct Natural Monopoly*

The arguments above allow us to arrive at the following conclusions regarding multiproduct natural monopoly:

(1) The multiproduct nature of integrated electric utilities yields economies of scope. Economies of jointness in electric utilities are likely to be sufficient to yield natural monopoly status;

(2) The multiproduct nature of the electric utility industry obviates the need to make reference to economies of scale, irrespective of whether they have been exhausted;

32. Douglas Gegax & John Tschirhart, *An Analysis of Interfirm Cooperation: Theory and Evidence form Electric Power Pools*, 50 S. ECON. J. 1077, 1079.

(3) Vertical integration in the electric utility industry contributes to the industry's ability to simultaneously produce an efficient level of output and to internalize the problem of loop flow;

(4) Horizontal integration in the electric utility firms enables industry to reduce the total cost of output-cum-reliability by allowing firms to reduce reserve capacity per unit of output.

III. Unsustainable Monopoly Markets

In this Part we further develop the concept of weak natural monopoly with emphasis on the facts that (a) a "weak" natural monopoly is still a natural monopoly, and asset duplication is inefficient for society, (b) a "weak" natural monopoly is consistent with observed entry, and (c) maintenance of such a monopoly requires absolute entry deterrence.

A. *The Nature of an Unsustainable Market*

A weak natural monopoly with constant or increasing long-run average costs is likely to be able to produce additional output under conditions of economic subadditivity. Pricing at marginal cost will yield economic profits that invite either entry by a similar firm or intermodal competition. Allowing such entry, however, would be uneconomical and a waste of society's resources.

Ed Zajac explains one circumstance of vulnerability which is possible for the efficiently pricing monopolist.[33] In such a condition of vulnerability, Zajac proves that no matter how a firm apportions the required revenue among customer classes, some classes will contribute in excess of their respective stand-alone cost. These classes have an incentive to purchase service from a rival firm. Ramsey prices would be unsustainable. Such a firm must have its market protected in order to benefit from cost subadditivity, even when the firm is charging theoretically efficient prices. The existence of entry into an industry simply does not mean that the entry is efficient.

B. *Unsustainability and Power Markets*

Allowing entry into monopoly markets drives up the overall average cost of generating and selling electricity. A utility provides not only current to a line, but also current which has some high probability of being there when it is needed. A utility builds generating plant and transmission plant to achieve some required level of reliability. There are two products: power and reliability.

33. EDWARD E. ZAJAC, FAIRNESS OR EFFICIENCY: AN INTRODUCTION TO PUBLIC UTILITY PRICING 78-80 (1978).

Utilities maintain generating capacity in operating reserve status to meet unexpected increases in demand, equipment failures, and maintenance. The level of reserves needed depends primarily on the size of on-line generating units and the loss-of-load probability the utility desires to achieve. The level of reserve capacity needed to meet excess demand or equipment failure with high levels of reliability is not trivial. Typical levels of reserve capacity range between 15 and 30 percent of on-line generating capacity.

A firm may generate some level of power, equivalent to what the utility is selling to any customer, at a lower apparent cost than that incurred by the utility. However, such a firm is entering only the market for power, without providing for reliability. The utility could be required to provide reliability not only for the power it produces itself, but also for power the new entrant produces. The irony is that, in such an event, the utility's costs per unit of power provided is likely to increase, due to the additional facilities required to be built to provide reliability for the entrant's production. Additionally, the utility absorbs the financial risk associated with the EWG and consequently will be penalized in securities markets. In such a case, the utility would ask for an increase in its allowed rate of return and in prices.

In contrast, if the utility had acquired the additional facilities internally, although additional reserve capacity would be necessary as well, coordination in facilities planning would reduce the overall cost of the bundle.
CNEPA, by creating EWGs exacerbates the problems faced by the utility in maintaining reliability to the extreme. For example, the Texas Industrial Energy Consumers have recently persuaded the Texas Public Utilities Commission to consider requiring utilities to wheel power to retail customers.[34]

The additional problem is that after the new entry, the utility's costs look even worse, thus inducing even more entry. Such a situation can be handled easily by requiring the entrant to bear the cost of a given level of reliability for the power it generates. Indeed, FERC has recently allowed utilities to seek complete cost recovery for upgrading facilities necessary for wheeling from the requester.[35] In fact, if the costs of providing for reliability had been evaluated previously when considering the so-called efficiency of the QFs and PURPA machines,[36] the EWG would not receive the existing level of enthusiasm.

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34. Fortunately, this practice is prohibited under the existing PUHCA reform provisions of Title VII of the Comprehensive National Energy Policy Act.

35. *See, e.g.*, Entergy Services, 58 F.E.R.C. ¶ 61,234. But see Northeast Utilities Service Company, 53 F.E.R.C. ¶ 65,020, in which obtaining such cost reimbursement will probably require a formal hearing to establish whether or not the entrant is indeed responsible for reliability costs.

36. A "PURPA machine" is a QF which would not exist except by virtue of the requirement that a utility purchase the power it creates. Such QFs are totally in contravention of the idealistic and optimistic purposes of the Public Utilities Regulatory Policy Act of 1978.

C. *Conclusions Regarding Unsustainable Monopoly Markets*

A firm may possess a considerable range of future output expansion while remaining in a range of cost subadditivity despite having exhausted scale economies. Society benefits by maintaining the firm's monopoly. These monopolies cannot prevent uneconomic entry into the market, however, without protection by society.

IV. Transactions Costs and the Vertically Integrated Firm

Vertical integration eliminates or conserves transactions costs. Almost every activity engaged in by vertically integrated utilities today, however, is also performed by vertically deintegrated firms. Why, then, is vertical integration necessary?

Oliver Williamson says "[t]ransaction costs are the economic equivalent of friction in physical systems."[37] Transaction costs include problems such as market uncertainty, the quantity of trading partners, and human factors such as bounded rationality and opportunistic behavior. Market uncertainty refers to the fact that events in the future such as future demand, costs of inputs, prices of outputs and institutional arrangements are not known within any reasonable probability. As a result, as William Sharkey points out, long-term contracts may be essential to economize on costs.[38] Vertical integration is beneficial because it avoids such contracting costs. Indeed, in the utility industry today, the absence of vertical integration is compensated by long-term contracts which likewise seek to conserve on short-term transactions costs. However, long-term contracts are typically underpinned by a long historical relationship between contracting parties.[39]

The quantity of trading partners affects transaction costs because the more firms with which any given firm must deal, the greater the number of contracts which must be negotiated. On the other hand, reducing the number of contracting pairs does not improve efficiency necessarily because smaller numbers of participants may result in opportunistic behavior and the use of market power.

Bounded rationality is the notion that although economic actors intend to be rational, they intend to be so in only a limited sense. Limitation stems from limited competence or an economizing of mental effort. In either case, some economic actors will have superior performance than others in any given situation. Blair and Kaserman point out the importance of bounded rationality

37. OLIVER E. WILLIAMSON, THE ECONOMIC INSTITUTIONS OF CAPITALISM 19 (1985).

38. SHARKEY, *supra* note 24, at 81.

39. These historical relationships give rise to what is referred to in the literature as "idiosyncratic information." In other words, human capital specific assets are a form of sunk cost that constitute a barrier to entry.

for vertical integration: "Because of these limits, 'uncertainty' may exist at the individual level even when all relevant data are theoretically available, that is, when no market uncertainty is present."[40] Bounded rationality involves a transaction cost, then, at the moment of negotiating a contract.

When opportunistic behavior is likely, transaction costs increase.On opportunism Williamson said, "More generally, opportunism refers to the incomplete or distorted disclosure of information, especially to calculate efforts to mislead, distort, disguise, obfuscate, or otherwise confuse. It is responsible for real or contrived conditions of information asymmetry, which vastly complicates problems of economic organization."[41]

Firms concerned with opportunistic behavior on the part of others must take costly precautions. Precautions include negotiating detailed contracts in order to avoid exploitation by the opportunistic behavior of others. Blair and Kaserman summarize the effects from the variety of transaction costs: ". . . (1) long term contracting costs are increased by the combined effects of market uncertainty and bounded rationality, while (2) the costs of relying upon an equivalent series of short-term contracts are increased by the combined effects of small numbers bargaining and opportunism."[42]

Vertical integration within a single firm avoids the transaction costs associated with both long-term and short-term contracts.

V. The EWG Environment and Transactions Costs

In this Part we postulate the kind of market that must develop in the EWG environment in order to reap the benefit of efficiency through competition. We consider the recent theoretical discussions of "contestable" markets and competition for, rather than in, markets. Absent large numbers of buyers and sellers, we find these substitutes wanting. Rather, experience from other industries suggest that sufficient competition is unlikely to develop.

A. *The Requirements of a Competitive Market*

We evaluate the EWG environment by looking to the potential benefits and costs. The potential benefits are the increased incentives for cost minimization at the individual firm level and the closer tracking of price and marginal cost at the consumer level. Potential costs are the scale economies, economies of scope, economies of integration and intra- and inter-firm cooperation not realized under deintegration.

40. ROGER D. BLAIR & DAVID L. KASERMAN, THE LAW AND ECONOMICS OF VERTICAL INTEGRATION AND CONTROL 20 (1983).

41. WILLIAMSON, *supra* note 35, at 47-48.

42. BLAIR & KASERMAN, *supra* note 38, at 20.

The putative benefits of an EWG environment depend upon the degree to which competition prevails. Deregulation does not necessarily imply competition. For example, there are fewer commercial airlines today than in 1978 when the airlines were deregulated. The number of such commercial airlines is likely to continue to decrease. Allegations of price-fixing brought by the Department of Justice Antitrust Division against the airline industry have been settled by a consent decree in which the airlines involved agree to reimburse a portion of the ticket price to those who traveled during the period of the alleged conspiracy.[43]

Mergers have likewise reduced the number of pipeline firms since FERC's experiment with compelling common carriage on the gas pipeline industry.[44] In addition, over $9 billion in existing take-or-pay contracts with producers became the obligation of pipelines, much of which had to be absorbed by stockholders.[45] The process of renegotiating these contracts and dispute resolution was not without costs.[46]

Active competition creates efficiency. In a world of scarce resources conscious rivalry will arise among vendors. However conscious rivalry should not be confused with an economists notion of competition. As Clarkson and Miller point out, "jockeying for position in the car market among the Big Three is an example of vigorous rivalry, but the market structure is not one of perfect competition. On the other hand, perfect competition between producers may exist without conscious rivalry. Two Nebraska wheat farmers on adjacent farms are perfect competitors, but certainly are not conscious rivals."[47] Indeed, the bidding for power capacity contracts may involve intense rivalry with or without the structure of competition.

Efficiency gained through competition requires the existence of a large number of actual competitors. Actual competitors are firms that will take serious portions of the market share should there be any slack in competitive performance. To ensure the existence of actual competitors, there must be negligible barriers to entry so that potential competitors can freely enter the market. Conversely, there must be relatively small barriers to exit so that firms can leave at the first sign of trouble. Small barriers to entry and exit allow the market to efficiently allocate resources among alternative competitive uses. However, the ease to entry and exit requires an absence of sunk costs, bounded rationality, opportunism and externalities.[48] None of these four factors exist in the electric utility industry.

43. A consent decree does not imply wrong doing, but a settlement is cause for concern.

44. Curtis Cramer, *Natural Gas Pipelines and Monopoly*, *in* PUBLIC UTILITY REGULATION: THE ECONOMIC AND SOCIAL CONTROL OF INDUSTRY 137, 152 (Kenneth Nowotny et al. eds., 1989).

45. DEPT. OF ENERGY, NAT. GAS MONTHLY (Jan. 1991).

46. *Id.*

47. KENNETH W. CLARKSON & ROGER LEROY MILLER, INDUSTRIAL ORGANIZATION 109 (1982).

48. WILLIAMSON, *supra* note 37.

In a competitive market, price equals marginal cost. An individual firm operating within a competitive market is a price taker in that it takes the market price as given. With a sufficient number of firms, each firm has a negligible influence over market price via its production decision. If a firm has influence over market price, then price may diverge from marginal cost. A firm capable of sustaining a price greater than marginal cost has market power. A price greater than marginal cost causes allocative inefficiency because too few resources are allocated to the industry. Output is too low relative to the value consumers place on the good and to the cost of expanding service.

B. *Contestable Markets and Demsetz Competition*

In some situations the existence of a large number of actual competitors may be unnecessary to insure that price equals marginal cost. A market is contestable when the mere threat of entry is sufficient to keep price close to marginal cost.[49] Shepherd comments on the notion of contestability and replaces the term "contestability" with the term "ultra-free entry." The term ultra-free entry is appropriate because the only condition in which the threat of entry keeps price close to marginal cost is when entry is free and without limit, entry is absolute, entry is perfectly reversible, and sunk cost is zero.[50]

In a contestable market, entry and exit conditions are such that a firm may enter the market, take the whole bundle, and leave at the first sign of trouble without incurring entry and exit transactions costs. The ultra-free entry condition creates credible threat sufficient so that all existing firms behave in an optimal fashion. Commenting on the zero sunk cost assumption for contestability, Baumol states that: "If the share of relatively untransferable capital is 'large,' the activity belongs to the domain transactions cost analysis. If it is 'small,' it falls within the territory of contestability."[51]

The electric utility industry does not have ultra-free entry because utilities firms require substantial sunk cost. Moreover, raising the specter of contracting as opposed to overt entry does not save the theory. If an entrant can offer long-term contracts to cover a given market share, how much more easily can an existing firm do so?[52] While it is true that many kinds of corporations use the sale-leaseback technique to finance their bulk-power business, it is just as true that in the absence of the "leaseback," the "sale" would not have been consummated. Bankers and insurance companies do not acquire large baseload generating stations for which there is not a long-term guaranteed market. In any

49. BAUMOL ET AL., *supra* note 9, at 6.

50. William G. Shepherd, *Contestability and Competition*, 74 AM. ECON. REV. 572, 573 (1984).

51. William Baumol, *Williamsons "The Economic Institutions of Capitalism"*, 17 RAND J. ECON. 279, 284 (1986).

52. Shepherd, *supra* note 48, at 576.

event, long-term contracts such as the "leaseback" violates the "contestability" conditions.

Shepherd observed:

> *The case of a monopoly or dominant firm facing ultra-free entry is probably unstable and transient, not an equilibrium state.* If costs provide for a natural monopoly, the resulting firm will create entry barriers, threaten retaliation, and generally violate the assumptions of ultra-free entry... The case of an entry-nullified monopoly or dominant firm is unlikely to last even when it does occur.[53]

Thus "contestability" or "ultra-free entry" does not completely substitute for the existence of competitors which ensure the many benefits of competitive markets.

For example, some utilities are either compelled to or voluntarily put incremental generation requirements out for bid at rates equal to the utilities' avoided cost. An EWG would not accept the contract if it has an incremental cost higher than the utility's avoided cost. The result of the utilities' compelled or voluntary bidding is a long-term contract which fully compensates the EWG at the EWGs total embedded cost.[54] Such a contract would stipulate, at a minimum, "take-and-pay" provisions for the EWG facilities output at rates fully compensating all fixed costs and expected operating costs with escalation.

Such contracts are not only anti-competitive, but also place all of the EWGs risk on the host utility. If the EWG defaults or fails to complete the project, the host utility has the responsibility to supply the levels of power contracted by the EWG. If projected future demand does not materialize, the utility likely will be required to reduce its own production of energy in order to utilize the cost-plus energy of the EWG. These shifts of risk onto the host utility harm the utility's bond ratings.

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53. *Id.* at 578.

54. *See, e.g.*, Re Biennial Resource Plan Update Following the California Energy Commissions Seventh Electricity Report, Dec. No. 91-06-022, I.89-07-004, Cal. Pub. Util. Comm., June 5, 1991, reprinted in 124 PUR 4th 181, 204. The California Commissions order observes:

> "We are persuaded that the IDR[identified deferred resource] should remain the benchmark for QF bidding but that avoided cost principles do not require QFs to match the IDR payment structure. Both capital intensive QFs and cogenerators should benefit from bidding a payment structure that corresponds to the cost structure of the plant to be financed. this translates to lower risks to QFs and ultimately to ratepayers."

If this does not mean that the QFs are to be fully compensated, with risk shifted to the utility, it is difficult to know what it means.

Some analysts assert, however, that the bidding process itself is a substitute for competition in the market. Bidding represents competition for the market, known as the Demsetz competition. The winning bids reflect the most efficiently built generating plants. However, our analysis indicates that there is unlikely to be "numerous" competitive agents at the bidding stage. Because of scale economies, electricity generation is a tight oligopoly. Moreover, to prevent the exercise of market power *ex post*, parties to the contract will specify *ex ante* price and price-escalation clauses, as well as minimum sales and performance standards. These precautions require the parties to know a good deal about the future. The uncertainty and chance for opportunism involved when formulating these precautions are what Williamson believed would lead to market failure.

One alternative to providing for an uncertain future would be to negotiate a series of short-term contracts. However, not only are such short-term contracts unlikely to be viable, they produce potential anti-competitive outcomes. Once the contract period is over and a new bidding process begins, the EWG which won the first bid has substantial advantages over potential bidders in the second round. The prior winner has the sunk cost in place as well as the experience with the purchasing utility. In addition, the original EWG has gained crucial managerial expertise that is specific to the purchasing utility. These inter-firm relationships are what Williamson refers to as human capital specific assets. Human capital specific assets are effective as barriers to other firms entering the bidding process. Competition is already severely thwarted at the beginning of the second round.

The potential for market failure due to transactions cost and residual cost-subadditivity indicates that the number of firms in the electric utilities market will continue to decrease. The relatively small generating firms will consolidate into fewer, but much larger generating firms. All things considered, the EWG environment is most likely to be a tight oligopoly. The benefits of competition will not be possible in the EWG environment regardless of how the legislation defines an EWG or FERC defines market power. Nonetheless, the EWG environment will increase the cost of delivering electricity at socially determined levels of reliability.

C. *Conclusions Regarding the EWG Market Environment*

Deregulation or deintegration do not necessarily yield competition with the accompanying gains in efficiency. Nor will reliance on the electric utility market being "contestable" suffice. The enormous sunk costs and the plethora of long-term contracts disqualify utilities markets from being "contestable." The Demsetz competition for markets, as opposed to competition within markets, is also bound to fail in the long-run. Rather, the deintegrated EWG markets will evolve into tight oligopolies, stealing from society both the benefits of regulated monopoly and of competition.

VI. Alternatives to Competitive Entry

The pressure to allow competitive entry into the electric utility industry originates from two points of view. According to one, the cost advantages of centralized production have been exhausted. The other point of view holds that traditional regulation provides perverse incentives to the regulated firm. A large body of literature suggests that regulated firms do not minimize cost, and therefore society does not derive the benefits of natural monopoly. This article does not address the latter of these arguments. Rather, this article seeks to point out that alternatives to radical restructuring have been ignored or wrongly brushed aside for lack of merit or for being too expensive. For example, incentive regulation schemes can achieve many of the goals of de-regulation without the attendant costs of radical restructuring. Competitive bidding monitored by regulatory and antitrust authorities is also superior to deregulation. Moreover, rate base, rate-of-return regulation could be rescued from creating perverse incentives by decoupling. Decoupling requires separating the process of setting rates and establishing investment priorities from the process of determining revenue requirements. Decoupling has proven to be useful in implementing strategies of Demand Side Management (DSM), where at least one outcome may be that electric utilities purposefully sell less electricity to consumers generally.

DSM eases the need to build either baseload or peak load generation plants because DSM investments offer an inexpensive and environmentally benign alternative to generation. DSM offers a saving to both consumers and the utility. However, because some fixed costs are recovered in the price of variable consumption, a reduction in consumption may impair the utility's ability to recover the allowed rate of return. Thus there is a need to "decouple" revenues from sales. The California PUC with Pacific Gas and Electric and Southern California Edison, for example, apparently have successfully used decoupling in implementing DSM strategies. The political costs have evidently been minimal.[55]

Incentive regulation, usually associated with price caps, is another form of "decoupling." In effect, regulators and the utility together establish prices for service, usually some rate at which prices may escalate, for example, the Consumer Price Index minus a productivity adjustment of 1% or 2%. Any rate change within those bounds may be implemented automatically. If the utility

55. *See* DSM Steering Comm. of Elec. Util. Managers of Tex., A Survey of Demand-Side-Management Cost Recovery Systems (Ron Hiltunen, ed., 1991).

is able to lower costs, the utility may keep the resulting extra profits. The incentive to increased efficiency is apparent.[56] Incentive regulation appears to be working for telecommunications firms in many states.

Optional tariff schemes, another form of innovative regulation, give rate payers a menu of rate designs that closely track marginal rates with incremental cost. For example, the capped rate could be a status quo average cost rate. As an alternative to the average cost rate, consumers may opt for a tariff which includes a higher demand charge but a variable rate closer to incremental cost. Those who continue with the status quo rate are no worse off, while those who choose the optional tariff, typically high volume users, are presumably better off. Any incremental consumption charged at the lower variable rate yields an incremental profit that rate payers and stockholders can share.[57] Flexible pricing schemes such as optional tariff schemes allow consumers and utilities to benefit without regulatory cost. Regulatory supervision is needed only when there is a change in the capped status quo rate, in which case a standard rate needs to be re-formulated.

Vogelsang and Finsinger proposed a multiproduct pricing scheme in which the regulator allows the utility to charge any price for the next period, so long as the hypothetical revenue from the proposed prices in the next period, and current quantities, are less than current revenues. Under certain situations this process yields Ramsey prices without requiring the regulator to collect an inordinate amount of information. The regulator need know only the current quantities and revenue.[58]

When utilities offer new generation needs for bidding, competitive bidding has been proceeding without the need for PUHCA reform or much FERC action. Under the aegis of the Texas PUC, members of Electric Reliability Council of Texas (ERCOT) have added significant IPP and QF generation over the last decade.[59] Southwestern Public Service was acquiring co-generator electricity well before the passage of PURPA, but in the pre-PURPA environment the fuel savings were real, rather than legislatively induced.

The Western Systems Power Pool (WSPP) implemented an experiment in flexible pricing for coordination and transmission services in 1987. The WSPP used an electronic bulletin board through which participants could buy and sell energy within pre-established pricing boundaries. Between 1987 and 1991 the

56. For a discussion, review, and evaluation with respect to electrics, see Paul R. Joskow & Richard Schmalansee, *Incentive Regulation for Electric Utilities*, 4 YALE J. ON REG. 1 (1986).

57. Robert D. Willig, *Pareto-Superior Nonlinear Outlay Schedules*, 9 BELL J. ECON. & MGMT. SCI. 56, 64 (1976).

58. Ingo Vogelsang & Jörg Finsinger, *A Regulatory Adjustment Process for Optimal Pricing by Multiproduct Monopoly Firms*, 10 BELL J. ECON. & MGMT. SCI. 157 (1979).

59. Jay Zarnikau et al., *Wheeling Nonutility Power: The Texas Experience*, ELECTRICITY J., Aug.-Sept. 1989, at 32.

experiment saved the participants and consumers $71 million.[60] However, the experiment was terminated because the pool did not meet FERC's exacting standards with respect to open access. All gains from such trading were lost because of FERC's radical reforms.

In short, there are alternatives to a radical restructuring of the electric utility industry and the imposition of unwarranted entry into what remains an essentially cost subadditive setting. The alternatives are likely to cost less and allow for more evolutionary experimentation than FERC and the Comprehensive National Energy Security Act's current approach would permit.

Conclusion

The surge in electricity price, escalation in nuclear plant investment, utility bankruptcies and other failures in the electric utility industry in the late 1970s and early 1980s led some analysts to question the existing institution of regulation. These analysts have increasingly suggested relying on a competitive market. Furthering this agenda, FERC mandates open access to utility transmission facilities for the wheeling of bulk power and Congress has expanded the number of firms that can benefit from FERC's open access policy by creating a new entity, the EWG.

Some analysts justify Congress and FERC's competitive market approach by pointing out that the economies of scale that historically justified the existence of monopoly in electric utility generation has been exhausted. This article shows that economies of scale is only a sufficient condition for natural monopoly, and not a necessary condition. For the single product firm, natural monopoly cost conditions may exist despite the lack of economies of scale. If a firm has subadditivity, the firm has natural monopoly cost conditions, and society must restrict entry to preserve the benefits of natural monopoly.

Electric utilities are, in reality, multiproduct firms. For multiproduct firms, economies of scale are not a necessary condition for natural monopoly. In the multiproduct setting economies of joint production, referred to as economies of scope, often result in cost subadditive conditions. This is particularly true when the "products" under consideration are power and reliability.

In addition, a vertically integrated electric utility can internalize potential externalities such as "loop flow," a serious problem as the utility loses control over greater and greater proportions of the power flowing through its transmission grid. Vertical integration also reduces transactions costs. The increase in transactions costs caused by vertical de-integration will be passed on to the ratepaying public. Those advocating deintegration and deregulation have underestimated the associated increase in transactions costs.

60. Western Systems Power Pool, 55 FERC ¶ 61,099 (1991).

The EWG environment is unlikely to be competitive. Given sunk costs and long-term contracts, the electricity utility industry cannot be "contestable". Absent substantial controls, the deintegrated, deregulated electric utility industry will evolve into a tight oligopoly where society will be the loser, and a few lucky investors will be the winners.

It is unfortunate that Congress and FERC have devoted so much effort and resources to radically reform the utilities industry. There are many less radical alternatives to regulating the utilities industry that are less costly and more effective. For example, incentive regulation, DSM, decoupling, competitive bidding in a controlled environment and other processes yield greater efficiency without the attendant cost of radical departures.

In an era when we are already beginning to question the wisdom of eliminating airline regulation, with the recent reregulation of cable television, when take or pay contracts have undermined a great deal of the good created by the common carrier status for gas pipelines, do we really want to impose the free market on our electric utilities?

With respect to the move toward more competition in the natural gas industry, some analysts have observed, "Experimenting with competitive entry, while maintaining rate regulation or common carrier obligations, can yield market outcomes that are less efficient than those found under full regulation. . . . Entry can provide many benefits, but it can also result in. . . adverse welfare effects."[61]

61. Paul MacAvoy et al., *Is Competitive Entry Free? The Case of By-pass in Natural Gas Markets*, 6 YALE J. ON REG. 209, 247 (1989).