

Legislative Incentives and Energy Technologies: Government's Role in the Development of the California Wind Energy Industry*

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INTRODUCTION

The energy crises of the 1970's, triggered by the Arab oil embargo, the influence of the Organization of Petroleum Exporting Countries (OPEC), the severe winter of 1976-77, and the first Iran/Iraq war, had a severe impact on the economy of the United States. These energy shocks were aggravated by disarray in the United States' energy policy and by complacency in the energy sector—a result of the stability of the energy supply system over the previous quarter century.¹

The federal government responded to these events by reshaping the nation's energy policy. The first steps were taken in 1973-74 with the Nixon and Ford administrations' Project Independence,² which emphasized increasing domestic supplies of energy by encouraging higher prices to stimulate production of oil and gas and by accelerating the development of nuclear energy.³ Over the following years, however, the goals of Project Independence proved to be unrealistic, and its efforts to alleviate

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1. Until 1978, for example, the United States had anticipated being able to rely on Iran indefinitely as a stable ally and a continuing source of oil. As long as the United States could obtain such affordable and abundant supplies from Iran and other Middle Eastern nations, there was no urgent need to encourage energy conservation or the development of new energy technologies. See R. STOBAUGH & D. YERGIN, *ENERGY FUTURE* 32 (3d ed. 1983).

2. See President's Address to the Nation About Policies to Deal With the Energy Shortages, 1973 PUB. PAPERS 916, 920 (Nov. 7, 1973).

3. R. STOBAUGH & D. YERGIN, *supra* note 1, at 32. In January 1975, President Ford

the energy predicament using traditional energy resources were unsuccessful.⁴

The most innovative legislative response to the energy shocks was the National Energy Act of 1978 (NEA).⁵ The NEA focused on a set of three interconnected goals: reducing consumption of imported oil; encouraging conservation; and diversifying the nation's energy supply by developing alternative energy technologies that use renewable resources.⁶ This Comment focuses on the third of these goals. In particular, it examines the legislative, regulatory, and judicial actions that prompted the commercial development of the wind energy industry in California. The growth of wind energy provides a dramatic example of the influence of law on technological development because of the clear relationship between the establishment of governmental incentives and the commercialization of the industry and because of the speed at which the industry matured.⁷

Section I provides background on the growth of the wind industry from 1981 until 1986, when changes in the energy sector led to a decline in support for wind energy and other renewable energy technologies. Section II briefly describes the elements of the federal and state legislative programs that spurred the growth of the wind energy industry. Section III returns to these governmental programs and analyzes in depth the role each played in the industry's growth. Section IV reflects on the lessons learned from the commercial development of the wind energy industry. It concludes that this development, although not without its drawbacks, was a success that can serve as an example for government efforts with other energy technologies. Finally, Section V takes a broader look at the importance of a national energy policy and the role of renewable energy in the nation's energy future. It concludes that legislative incentives can and should play a role in encouraging the development of renewable energy technologies because, in the long run, renewable re-

called for the construction within 10 years of 200 nuclear power plants, 150 coal-fired power plants, 30 oil refineries, and 20 synthetic fuel plants. *Id.*

4. *Id.* at 279.

5. The National Energy Act was actually a set of five different statutes: the Public Utility Regulatory Policies Act of 1978, Pub. L. No. 95-617, 92 Stat. 3117 (codified in scattered sections of 15, 16, 30, 42, and 43 U.S.C.); the Energy Tax Act of 1978, Pub. L. No. 95-618, 92 Stat. 3174 (codified in scattered sections of 19 and 26 U.S.C.); the National Energy Conservation Policy Act of 1978, Pub. L. No. 95-619, 92 Stat. 3207 (codified in scattered sections of 12, 15, 23, and 42 U.S.C.); the Powerplant and Industrial Fuel Use Act of 1978, Pub. L. No. 95-620, 92 Stat. 3289 (codified in scattered sections of 15, 19, 42, 45, and 49 U.S.C.); and the Natural Gas Policy Act of 1978, Pub. L. No. 95-621, 92 Stat. 3350 (codified in scattered sections of 15 and 42 U.S.C.). See *infra* text accompanying notes 81-84 for an introductory discussion of the NEA.

6. See H.R. REP. NO. 543, 95th Cong., 2d Sess. 9, reprinted in 1978 U.S. CODE CONG. & ADMIN. NEWS 7673, 7678.

7. Gipe, *Maturation of the U.S. Wind Industry*, 117 PUB. UTIL. FORT., Feb. 20, 1986, at 68.

sources are strategically and environmentally preferable to many of the resources the nation traditionally has relied on for its energy supply.

I

DEVELOPMENT OF THE WIND ENERGY INDUSTRY

A. *Early Developments: Response to Prices and Policies*

Harnessing the wind as a source of energy has been common practice for thousands of years,⁸ but wind energy did not emerge as a potentially significant technology for utility-scale generation of electricity until the 1970's.⁹ One important factor in the emergence of wind energy was

8. J. NAAR, *THE NEW WIND POWER* 39-40 (1982). Historically, the power of the wind was used to pump water and grind corn in ancient China, in medieval Europe, and in 17th-century Holland. *Id.* at 19. More recently, wind energy played an important role in opening up the North American frontier. Although the applications for windmills in North America were limited to pumping water and generating electricity on a small scale in rural areas, over six million were in use in the United States between 1850 and 1940. *Id.* Most were the classic water-pumping windmills, with their metal fans and tail vanes, that are still a familiar feature in the American West. *Id.* at 45. Others were the early wind-electric systems, known simply as "wind chargers," which gained popularity after World War I as power sources for isolated farms and ranches. *Id.* at 47. They remained the most efficient and cost-effective source of electricity for these areas until the Rural Electrification Act of 1936, 7 U.S.C. § 901 (1982), when the federal government committed itself to providing residents of the Great Plains and the rural West access to centrally distributed electrical networks—our electrical "grids." J. NAAR, *supra*, at 48. Because the stand-alone windmills could not compete economically with less costly electricity from large and efficient fuel-burning powerplants, they soon faded from the American landscape. U.S. DEP'T OF ENERGY, *WIND ENERGY SYSTEMS PROGRAM SUMMARY* 1 (1983).

9. See U.S. DEP'T OF ENERGY, *supra* note 8, at 1. The integration of wind-generated electricity into the electrical supply system is not complicated. Most wind turbines now produce 110-volt, 60-cycle power that can be interconnected immediately with local utility lines or transformed if interconnection requires a higher voltage. Once the energy is "on-line" it is simply another source of electrical energy: a kilowatt-hour generated from wind is no different from that generated from hydropower or nuclear power.

Because utility-scale electrical energy, for all practical purposes, cannot be stored for any length of time, utilities constantly monitor supply and demand to maintain an equilibrium on their lines. Their task is made more difficult because the power production from wind turbine arrays is highly variable, fluctuating constantly with changes in wind speed. Utilities are accustomed to such changes on the demand side, because consumers turn their power-consuming devices—from hair dryers to steel smelters—on and off with maddening frequency. With wind energy, the change is on the supply side, over which the utilities are accustomed to maintaining a great deal of control. Whether responding to changes in demand or supply, however, the utilities' response is the same: they simply increase or decrease power production at one of the generating plants that is under their control to maintain equilibrium on the grid.

A utility must cope not only with relatively small, instantaneous changes in demand, but also with larger, cyclical changes in demand caused by its customers' patterns of consumption. Utility demand varies daily, weekly, and seasonally. A utility's minimum expected demand, called its "baseload" demand, usually occurs at night. The utility meets its baseload demand through sources with low marginal operating costs—i.e., low fuel costs—typically nuclear or fuel-burning power plants.

The utility's demand will fluctuate between the baseload demand and the highest demand, called the "peak" demand. The peak demand time will vary from period to period and from place to place: in the Southwest, the annual peak results from a massive air conditioning load

the large increase in the price of oil and gas during the 1970's.¹⁰ The higher cost of these fuels made the economics of renewable energy technologies more attractive and prompted a surge of interest in these technologies.

Improved economics, however, was not enough to trigger large-scale research and development efforts and investment in wind energy. Institutional obstacles such as the existing utility monopolies on electric power generation discouraged research and development. Furthermore, the investment community's traditional wariness towards new technologies dictated that much higher returns were needed to compensate for the greater risk of investment in these unproven technologies.¹¹ Thus, a second major step in the development of the wind energy industry was the elimination of institutional obstacles and provision for higher financial returns. This vital step was accomplished through incentive provisions included in the NEA. The NEA actually was a set of five different statutes covering every aspect of the energy sector from conservation to production and distribution.¹² Of those statutes, the Public Utilities Regulatory Policies Act (PURPA) and the Energy Tax Act (ETA) played a particularly important role in the successful development of the wind energy industry. PURPA's provisions established the ground rules for relationships among small power producers and electric utilities,¹³ and ETA's energy tax credits created a substantial financial incentive for private investment in alternative generating technologies.¹⁴

B. *The Growth Years: 1981 to 1986*

The growth of the wind energy industry did not start immediately after the passage of the NEA in 1978. Instead, there was a three-year lag before the nation's first commercial wind-based energy turbines were

on hot summer afternoons, whereas in the Pacific Northwest the annual peak comes on cold winter days when electrical heating loads are highest. The utility meets its peak demand with sources that easily can be cycled—turned on and off, or up and down. Hydropower facilities are an ideal peak power source, because their power output can be changed instantaneously by the utility. Areas without excess hydropower often are forced to use much more expensive peak power sources, such as gas-fired turbines.

Wind turbines do not qualify clearly as either baseload or peak supply sources. Their low (nonexistent) fuel costs would make them an ideal baseload supply source, but the fluctuations in their output are too unpredictable to rely on. Their availability for quick start-ups and fluctuating output would make them an ideal peak power source, but again the lack of control over the timing of their power production makes them difficult to rely on. Utilities are starting to address these problems as alternative sources become an integral part of the nation's power supply.

10. Hirsch, *Impending United States Energy Crisis*, 235 SCIENCE 1467, 1467 (1987).

11. See Minan & Lawrence, *Encouraging Solar Energy Development Through Federal and California Tax Incentives*, 32 HASTINGS L.J. 1, 37-38 (1980).

12. See *supra* note 5.

13. See *infra* notes 145-68 and accompanying text.

14. See *infra* notes 228-39 and accompanying text.

built. The primary reason for this delay was that PURPA's provisions repeatedly were challenged in the courts,¹⁵ causing uncertainty among investors regarding PURPA's implementation.¹⁶ The changes in the tax incentives, which were modest initially but increased through 1980,¹⁷ also may have played a role in the delay.

In 1981, after the lag ended, California's wind energy industry took its first steps toward growth with the installation of 144 wind turbines having a combined generating capacity of 7 megawatts (mW),¹⁸ less than one percent of the capacity of a typical fuel-burning power plant.¹⁹ In December of that year, the first kilowatt-hours (kWh) of wind-generated electricity were purchased by the two major California utilities, Pacific Gas & Electric Company and Southern California Edison Company. Despite the efforts of these first wind power entrepreneurs,²⁰ total production from wind projects in 1981 amounted to only 10,000 kWh, not enough to meet the annual needs of two average California households.²¹

The pace of development increased dramatically over the next few years. Clusters of turbines organized into wind-driven power plants called "windfarms"²² soon dominated the landscape in three of Califor-

15. See *infra* notes 171-211 and accompanying text.

16. See *infra* notes 206-11 and accompanying text.

17. See Friedmann & Mayer, *Energy Tax Credits in the Energy Tax Act of 1978 and the Crude Oil Windfall Profits Tax Act of 1980*, 17 HARV. J. ON LEGIS. 465, 492 (1980); Minan & Lawrence, *supra* note 11, at 3.

Some authorities, including Minan and Lawrence, found federal support to be inadequate even after the increase provided in the Windfall Profits Tax Act: "The current size of the credit is not sufficient to provide the type of stimulus needed to spur the widespread commercialization of solar use in the business community." *Id.* at 36.

Some industry representatives, however, discount the effect of changes in the tax incentives as a major factor in the delay. One wind energy developer felt that most wind projects would have gone forward even without the increase in the federal tax credit from 10% to 15% in 1980. Interview with James G.P. Dehlsen, Chairman of the Board, Zond Systems, Inc., in Tehachapi, Cal. (Mar. 23, 1987).

18. Gipe, *supra* note 7, at 68.

19. Large, centralized fuel-burning power plants typically have a generating capacity of 800-1,200 mW. See P. EHRLICH, A. EHRLICH & J. HOLDREN, *ECOSCIENCE* 410 (1977).

20. Tom Barber of Zond Systems, Inc. in Tehachapi, California tells of crawling on his hands and knees up to a Tehachapi ridgeline to measure the wind velocity during a major storm. Barber had to know what to expect as a maximum wind speed so that the wind turbines could be designed accordingly. He described himself sprawled on the ground, with one hand clutching a portable anemometer while the other grasped at the ground to keep the wind from bowling him over. By his account, good-sized pebbles were blowing over the ridge, along with sand and grasses; it was below freezing, without the wind chill; and the average measurement he obtained from the few minutes he remained on the ridge was slightly over 90 miles per hour. Interview with Tom Barber, Zond Systems, Inc., in Tehachapi, Cal. (Feb. 20, 1983).

21. See Table 1, *infra* p. 109. The average annual residential consumption of electrical energy in California is approximately 6,000 kWh. See generally Energy Bus. Update, Oct. 8, 1986, at 5.

22. J. NAAR, *supra* note 8, at 161. Although Naar uses the term "windfarm" to refer to windmills sited in clusters or arrays, as does essentially everyone in the wind energy business, neither he nor anyone else known to the author has traced the origin of the term.

nia's windiest regions: Altamont Pass, southeast of San Francisco; Tehachapi Pass at the southern end of the San Joaquin Valley; and San Geronio Pass near Palm Springs. Table 1 illustrates the industry's growth between 1981 and 1987. By 1984, utility purchases of wind-generated electricity totalled almost \$690 million, and the industry employed 14,000 persons,²³ making California home to ninety-five percent of the United States' and more than seventy-five percent of the world's commercial wind-electric capacity.²⁴ By 1985, total investment in California wind energy was nearly \$2 billion.²⁵ In 1987, over 17,000 wind turbines generated 1.7 billion kWh for sale to California utilities,²⁶ enough to meet the average annual needs of nearly 300,000 households.²⁷ Wind energy represented over 2.5% of California's installed generating capacity and supplied nearly one percent of the State's electricity needs²⁸—a remarkable accomplishment for a five-year-old industry. The growth is even more remarkable for having occurred in the energy sector, in which new technologies historically have required fifteen to thirty years of development before producing commercially, and another fifteen years of operation before contributing significantly to energy supplies.²⁹

The period of rapid growth in the wind energy industry was accompanied by increasing productivity, rapid consolidation, and declining costs among competing developers and manufacturers.³⁰ Increased productivity—measured as output per turbine—is as responsible for higher generation each year as is the increasing number of turbines.³¹ Productivity gains are a reflection of improvements in wind turbine reliability, a

23. See *Renewable Energy Incentives: Hearing Before the Subcomm. on Energy Conservation and Power of the House Comm. on Energy and Commerce*, 99th Cong., 1st Sess. 148 (1985) [hereinafter *Hearing on Renewable Energy Incentives*] (statement of Warren D. Noteware, Commissioner, California Energy Commission).

24. Gipe, *supra* note 7, at 68.

25. *Id.* at 68, 77.

26. Interviews with Paul Gipe, Principal, Paul Gipe & Assoc.; Western Representative, American Wind Energy Association; and Executive Director, Kern County Wind Energy Association, in Tehachapi, Cal. (Mar. 23, 1987, and Mar. 9, 1988).

27. See *supra* note 21.

28. *Hearing on Renewable Energy Incentives, supra* note 23, at 189.

29. See Gipe, *supra* note 7, at 76-77; see also Bezdek, Wendling, Bennington & Chew, *National Goals for Solar Energy: Economic and Social Implications*, 22 NAT. RESOURCES J. 337, 340 (1982) [hereinafter Bezdek] (cost-competitive energy technologies have taken 20 to 30 years to achieve a 20% market share). For example, heat pumps were developed 30 years before they were commercially produced. Nuclear power reached the commercial stage in the mid-1960's, only 15 years after its development, because of the major federal subsidy of research and development efforts; even so, it did not affect utility generation noticeably until the mid- to late-1970's. Gipe, *supra* note 7, at 76-77.

30. Gipe, *supra* note 7, at 68-73.

31. See *id.* at 71. Between 1983 and 1986, for example, the number of turbines increased tenfold (from 1,300 to 13,000), while total annual production increased thirtyfold. Thus, during this period the average annual production per turbine tripled from approximately 38,000 kWh per turbine to 115,000 kWh per turbine. *Id.* at 72.

TABLE 1: Growth of California Wind Energy Industry

Year	1981	1982	1983	1984	1985	1986	1987	Total
Generation (M kWh)	0.01	6	49	195	632	1,200	1,700	3,782
New Capacity (mW)	7	64	172	325	485	240	154	1,447
No. of New Turbines	144	1,145	2,500	4,700	5,000	2,300	1,392	17,181
Investment (M \$)	21	139	326	680	750	290	177	2,377
Oil Saved (K bbl)	—	11	86	340	1,120	2,127	3,014	6,698

SOURCES:

- Public Utilities Fortnightly, Feb. 20, 1986, at 68.
- Alternative Sources of Energy, Aug./Sept. 1986, at 8.
- Interviews with Paul Gipe, Mar. 27, 1987 and Mar. 9, 1988.

major problem that plagued the industry during its first few years.³² Capacity factors, which measure a wind turbine's output as a percentage of its maximum potential output,³³ more than doubled from 1983 to 1986³⁴ and should continue to increase.³⁵

Consolidation in the wind industry also has been apparent in recent years. Although there were over forty windfarm developers in 1982-83, perhaps half a dozen firms emerged as major players, and three of these³⁶ accounted for fifty-eight percent of the total wind energy production in 1984.³⁷

Finally, installation costs have declined to a fraction of the 1981 level (see Table 2).³⁸ Although as recently as 1979 wind turbines were estimated to be at least twice as expensive as competing generating equip-

32. Gipe interviews, *supra* note 26.

33. Gipe, *supra* note 7, at 71-72. For example, a wind turbine with a 100 kW generator is theoretically capable of generating electricity at its full rated capacity (100 kW) all year long (8,760 hours), producing a total of 876,000 kWh. If the turbine actually produces only a third that much, or 292,000 kWh, its capacity factor is 33%. The capacity factor is a better measure of productivity than the number of hours a turbine is in operation because the turbines generate electricity at below their rated capacity if wind speeds are below the level needed for full power production.

34. Average capacity factors increased from 8% to 17%, with two developers achieving an average capacity factor of 24%. *Id.* at 72. Because windfarm productivity is a function of the natural variability of the wind, capacity factors ultimately are limited to approximately 30%, even at excellent wind sites. *Id.* at 74. By comparison, capacity factors for other electrical generating technologies in the United States have ranged from 7% for natural gas to 65% for geothermal, with an overall average of 44%. Energy & Resources Group, University of California, Berkeley, Energy Data Card (1981) (unpublished compilation of energy statistics).

35. See Marier & Gipe, *Windfarm Update*, ALTERNATIVE SOURCES ENERGY, Aug./Sep. 1986, at 8; "Wind Turbine Reliability Increasing", *Speakers Say*, ALTERNATIVE SOURCES ENERGY, May 1986, at 38.

36. The three firms are U.S. Windpower, Zond Systems, Inc., and Fayette Manufacturing. Gipe, *supra* note 7, at 68.

37. *Id.*

38. Developers were offering windfarm investments at costs below \$900 per installed kilowatt in 1987. See PROJECT SUMMARY: SKY RIVER WINDPOWER GENERATING STATION 21.1 (1987) (Zond Systems, Inc.).

TABLE 2: Installation Costs

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
Installation (\$/kW)	3,100	2,200	1,900	1,860	1,200	~900	~700

SOURCES:

— Public Utilities Fortnightly, Feb. 20, 1986, at 76 [1981 to 1984]

— Alternative Sources of Energy, Aug./Sep. 1986, at 11 [1985 to 1987]

ment,³⁹ recent government studies have found that wind energy either is, or soon will be, cost-competitive with other energy technologies.⁴⁰ The federal Office of Technology Assessment (OTA), for example, found that wind energy "shows the lowest cost among the new generation technologies" and "has the potential for competing with the base-load technologies."⁴¹ Another analysis, by the California Energy Commission, estimates that by 1990 wind energy will rival hydropower as the cheapest source of energy, less expensive than oil or natural gas and half the price of nuclear power or coal.⁴² A third analysis, a comparison of various energy technologies by the Pacific Gas & Electric Company, found the cost of energy from wind to be 10.64 cents/kWh, compared to 11.78 cents/kWh for a generic in-state coal plant and 18.06 cents/kWh for a generic natural gas combined-cycle steam plant.⁴³ These studies demonstrate the dramatic decrease in costs for wind energy as operating experience has led to improvements in the efficiency and reliability of wind energy technology and as economies of scale have been achieved in manufacturing.

C. *The End of the Boom*

In spite of its remarkable growth from 1981 to 1986, the wind energy industry began stagnating in the wake of the Tax Reform Act of 1986,⁴⁴ which eliminated the last federal financial support for wind energy.⁴⁵ In 1986, after the expiration of the federal energy tax credit, the number of new turbines installed decreased for the first time since the

39. Beattie, *Solar Energy: Where Are We Heading?*, 30 MERCER L. REV. 475, 484 (1979).

40. See Gipe, *supra* note 7, at 77.

41. *Id.* (quoting OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, NEW ELECTRIC POWER TECHNOLOGIES: PROBLEMS AND PROSPECTS FOR THE 1990's (1985)).

42. *Id.* (citing RINGER, RELATIVE COST OF ELECTRICITY PRODUCTION (California Energy Commission Technology Assessments Project Office, 1984)).

43. PROJECT ASSESSMENT GROUP, GENERATION PLANNING, PACIFIC GAS & ELECTRIC CO., PG&E 1985 GENERIC COMPARISON, *cited in* Pepper, *Wind Farm Economics From A Utility Perspective*, ALTERNATIVE SOURCES ENERGY, Jan./Feb. 1986, at 20.

44. Pub. L. No. 99-514, 100 Stat. 2085 (codified in scattered sections of U.S.C.).

45. The Tax Reform Act extended the energy tax credit for a number of other renewable energy technologies, but not for wind energy. See STAFF OF JOINT COMM. ON TAXATION, 99TH CONG., 2D SESS., SUMMARY OF CONFERENCE AGREEMENT ON H.R. 3838 (TAX REFORM ACT OF 1986) 24-25 (Comm. Print 1986).

growth boom began.⁴⁶ Sales of wind turbines totalled \$400 million, down from \$600 million in 1985.⁴⁷ Two major wind energy developers, Flowind Corporation and Fayette Manufacturing, laid off or transferred a large part of their work force.⁴⁸ Although the decline was not as serious as analysts had expected,⁴⁹ there were concerns that the expiration of the federal tax credits would "cripple the fledgling wind industry . . ."⁵⁰

Furthermore, the expiration of the federal energy tax credit for wind energy was just the first of a series of blows to the wind industry. In 1987, the federal investment tax credit was eliminated,⁵¹ the California energy tax credit was allowed to expire,⁵² accelerated depreciation benefits were reduced or revoked,⁵³ and the California Public Utilities Commission (CPUC) revised its interpretation of PURPA's avoided cost and interconnection requirements in a manner that adversely affected the wind energy industry.⁵⁴

The elimination of various governmental incentives for the industry, combined with reduced energy prices, will prevent renewed growth at anything approaching the 1981-86 rates. In 1988, the energy crisis atmosphere has faded, energy prices have stabilized, and there is less public pressure for the rapid development of alternative energy technologies. PURPA is the only remaining governmental impetus for the development of small power-producing facilities.

II

MILESTONES IN ENERGY POLICY

A. *Legislative Response to an "Energy Crisis"*

Using legislative incentives to encourage the development of certain technologies is not a novel idea. This is particularly true in the energy sector,⁵⁵ in which the traditionally close relationship between energy

46. Marier & Gipe, *supra* note 35, at 8. The decline was attributed to the lack of federal support; one newspaper noted that "[t]he expiration of the federal tax credits caused a year of turmoil in the wind power industry." *Contra Costa Times*, Nov. 30, 1986, at 18A, col. 1.

47. *Contra Costa Times*, Nov. 30, 1986, at 19A, col. 1.

48. *Contra Costa Times*, Jan. 10, 1986, at 9C, col. 1.

49. The \$400 million in 1986 sales greatly exceeded industry projections of \$150 million to \$200 million. *Id.*

50. *Id.*

51. Tax Reform Act of 1986, Pub. L. No. 99-514, § 211, 1986 U.S. CODE CONG. & ADMIN. NEWS (100 Stat.) 2085, 2166-70. See also H.R. REP. NO. 841, 99th Cong., 2d Sess., vol. II, at 51 (1986); STAFF OF JOINT COMM. ON TAXATION, *supra* note 45, at 18.

52. *Contra Costa Times*, Nov. 30, 1986, at 18A, col. 1.

53. H.R. REP. NO. 841, 99th Cong., 2d Sess., vol. II, at 39 (1986).

54. Gipe Interviews, *supra* note 26. For a description of how the CPUC's interpretation of PURPA's ratemaking requirements affected the wind energy industry, see the discussion *infra* at notes 212-27 and accompanying text.

55. See Adams, *An Analysis of Solar Legislation—Taxes and Easements*, 14 LAND & WATER L. REV. 393, 397 (1979); Entin, *Energy Politics in the House of Representatives: The National Energy Plan*, 11 CONN. L. REV. 403, 405 (1979).

availability and national productivity has motivated state and federal governments to intervene. The nuclear power industry, for example, has relied on government funding and subsidy since its inception.⁵⁶ Similarly, mandatory import quotas and the depletion allowance have provided major financial benefits to the oil industry for many years.⁵⁷ Incentives and subsidies to these two industries alone have cost the federal government approximately \$93 billion over the last thirty years⁵⁸ and continue to command the lion's share of governmental support for the energy sector.

The novelty of the federal government's efforts beginning in the 1970's is that for the first time incentives were directed in part at the so-called "soft-path" energy technologies favored by analysts such as Amory Lovins.⁵⁹ These technologies are characterized by their use of renewable fuels and by their diversity, flexibility, and scale, which match the type of energy to its ultimate use.⁶⁰

In terms of dollar amounts, support has remained far greater for traditional energy technologies than for alternative technologies.⁶¹ Nevertheless, the development of the wind industry exemplifies the influence of government incentives on technological development because of the clear correlation of those incentives with the subsequent commercialization of the industry. Not since the early years of the nuclear power industry has government's role in the development of an energy technology been so apparent.

The legislative incentives that prompted the development of the wind energy industry followed two distinct paths. The first was the Federal Wind Energy Program's direct federal funding of high-risk, high-potential research and development in areas that had little chance of support from the private sector.⁶² The second path was the NEA's encouragement of a commercial wind energy industry through the establishment of a variety of institutional and financial incentives for private sector investment.

56. The Department of Energy estimates that the cost of subsidies for nuclear power totaled between \$15 billion and \$17 billion over the last 30 years. Minan & Lawrence, *supra* note 11, at 2-3. This figure may be low; another commentator estimates the federal subsidies for nuclear fission at \$15.8 billion for 1984 alone. *Hearing on Renewable Energy Incentives*, *supra* note 23, at 56 (statement of H. Richard Heede, Research Associate, Rocky Mountain Institute).

57. Entin, *supra* note 55, at 405.

58. Minan & Lawrence, *supra* note 11, at 3.

59. See, e.g., Lovins, *Energy Strategy: The Road Not Taken*, 55 FOREIGN AFF. 65 (1976). Lovins advocates low growth in energy demand and reliance on "soft" technologies, while criticizing centralized, large-scale energy production and use.

60. A. LOVINS, *SOFT ENERGY PATHS: TOWARD A DURABLE PEACE* 38-39 (1977).

61. See Gipe, *supra* note 7, at 79. See generally R. STOBAUGH & D. YERGIN, *supra* note 1, at 272-90 (describing the political conflicts affecting subsidization of various energy technologies).

62. See U.S. DEP'T OF ENERGY, *supra* note 8, at 4.

B. *The First Path: Federal Research and Development*

In 1973, the federal government established the Federal Wind Energy Program "to implement a wide range of research and development tasks and to coordinate the efforts of government, private industry, universities, and laboratories."⁶³ This research program was part of the nation's solar energy development effort, established by a series of legislative actions, including the Solar Energy Research, Development, and Demonstration Act,⁶⁴ the Energy Reorganization Act,⁶⁵ and the Federal Non-Nuclear Energy Research and Development Act.⁶⁶ From 1974 to 1977, the federal wind energy research effort was led by the Energy Research and Development Administration (ERDA).⁶⁷ The program was integrated into the Department of Energy (DOE) with DOE's creation in 1977,⁶⁸ and overall direction of the program was vested in DOE's Office of Energy Technology.⁶⁹

From its inception, the focus of the Federal Wind Energy Program was on the development of large-scale wind-electric generation. As a consequence, over half of the entire federal wind energy budget went to the Wind Project Center at the National Aeronautics and Space Administration (NASA)/Lewis Research Center in Cleveland, Ohio.⁷⁰ NASA used the funds to contract with some of the nation's aerospace and electrical industry giants (Boeing, General Electric, Westinghouse, and others) for the development and construction of megawatt-scale experimental wind turbines.⁷¹ The balance of the funds were used for wind resource assessment, small turbine testing, environmental impact analysis, and other minor programs.⁷²

Initial funding of the Federal Wind Energy Program was modest—under \$2 million for fiscal year (FY) 1974.⁷³ Funding increased steadily throughout the 1970's to a peak of \$100 million in FY 1981.⁷⁴ Because of the Reagan administration's decreased emphasis on development of renewable energy sources,⁷⁵ however, the budget was decreased by sixty to eighty percent in FY 1982, to a level of between \$20 million and \$30

63. *Id.* at 3.

64. Pub. L. No. 93-473, 88 Stat. 1431 (1974) (codified at 42 U.S.C. §§ 5551-5566).

65. Pub. L. No. 93-438, 88 Stat. 1233 (1974) (codified in scattered sections of 5 and 42 U.S.C.).

66. Pub. L. No. 93-577, 88 Stat. 1878 (1974) (codified at 42 U.S.C. §§ 5901-5920).

67. U.S. DEP'T OF ENERGY, *supra* note 8, at 3.

68. The DOE was created by the Department of Energy Organization Act, 42 U.S.C. § 7131 (1982).

69. J. NAAR, *supra* note 8, at 113.

70. *Id.* at 116.

71. *See id.* at 116-17.

72. *See* U.S. DEP'T OF ENERGY, *supra* note 8, at 5-6.

73. *Id.* at 7; J. NAAR, *supra* note 8, at 113.

74. J. NAAR, *supra* note 8, at 113.

75. *See* R. STOBACH & D. YERGIN, *supra* note 1, at 239-40.

million.⁷⁶ As a result of additional budget cuts, the program is now effectively inactive.⁷⁷

C. The Second Path: Incentives for the Private Sector

The enactment of the NEA in 1978 was the first serious attempt to provide governmental incentives for private-sector investment in renewable energy technologies. The Carter administration, arriving in Washington during the fuel shortages that accompanied the severe winter of 1976-77, took advantage of the crisis atmosphere⁷⁸ that prevailed in Congress to unveil its National Energy Plan.⁷⁹ Declaring the effort to end wasteful use of energy as "the moral equivalent of war,"⁸⁰ the President spurred Congress into enacting—in the relatively short timeframe of eighteen months—the nation's first attempt at a comprehensive energy policy.

1. The National Energy Act

The objective of the NEA was to reduce the dependence of the United States on imported oil and to facilitate a transition from the era of inexpensive and abundant energy supplies to a period of costly and scarce fossil fuels.⁸¹ Two of the NEA statutes—the Public Utility Regulatory Policies Act (PURPA) and the Energy Tax Act (ETA)—played an essential role in the development of the wind energy industry by creating major institutional and financial incentives for private investment in the planning and construction of wind energy facilities.

The NEA represented the first time that the federal government had characterized solar energy⁸² as a serious near-term energy resource.⁸³ It attempted a sweeping overhaul of the regulatory environment for the energy sector, and its provisions were controversial and widely publicized. Despite this fanfare and controversy, the provisions that led to the development of wind energy as a billion-dollar industry for the most part went unnoticed by all,⁸⁴ including the electric utilities, who had the most at

76. See M. MERRIAM, WIND ELECTRICITY FOR CALIFORNIA: COSTS AND BENEFITS 4 (1986) (Universitywide Energy Research Group, University of California, Report No. UER-164).

77. See J. NAAR, *supra* note 8, at 215.

78. Entin, *supra* note 55, at 409.

79. ENERGY POLICY AND PLANNING, EXECUTIVE OFFICE OF THE PRESIDENT, THE NATIONAL ENERGY PLAN (1977).

80. President's Address to the Nation: The Energy Problem, 1977 PUB. PAPERS 656, 656 (Apr. 18, 1977).

81. H.R. REP. NO. 453, 95th Cong., 1st Sess. 7 (1977); Minan & Lawrence, *supra* note 11, at 6.

82. Wind is considered a form of solar energy, because winds are caused by the uneven heating of the Earth's surfaces by the Sun. See Beattie, *supra* note 39, at 476; Comment, *Tax Benefits Through the Use of Solar Energy: A Comparison of Federal and California Legislation*, 2 NORTHROP U.L.J. AEROSPACE, ENERGY & ENV'T 85, 88 (1980).

83. R. STobaugh & D. YERGIN, *supra* note 1, at 280.

84. See *infra* note 88.

stake.

a. *The Public Utility Regulatory Policies Act*

PURPA was primarily an attempt at reforming utility pricing and policy.⁸⁵ In particular, it attempted to move the nation's utilities toward policies that price electricity at the true cost of providing services; it also provided stronger coordination of power supplies.⁸⁶ Perhaps its most important provision for the wind energy industry was section 210, which eliminated the institutional obstacles to private power generation by requiring utilities to purchase electricity generated by "small power producers" at favorable rates and to transmit the electricity on utility powerlines.⁸⁷ Although the provisions allowing private generation of electricity for use or sale to the utilities were innovative and unique, section 210 received very little attention from either the public or private sector at the time the NEA was passed.⁸⁸ The individuals and institutions with an interest in energy were preoccupied with more controversial aspects of PURPA, such as federal interference in utility ratemaking—which traditionally had been the exclusive domain of the states⁸⁹—and with the deregulation of natural gas.⁹⁰

85. See generally Joskow, *Public Utility Regulatory Policy Act of 1978: Electric Utility Rate Reform*, 19 NAT. RESOURCES J. 789 (1979).

86. H.R. REP. NO. 543, *supra* note 81, at 10.

87. See *infra* text accompanying notes 149-52.

88. The final debates on the House floor did not even mention section 210's provisions for small power production. See 124 CONG. REC. 38,483 (1978).

89. See Joskow, *supra* note 85, at 797.

90. Most of the discussion in the *Congressional Record* regarding the NEA focused on the Natural Gas Policy Act of 1978, Pub. L. No. 95-621, 92 Stat. 3350 (codified in scattered sections of 15 and 42 U.S.C.) (NGPA). NGPA was so controversial that it seemed destined not to pass in the House, until the Rules Committee presented a resolution ordering the consideration of all five component acts of the NEA *en bloc*, hoping to enact the bill on the coattails of the four others, which had been approved overwhelmingly in the Senate. The resolution passed—207 to 206. The tactic succeeded, but only because—as reflected in the testimony of some House members—it was politically unpalatable at the time to vote against an energy policy. Congressman Anderson of Illinois stated:

A grave injustice was perpetrated yesterday

[T]his body has permitted itself to be cowed into the most unseemly submission by a leadership that resorts to procedural railroading when it doubts it can prevail in a consideration based on substance.

[T]he rule we adopted yesterday was intended for no other purpose than to put opponents of the natural gas bill in [an] unfair and unnecessary dilemma

124 CONG. REC. 38,352 (1978). Congressman Brown of Ohio conceded that "I am enough of a realist to know that a majority of my colleagues will find it impossible to vote against 'an energy bill,' regardless of how ill-conceived and counterproductive the bill may be." *Id.* at 38,354. Similarly, Congressman Edwards of Oklahoma quoted an unnamed fellow member of Congress as saying, "I am going to put on a clothespin, and I am going to vote for this . . . because I cannot go home and face my voters and say I did not vote for an energy policy. I had to vote for an energy policy." *Id.* at 38,480.

b. The Energy Tax Act

Although tax credits had been suggested as early as 1975 as a vehicle for motivating investment in renewable energy technologies,⁹¹ the Energy Tax Act of 1978 (ETA)⁹² was the first successful enactment of these incentives. It amended the investment tax credit provisions in section 46 of the Internal Revenue Code to include an additional ten percent energy tax credit for business investment in qualifying energy property.⁹³ Because investment in some energy property, including wind energy equipment used for electrical generation, also qualified for the regular investment tax credit,⁹⁴ the total federal tax credit for these investments was twenty percent. The incentives represented an effort "to reduce demand for energy, to induce conversion from oil and gas to more abundant domestic energy sources, and to increase U.S. production of a broad range of energy sources."⁹⁵ The energy tax credit originally applied to investment in solar, wind, synthetic fuel, shale oil, and geothermal energy equipment.⁹⁶

Congress spent a year after the passage of the NEA, which included the ETA, evaluating its effectiveness, monitoring the deepening energy crisis, and giving further consideration to the comparative merits of tax incentives versus other legislative incentives.⁹⁷ In 1980, with the worldwide oil supply situation looking even more bleak than it had in 1978, Congress expanded the energy tax credits in the Crude Oil Windfall Profits Tax Act (WPTA).⁹⁸ Although the WPTA is better known for imposing a tax on domestic oil production,⁹⁹ it also increased the federal

91. See STAFF OF JOINT COMM. ON TAXATION, 95TH CONG., 1ST SESS., BUSINESS ENERGY TAX CREDITS FOR CONSERVATION AND CONVERSION 30 (Comm. Print 1977).

92. Pub. L. No. 95-618, 92 Stat. 3174 (codified in scattered sections of 19 and 26 U.S.C.).

93. I.R.C. § 46(a)(2)(C) (1981). For a description of both the regular business tax credits and the energy tax credits, see Minan & Lawrence, *supra* note 11, at 31-32.

94. I.R.C. § 46(c)(8)(f) (repealed 1986). The investment tax credit was available for tangible personal property used in trade or business, such as machinery and equipment. Friedmann & Mayer, *supra* note 17, at 482.

95. S. REP. NO. 529, 95th Cong., 2d Sess. 3 (1977). The committee also emphasized its belief that

this approach will be more effective than an approach which relies largely on tax increases to reduce demand for energy. . . . The cost of these tax incentives will be very small in relation to the economic and strategic costs of failing to take decisive action to deal with the energy import problem.

Id.

96. Energy Tax Act of 1978, Pub. L. No. 95-618, § 301, 92 Stat. 3194-98 (current version at I.R.C. § 46 (1987)).

97. In particular, Congress was weighing the relative benefits of the business and residential energy tax credits. Friedmann & Mayer, *supra* note 17, at 470.

98. Pub. L. No. 96-223, 94 Stat. 229 (1980) (codified in scattered sections of 7, 19, 26, and 42 U.S.C.). The Act established many new incentives for conservation and renewable energy development, most to be financed by the tax on the "windfall" from oil profits. *Id.* For the legislative history of the Act, see H.R. REP. NO. 817, 96th Cong., 2d Sess. (1980).

99. Minan & Lawrence, *supra* note 11, at 6.

energy tax credit from ten percent to fifteen percent and extended the expiration date of the credits to December 31, 1985.¹⁰⁰ These measures provided both an additional financial incentive and added security for the investment community. In addition, the credit was amended to cover investments in biomass, ocean thermal, small hydropower, and some cogeneration equipment.¹⁰¹

To provide additional incentives beyond those established by the tax credits, the federal government allowed wind energy equipment to qualify for accelerated depreciation benefits under the Accelerated Cost Recovery System,¹⁰² established in 1981 by the Economic Recovery Tax Act. Although in dollar terms these benefits represented as much of a loss to the federal treasury as the tax credits,¹⁰³ accelerated cost recovery was available for most categories of capital investment and therefore was not a major factor in directing investment toward wind energy in particular.

2. Other Attempts To Expand and Extend Federal Tax Credits

Within four years after the enactment of the Windfall Profits Tax Act, OPEC's inability to maintain oil production quotas, combined with increased non-OPEC production, led to a significant drop in oil prices.¹⁰⁴ The lower prices and steady supplies alleviated concerns about the energy crisis and led to a remarkable turnaround in the public's perception of energy availability as a national concern. One consequence of this change in priorities was a decrease in the level of support for the development of renewable energy technologies. Numerous attempts were made to expand and extend the energy tax credits during the period from 1983 until their expiration in 1985. However, because of the change in political priorities and the increased understanding about the potential benefits and practical limitations of the alternative energy technologies, the attempts to expand and extend the tax credits for wind energy ultimately failed.

The legislative history surrounding these attempts reflects greater

100. WPTA, Pub. L. No. 96-223, § 221(a), 94 Stat. 229 (codified as amended at I.R.C. § 46(a)(2)(C) (1981)). The Senate had proposed increasing the rate to 20% and extending the credit until the end of 1990, but the House had not supported any expansion or extension at all. The final provision was the result of a compromise in the conference on the bill. See H.R. REP. NO. 817, *supra* note 98, at 124.

101. Pub. L. No. 96-223, §§ 221-222, 94 Stat. 260-66 (codified in scattered sections of 46 and 48 I.R.C.).

102. I.R.C. § 168 (1982). Depreciation deductions allow taxpayers to recognize the diminution over time in value of an asset. Accelerated depreciation permits the taxpayer to deduct her full costs at a faster rate than is otherwise allowed, often before the useful life of the property is over. See J. McNULTY, *FEDERAL INCOME TAXATION OF INDIVIDUALS IN A NUTSHELL* 16-17 (1983).

103. See Table 3, *infra* p. 140.

104. See *ENERGY FORUM*, Oct. 1986, at 3.

attention on the part of Congress to the role of tax credits in encouraging the development of these technologies. Unlike the ETA and WPTA provisions, which were hastily enacted during the crisis period of the previous decade, the various bills proposed from 1983 to 1985 were the subject of exhaustive, detailed testimony regarding both the successes and the failures of alternative energy technologies.¹⁰⁵ A number of different solar energy tax credit bills were introduced during this period.¹⁰⁶ For example, in 1983 Senator Packwood introduced Senate Bill 1305, which would have increased the business energy credit to twenty-five percent and would have extended both the residential and business energy credits by five years, to December 31, 1990.¹⁰⁷

In 1985, another cluster of bills was introduced in an attempt to extend the tax credits before their expiration. By this time, however, the continued availability of oil at moderate prices had made the energy crisis a concern of the past in the minds of the public and the press.¹⁰⁸ In addition, bills extending energy tax credits were forced to compete for congressional attention with President Reagan's tax simplification proposal—a bill that eliminated financial incentives for conservation and alternative energy technologies while retaining existing subsidies for oil and gas and for nuclear power.¹⁰⁹ Although several of these bills proposing to extend the credits introduced creative solutions to problems associated with the structure of the existing tax credits,¹¹⁰ none of them garnered enough support to become law.

Even after the expiration of the existing federal energy tax credits in 1986, attempts were made to reintroduce the credits at a reduced percentage. The Renewable Energy and Conservation Transition Act (S. 1220) would have extended the credits, while phasing them out over a period of three to five years.¹¹¹ Under the proposal, the business energy

105. See, e.g., *Hearing on Renewable Energy Incentives*, *supra* note 23; *Miscellaneous Energy and Agricultural Tax Bills: Hearing Before the Subcomm. on Energy and Agricultural Taxation of the Senate Comm. on Finance*, 98th Cong., 1st Sess. (1983) [hereinafter *Hearing on Energy & Agricultural Tax Bills*]; *Tax Incentives for New Energy Technologies: Hearing Before the Subcomm. on Energy Development and Applications of the House Comm. on Science and Technology*, 98th Cong., 1st Sess. (1983) [hereinafter *Hearing on Tax Incentives for New Energy Technologies*].

106. See *Hearing on Energy & Agricultural Tax Bills*, *supra* note 105, at 5; *Hearing on Tax Incentives for New Energy Technologies*, *supra* note 105, at 3; STAFF OF JOINT COMM. ON TAXATION, 98TH CONG., 1ST SESS., DESCRIPTION OF S. 1396 (ENERGY SECURITY TAX INCENTIVES ACT OF 1983) 6-7 (Joint Comm. Print 1983).

107. *Hearing on Energy & Agricultural Tax Bills*, *supra* note 105, at 17.

108. See R. STOBAUGH & D. YERGIN, *supra* note 1, at 273.

109. The administration's opposition to the funding of conservation and solar energy research and development ostensibly was based on free market principles. The free market philosophy, however, was being imposed on renewable energy resources but not on traditional energy resources. See *infra* notes 303-08 and accompanying text.

110. See *infra* text following note 254 for a discussion of some of the proposed alternative tax credit schemes.

111. Energy Bus. Update, June 10, 1985, at 1.

credit for wind energy would have been extended for three years at a level of ten percent for 1986 and 1987 and five percent for 1988.¹¹² As with the other proposals, however, S. 1220 failed to find enough support in Congress.

Ultimately, Congress passed the Tax Reform Act of 1986¹¹³ with provisions extending the tax credits for most renewable energy technologies but not for wind energy.¹¹⁴ In addition, the ten percent regular investment tax credit, previously available for all qualifying capital investments, was eliminated by the 1986 Act,¹¹⁵ leaving the wind energy industry suddenly without any federal financial incentives for attracting continued investment.

3. Tax Credits and State Regulation in California

Many states decided to provide their own incentives for renewable energy investment in response to the energy crisis.¹¹⁶ California established a twenty-five percent tax credit for investment in qualifying solar energy systems for business applications, including wind turbines and related equipment.¹¹⁷ The California provision offered the greatest financial benefits of any state solar tax incentive law.¹¹⁸ Support for the wind energy tax credits, however, has declined in California as it has in Washington, D.C. On June 28, 1985, Governor Deukmejian signed into law a provision that continued the twenty-five percent credit for commercial wind energy installations in 1985 but decreased the credit to fifteen percent in 1986 and eliminated it completely beginning in 1987.¹¹⁹

California's development of a wind energy industry was as much a product of a favorable regulatory environment as it was the result of financial incentives provided by the federal and state tax credits. In the early 1980's, the California Public Utilities Commission took an aggressive, strongly pro-development position in its interpretation of PURPA, the interpretation of which Congress had left largely in the hands of state

112. *Id.*

113. Pub. L. No. 99-514, 100 Stat. 2085 (codified in scattered sections of U.S.C.).

114. See STAFF OF JOINT COMM. ON TAXATION, *supra* note 45, at 24-25; Energy Bus. Update, Sept. 10, 1986, at 2.

115. See *supra* note 51 and accompanying text.

116. More than 25 states, for example, have enacted legislation providing tax incentives for solar energy. Mostly this legislation provides for tax credits or deductions for investment in solar energy equipment or allows an exemption from real property taxes for such equipment. Minan & Lawrence, *State Tax Incentives to Promote the Use of Solar Energy*, 56 TEX. L. REV. 835, 837 (1978).

117. CAL. REV. & TAX. CODE § 17052.5(a)(3) (West 1983) (repealed 1986).

118. Minan & Lawrence, *supra* note 11, at 5.

119. 1985 Cal. Stat. 116, § 1(a)(3); see Energy Bus. Update, Sept. 3, 1985, at 1. Because the federal solar energy tax credit also had been eliminated, the governor's action left the wind energy industry without any governmental incentives for attracting investment.

regulators.¹²⁰ The CPUC's favorable interpretation of PURPA's avoided-cost and interconnection requirements,¹²¹ combined with California's high generation costs because of its reliance on oil-fired power plants, made California the most favorable location in the country for wind energy development.¹²² Recent CPUC interpretations of PURPA indicate, however, that the CPUC has started to retreat from its pro-development stance.¹²³

III

ANALYZING THE ROLE OF LEGISLATIVE PROGRAMS

This Section considers in greater detail the impacts of each of the legislative incentive programs introduced in Section II. Their effectiveness, both individually and collectively, will be analyzed in an attempt to assess their strengths and weaknesses and to determine what form future incentive programs for energy technologies should take.

A. Effectiveness of the Federal Wind Energy Program

The Federal Wind Energy Program was a \$300 million program of direct investment in wind energy research and development.¹²⁴ There were five major elements to the program.¹²⁵ Two of the five—the Technology Development and Engineering Development programs—were tied to the development of large turbines.¹²⁶ Together, these two programs received approximately eighty percent of the total Federal Wind Energy Program funding.¹²⁷ Several generations of prototype turbines were manufactured and tested under the DOE/NASA program, but none was sufficiently advanced—economically or technically—to play a role in the industry's boom during the 1980's. Although attempts were made to develop windfarms consisting of clusters of these multimegawatt

120. PURPA § 210(a), 16 U.S.C. § 824a-3(a) (1982), requires the Federal Energy Regulatory Commission to prescribe "such rules as it determines necessary to encourage cogeneration and small power production." These rules, which are quite general, are laid out at 18 C.F.R. §§ 292.101-.602 (1986). Beyond these broad guidelines, section 210(f) of PURPA states simply that "each State regulatory authority shall, after notice and opportunity for public hearing, implement such rule (or revised rule) for each electric utility for which it has ratemaking authority." 16 U.S.C. § 824a-3(f). The effect of this provision essentially was to leave the details of ratemaking in the hands of the individual utility regulatory commissions. See Lock, *Encouraging Decentralized Generation of Electricity: Implementation of the New Statutory Scheme*, 2 SOLAR L. REP. 705, 717 (1980).

121. See *infra* text accompanying notes 212-14.

122. Gipe interviews, *supra* note 26.

123. See *infra* text accompanying notes 219-26.

124. See U.S. DEP'T OF ENERGY, *supra* note 8, at 7.

125. *Id.* at 17.

126. *Id.* at 21-30. See *infra* note 137 for a description of the three other programs funded under the Federal Wind Energy Program.

127. The exact figures are 70% for 1981, and 87% for 1982, the most recent years for which reliable information is available. U.S. DEP'T OF ENERGY, *supra* note 8, at 8.

turbines, none was successful.¹²⁸

The largest and latest of these prototypes, the Boeing Mod-2, came nearest to achieving commercial status. The Mod-2 has a 200-foot tower, a 300-foot rotor diameter, and a generating capacity of 2.5 megawatts,¹²⁹ approximately twenty-five times that of the typical small wind turbines used in windfarms. Four of the Mod-2 units were installed at locations in the United States: three in a cluster in Goodnoe Hills, Washington, near the mouth of the Columbia River,¹³⁰ and one in Fairfield, California, about forty miles north of Altamont Pass.¹³¹ In May 1985 the California unit, owned and operated by Pacific Gas & Electric Company, achieved a milestone of sorts when it set a single-turbine production record of 5 million kWh after three years of operation.¹³² This figure is unimpressive, however, considering that original projections were for production of 10 million kWh per year¹³³ and that, in 1985 alone, PG&E purchased nearly 400 million kWh from Altamont Pass windfarms.¹³⁴

Although funding for another prototype, the Mod-5B, recently was restored after being eliminated in congressional budget-cutting sessions,¹³⁵ the fate of the large wind turbine program is uncertain and the outlook bleak. Between the limited success of the Federal Wind Energy Program and the current administration's lack of support for renewable energy programs in general, additional funding is unlikely.

Other aspects of the Federal Wind Energy Program were less visible but more successful. Although their direct contribution to the commercialization of the industry was minimal,¹³⁶ several of the branch programs provided useful technical and economic information for manufacturers and developers in the private sector.¹³⁷

128. A \$400 million joint venture between the Boeing Company and Denver-based Aero-Turbine Energy Corporation was planned for the hills around Fairfield, California. Using 36 turbines rated at 3.5 mW each, the project was supposed to be in place by 1985. See Vicker, *PG&E Hopes to be Buying Electricity from Biggest U.S. 'Wind Farm' by 1985*, Wall St. J., Nov. 11, 1982, at 18, col. 1. The project was never built.

129. J. NAAR, *supra* note 8, at 171.

130. *Id.* at 164-65.

131. Vicker, *supra* note 128, at 18, col. 1.

132. Cal. Energy Update (later Energy Bus. Update), Apr. 15, 1985, at 5.

133. J. NAAR, *supra* note 8, at 172.

134. The exact figure was 379,044,597 kWh. CAL. ENERGY COMM'N, RESULTS FROM THE WIND PROJECT PERFORMANCE RATING SYSTEM: 1985 ANNUAL REPORT 20 (1986).

135. Energy Bus. Update, July 16, 1986, at 4-5.

136. The installed costs per kWh of generating capacity of the larger turbines could not compete with the lower generating costs of the smaller turbines. See CAL. ENERGY COMM'N, SOLAR AND WIND TECHNOLOGY TAX INCENTIVE IMPACT ANALYSIS 3-21 (1986).

137. The three other program elements were:

(1) Systems and Operational Analysis. This element involved research on the operations of wind systems, including institutional, environmental, and economic issues. Most of the work in this area was performed by the Solar Energy Research Institute (SERI) in Golden, Colorado. SERI's accomplishments included the development of various economic models for

The Federal Wind Energy Program generally was unsuccessful. The factors limiting its progress could not have been anticipated, however, and it is difficult to say how the funds could have been better utilized within the framework of direct funding of renewable energy research and development. Several points are worth discussion.

First, with the benefit of hindsight, the program's emphasis on development of large turbines seems misdirected. Although early feasibility studies indicated that costs per unit of energy would be much lower with large wind turbines—i.e., turbines of 500 kilowatts capacity or more—several years' experience revealed a flaw in these studies: the stress resulting from turbulent wind conditions near the ground proved more serious an obstacle to large turbines than had been anticipated.¹³⁸ Had the initial prototypes been more successful, the large turbines would have attracted the continuing interest of manufacturers, utilities, and financiers. If so, a significant part of the nation's installed wind energy generating capacity would have consisted of these large-scale turbines. That this turned out not to be the case is the result of complex technical and economic factors, none of which were foreseeable when most of the implementing legislation was passed during the 1970's.¹³⁹

A second point worth noting is that the NEA and its provisions

the wind energy and utility industries, identifying potential environmental impacts (mostly noise and safety) and publishing reports on a number of legal and institutional issues.

(2) Wind Characteristics. This element led to most of the wind resource assessment done at the federal level. The assessment work included developing wind models for turbine design, researching methodologies for site selection, and developing wind forecasting techniques. The assessment work was done by the Pacific Northwest Laboratory in Richland, Washington. It resulted in the publication of a variety of wind resource maps and atlases for the United States and its territories.

(3) Implementation and Market Development. Designed to identify markets for wind turbines and to disseminate information on wind energy to the public, this element was ineffective and was phased out after fiscal year 1981.

See U.S. DEP'T OF ENERGY, *supra* note 8, at 17-20, 31.

138. In theory, large-scale turbines are more cost-effective. See GENERAL ELECTRIC CO., DESIGN STUDY OF WIND TURBINES 50 kW - 3,000 kW FOR ELECTRIC UTILITY APPLICATIONS (1976); KAMAN AEROSPACE CO., DESIGN STUDY OF WIND TURBINES 50 kW - 3,000 kW FOR ELECTRIC UTILITY APPLICATIONS: ANALYSIS AND DESIGN (1976) (prepared for NASA under contract). Because the area swept by the turbine's rotor increases as the square of the increase in rotor diameter, doubling the size of a rotor quadruples the swept area and, therefore, the available energy. This relationship tends to favor increasingly large rotor diameters, up to the point at which compensating for the aerodynamic and other physical stresses associated with a large, rapidly spinning rotor is too expensive. The feasibility studies—prepared by the best aerodynamics companies in the world—erred in underestimating just how serious these stresses would be.

Aerodynamicists are accustomed to designing equipment for operation in the smooth, laminar airflows of the upper atmosphere. But ground-level winds are made up of air that is constantly swirling, eddying, gusting, and shifting. The stresses resulting from these turbulent conditions are greater than had been predicted and were perhaps the main obstacle in the success of the program to develop large wind turbines.

139. The factors included difficulties in designing turbine blades able to cope with complex wind flow patterns near the ground, in reducing the costs of manufacturing below those of the

favoring private investment in alternative energy overshadowed the direct federal research and development effort, with the result that the attention of interested parties and prospective investors was redirected away from the large turbine program. Financiers interested in wind energy investment in the mid-1970's almost certainly held off once it was clear that additional financial benefits would be provided by the NEA.

Third, alternative energy technologies were to some extent the darling of the "small is beautiful" set during the 1970's.¹⁴⁰ The prospect of prototype turbines with 300-foot rotors, built by the world's largest aerospace corporations at costs of millions of dollars, detracted from the grassroots appeal of the technology. Much of the theoretical interest in alternative technologies stemmed from the fact that they encouraged small-scale, decentralized energy production.¹⁴¹ Advocates of wind energy were willing to support the federal effort when it was the only game in town, but when the private incentive structure was put in place, its emphasis on "small power producers" and entrepreneurial investment proved more appealing to a large segment of the interested public.

Fourth, an argument can be made that promoting entrepreneurial investment is often more efficient than direct federal investment in the development of energy technology.¹⁴² Because there are few examples of the government pursuing both avenues simultaneously, it would be unwise to generalize broadly from the relatively isolated case of the alternative energy programs. Nevertheless, in comparing the dollars invested—or forsaken—by the federal treasury with the impact on development of

prototype models, and in securing financing during a period of extremely high interest rates. Gipe Interviews, *supra* note 26.

140. The phrase "small is beautiful" was taken from E. F. Schumacher's book of the same title. E. SCHUMACHER, *SMALL IS BEAUTIFUL: ECONOMICS AS IF PEOPLE MATTERED* (1973). "Small is beautiful" has become the catchphrase for many individuals who believe that it is not the *type* but the *scale* of economic and social organizations that is humanity's most pressing problem. Schumacher believed that we suffer from "an almost universal idolatry of giantism," *id.* at 66, and preferred technologies and institutions that operate on a more appropriate scale.

141. See, e.g., A. LOVINS, *supra* note 60, at 38-39, 85-103.

142. Although direct government research and development (R&D) programs may be necessary to support risky ventures or to nurture an industry during its early stages, R&D funding—sometimes motivated by national security needs—often does not provide the flexibility for businesses to pursue the competitive efforts needed for commercialization. I. MAGAZINER & R. REICH, *MINDING AMERICA'S BUSINESS: THE DECLINE AND RISE OF THE AMERICAN ECONOMY* 233, 366 (1982). Government R&D contracts impose rigid constraints that are not responsive to market conditions, whereas tax credits create flexible economic incentives for industry. *Id.* In addition, government R&D programs are better suited to funding large-scale projects rather than small-scale entrepreneurial efforts. *Id.* at 350. If the government, rather than a private company, proposes a particular R&D project, the project is less likely to be directly applicable to the commercialization and competitive development of the product. *Id.* at 351. Thus, although government funding is helpful for projects not likely to have commercial applications in the short term, legislative incentive programs—such as tax credits—that allow companies to pursue their own competitive strategies are more likely to result in cost-efficient commercialization over a relatively short timespan. *Id.* at 351, 366.

the wind energy industry, it is clear that the tax credit program was a relative bargain: the \$300 million spent in the Federal Wind Energy Program resulted in perhaps 10 million kWh of electrical production, whereas the National Energy Act and its progeny cost four times as much but resulted in 200 times¹⁴³ the amount of energy generation.

Finally, the failure of the Federal Wind Energy Program may be a function of timing. It preceded the incentive programs of the NEA by five years, which may have been enough time to allow other changes in the economy (rising fuel prices, higher capital costs for conventional generating facilities, and uncertainties regarding electricity demand) to make alternative energy technologies much more attractive to the investor of 1980 than they were to the investor of 1975.¹⁴⁴

The Federal Wind Energy Program was a costly high-technology research and development effort using the nation's biggest and best engineering firms. Its focus on megawatt-scale turbines was a gamble that failed to pay off, and the goal—successful commercialization at a level allowing mass production at lower cost—never was achieved. By contrast, the NEA and its progeny were successful in spurring the commercialization of the wind energy industry.

B. Effectiveness of Private Sector Incentive Programs

The private sector incentive programs established by the NEA and, later, by the Windfall Profits Tax Act of 1980, were more broadly designed and open to interpretation than were the earlier research and development programs. This versatility may be primarily responsible for the wind energy industry's first years of success.

PURPA and ETA addressed very different elements of a coordinated national energy policy, yet both played a key role in the development of the wind energy industry. Each was a necessary element in the eventual investment boom, and it was the symbiotic effect of the two statutes that made possible the industry's remarkable growth.¹⁴⁵

143. See Table 1, *supra* p. 109.

144. Even so, the 1980 developer still had the option of investing in large wind turbines—already under construction by the federal government for five years—or small wind turbines. The developers ultimately chose the small turbine option. See *supra* note 136 and accompanying text. On the other hand, the theoretical basis for favoring large turbines remains sound and the large turbines may yet achieve a level of success commensurate with the attention they have received at the federal level. There has been a trend toward increasing size among wind turbines installed at commercial windfarms, though the largest units still are smaller than those designed by the aerospace firms. See Gipe, *supra* note 7, at 74.

145. As one small power producer put it:

PURPA has been the linchpin by which the small power production opportunities in this country have been allowed. It is a necessary condition. It is not a sufficient condition.

The companion to PURPA are the tax incentives that have been established by Congress [T]hese two conditions need to exist together.

Renewable Energy Industry: Joint Hearing Before the House Comm. on Energy and Com-

1. PURPA: Setting the Stage

a. The Unique Approach of PURPA

Sections 201 and 210 of PURPA were the key provisions in encouraging the development of alternative energy technologies. Their purpose was to "remove regulatory and market barriers that prevent the commercial feasibility of on-site electrical generation."¹⁴⁶ These sections were designed to create a market where none had existed before: a market for cogeneration and small power production using renewable resources.¹⁴⁷ Section 201 defined the requirements cogenerators and "small power producers" such as wind energy developers were obligated to meet in order to become "qualifying facilities."¹⁴⁸ Section 210 then laid out the three key requirements that would benefit qualifying facilities.¹⁴⁹ First, section 210 required the Federal Energy Regulatory Commission (FERC) to establish rules forcing utilities to purchase electric power from qualifying cogenerators and small power producers.¹⁵⁰ Second, section 210 required FERC to set standards for the state regulatory commissions to use in determining the rates that utilities must pay for the power generated by qualifying facilities.¹⁵¹ Third, section 210 required state utility commissions to exempt qualifying facilities from regulation.¹⁵²

Taken together, these provisions eliminated the formidable institutional barriers that had prevented independent power producers from breaking up the utility monopoly on electric power generation. They did

merce, the House Comm. on Small Business, and the House Comm. on Education and Labor, 98th Cong., 1st Sess. 88 (1983) [hereinafter *Joint Hearing on Renewable Energy Industry*] (statement of Robert P. Kennel, Vice President, Ultrasystems, Inc.).

146. Hamilton, *Standard Contracts and Prices for Small Power Producers*, 11 WM. MITCHELL L. REV. 421, 427 (1985).

147. Comment, *Problems with PURPA: The Need for State Legislation to Encourage Cogeneration and Small Power Production*, 11 B.C. ENVTL. AFF. L. REV. 149, 157 (1983).

148. 16 U.S.C. § 796(17)-(22) (1982). Qualifying criteria included allowable primary energy sources, maximum generating output, and restrictions on ownership to "a person not primarily engaged in the generation or sale of electric power." See Comment, *supra* note 147, at 159 (quoting 16 U.S.C. § 796(17)(C)(ii)).

149. 16 U.S.C. § 824a-3.

150. *Id.* § 824a-3(a). In pertinent part this subsection reads: "[T]he Commission shall prescribe . . . such rules as it determines necessary to encourage cogeneration and small power production . . . which rules require electric utilities to . . . (2) purchase electric energy from such facilities."

151. *Id.* § 824a-3(b). In pertinent part this subsection reads: "[T]he rates for such purchase—(1) shall be just and reasonable to the electric consumers of the electric utility and in the public interest, and (2) shall not discriminate against qualifying cogenerators or qualifying small power producers."

152. *Id.* § 824a-3(e). In particular, this subsection exempted qualifying facilities from the Federal Power Act, 16 U.S.C. §§ 791a-828c (1982), from the Public Utility Holding Company Act, 15 U.S.C. §§ 79 to 79z-6 (1982), and from "State laws and regulations respecting the rates, or respecting the financial or organizational regulation, of electric utilities . . . if the Commission determines such exemption is necessary to encourage cogeneration and small power production."

so by offering qualifying facilities a guaranteed market for their electricity, at a fair price, and without the burden of regulatory constraints. Each of these provisions was an important factor in encouraging the development of small power production.

The first two requirements—establishing guaranteed markets and price guidelines—were necessary to overcome opposition from utilities. The utilities generally were hostile to the concept of small power producers because they perceived small energy producers as competitors in a limited market, interfering with the utilities' traditional turf.¹⁵³ Moreover, because small power producers had no other outlet for their electricity,¹⁵⁴ utilities had the monopsony power necessary to control the market¹⁵⁵ and to prevent the development of small-scale production.

Even after the passage of PURPA, the utilities' hostility continued to manifest itself in a variety of ways. The utilities resisted FERC's attempts to encourage state utility commissions to establish a rate equal to full avoided cost, the maximum allowable level under section 210(b) of PURPA.¹⁵⁶ They took advantage of the "gray area" between federal and state regulatory jurisdiction over utilities to hamper the implementation of PURPA's goals.¹⁵⁷ Utilities also were slow to comply with the FERC

153. See Lock, *supra* note 120, at 712.

154. Comment, *supra* note 147, at 157.

155. Lock, *supra* note 120, at 712. Lock's article provides an excellent discussion of the economic and institutional barriers to small power production. See also Hamilton, *supra* note 146, at 428, 434.

Monopsony, the market condition in which there are many sellers but only one buyer, is the flip side of monopoly. In the absence of regulation, the buyer can control the market and the price by being the only source of demand. For example, in the absence of PURPA, the utility could limit its purchases from small power producers, creating excess supply and driving prices down.

Ironically, utilities usually are thought of as requiring regulation because they are natural monopolies, see Comment, *supra* note 147, at 185; that is, they are in a declining-cost industry, in which the cost per unit of production is lowest with only one supplier because the large capital costs of developing the necessary infrastructure (power plants, transmission lines, substations, etc.) can be justified economically only by spreading the amortized cost among large numbers of buyers. Regulated utilities are allowed to retain their monopoly status and, therefore, to have captive buyers within their service area. In return, they give up the right to set their own prices and earnings. When, under PURPA's provisions, the utilities themselves become buyers instead of sellers, the same factors work to their advantage because the small power producers cannot afford the cost of duplicating the infrastructure that the utilities already have in place. The utilities have captive sellers rather than their more typical captive buyers, but the effect on the utilities' power over the market is identical.

In short, the factors that require the regulation of utilities as monopolistic sellers also requires their regulation as monopsonistic buyers; PURPA's interconnection requirements and pricing guidelines are simply regulatory guidelines to eliminate the utilities' institutional advantage.

156. Comment, *supra* note 147, at 166. The utilities' resistance ultimately led to the legal challenge to FERC's standards in *American Paper Inst., Inc. v. American Elec. Power Serv. Corp.*, 461 U.S. 402 (1983), discussed *infra* at notes 184-211 and accompanying text.

157. Comment, *supra* note 147, at 167. The challenges in *American Paper* and *FERC v. Mississippi*, 456 U.S. 742 (1982), were extreme examples of attempts by utilities to press for

rules promulgated under PURPA standards:¹⁵⁸ they resisted buying electricity from qualifying facilities,¹⁵⁹ and they were reluctant to provide interconnection between their powerlines and the small power producer.¹⁶⁰ When several petitions for rehearing were filed after FERC promulgated its final rules under PURPA, eight of the nine petitioners seeking reconsideration of the broad interpretation of PURPA's mandate were utilities.¹⁶¹

The third requirement of PURPA—eliminating regulatory authority over qualifying facilities—was necessary to encourage small power production¹⁶² because the burden of complying with the strict regulatory constraints designed for large public utilities would make it impossible for small entrepreneurial firms to survive.¹⁶³ In return for being allowed to have monopolies on the service within a given area, public utilities traditionally have been subject to extensive controls imposed by state and federal governments.¹⁶⁴ The controls are oriented toward providing a high level and quality of service at a fair price determined by the regulating agency. Specifically, the regulatory agency has control over such matters as restricting entry into the market, franchising within certain geographic areas, providing a certain standard of service in a nondiscriminatory manner to all consumers within the franchise, establishing rates, issuing bonds, and discontinuing service.¹⁶⁵ The risk of being considered a public utility and, therefore, being subject to extensive regulatory re-

favorable interpretations of PURPA's mandate. *See infra* notes 172-211 and accompanying text.

158. Comment, *supra* note 147, at 171. The utilities were supposed to begin implementing PURPA within one year of the publication of the FERC regulations. Many failed to do so, claiming either that the federal government lacked the authority to impose its standards on state regulatory commissions or that the standards exceeded the scope of any such authority. *See id.* at 189.

159. *Id.* at 181. Because FERC had delegated most of its authority over implementation to state regulatory commissions, it remained the responsibility of those commissions to force utilities to comply with PURPA.

160. Note, *A Vote of Confidence for PURPA and Rulemaking in the Early Stages of Emerging Technology Legislation*—American Paper Institute v. American Electric Power Service Corp., 5 WHITTIER L. REV. 625, 642 (1983). Because the cost of developing independent electrical transmission capability is prohibitive, the utilities' refusal to provide interconnection was a major institutional barrier to independent power production.

161. *FERC Rules on PURPA Challenges*, 2 SOLAR L. REP. 240, 240 (1980).

162. The qualifying facilities are exempt from regulation under the Federal Power Act, 16 U.S.C. §§ 791a-828c (1982), the Public Utilities Holding Companies Act, 15 U.S.C. §§ 79 to 79z-6 (1982), and state laws governing electric utilities. This relieves the qualifying facilities from the administrative burdens and rate-of-return limitations that utilities face. *See Kent, Long-Term Electricity Supply Contracts Between Utilities and Small Power Producers*, 5 STAN. ENVTL. L. ANN. 175, 178 (1983); Lock, *supra* note 120, at 713.

163. There is a certain irony in the establishment of regulations to free an emerging industry from the burden of other regulations, but the idea was both logical and effective. *See* Lock, *supra* note 120, at 713.

164. Comment, *supra* note 147, at 182.

165. *Id.* at 182-85.

quirements was one of the major barriers to the success of cogenerators and small power producers.¹⁶⁶ Even FERC, the chief federal energy regulatory body, recognized the "disincentive of utility-type regulation."¹⁶⁷ Free from these regulatory constraints and the general administrative burden of responding to regulatory requirements, a small power producer can operate independently and efficiently.¹⁶⁸

PURPA is unique among federal energy regulatory laws. It revolutionizes the electrical power industry by eliminating the utility monopoly over electrical generation, expanding energy investment opportunities, and encouraging unfettered energy production, rather than restricting and encumbering the industry. In particular, it represents an explicit decision to encourage decentralized electricity generation using renewable resources.¹⁶⁹ As one commentator put it:

Years of adherence to the notion of large-scale concentrated generation, catering to rapidly growing demand, led to market and regulatory structures that created serious economic and institutional barriers to the marketing of decentrally generated electricity.

. . . .

[PURPA's] provisions are intended to create, when coupled with the new economics of centralized generation, a flourishing market for decentralized generation.¹⁷⁰

166. *Id.* at 158 n.76.

167. 45 Fed. Reg. 12,232 (1980).

168. The rules promulgating this requirement of PURPA are at 18 C.F.R. §§ 292.601-.602 (1987).

169. See Hagler, *Utility Purchases of Decentralized Power: The PURPA Scheme*, 5 STAN. ENVTL. L. ANN. 154, 160 (1983). Hagler states that "Congress entered the debate over decentralized power because of its increasing awareness of the national energy problem and the lack of state involvement." *Id.*

170. Lock, *supra* note 120, at 711-13. Lock went on to credit PURPA with breaking the utility monopoly of power generation, *id.* at 705, and called it "a bill of rights for the decentralized generator," *id.* at 713. He also praised the FERC rules implementing PURPA sections 201 and 210: "The FERC rules . . . have resolved, in an intelligent and practical fashion, many troublesome issues that might have plagued [public utility commissions] for years to come. . . . [They] are a major step toward laying the economic basis for a sound decentralized generation industry." *Id.* at 751-52.

Lock was not alone in finding PURPA to be an innovative response to the energy crisis. Among commentators, the response to PURPA was overwhelmingly positive. One author stated that the importance of decentralized electricity generation in America's energy picture has increased dramatically in a way that would have been impossible without radical restructuring in the heavily regulated electric utility industry, and he called PURPA "the cornerstone of the restructuring process." Kent, *supra* note 162, at 197. Another commentator proclaimed that PURPA's provisions "advance the federal role of encouraging the development of renewable energy technologies," Hamilton, *supra* note 146, at 427, and lower "many of the all but insurmountable entry barriers faced by cogenerators and small power producers." *Id.* at 428.

But see Comment, *supra* note 147, at 151-52 (expressing concern that PURPA's provisions have "created conflicts between federal and state utility regulators," because the provisions "represent an encroachment by the federal government upon traditional state regulatory

b. *The Role of the Supreme Court*

Support for PURPA also came from the United States Supreme Court. Those in the energy and utility industries who were hostile to PURPA turned to the courts for relief as soon as the NEA was passed in 1978. Two of these cases reached the Court: *FERC v. Mississippi* in 1982,¹⁷¹ and *American Paper Institute, Inc. v. American Electric Power Service Corp.* in 1983.¹⁷² Both decisions upheld the challenged provisions of PURPA, resolving the controversies surrounding the legality of PURPA and allowing wind energy projects to take advantage of PURPA's provisions without threat of constitutional objection. The significance of these favorable court decisions cannot be overemphasized because they eliminated the remaining uncertainty that held back initiative and investment by energy entrepreneurs.¹⁷³

Although both cases have been thoroughly analyzed elsewhere,¹⁷⁴ they deserve a brief review here because of their importance in eliminating the uncertainty that surrounded PURPA's provisions. The *Mississippi* case involved a challenge to congressional power under the commerce clause¹⁷⁵ to pass legislation directly affecting state agencies.¹⁷⁶ The state of Mississippi argued that section 210 of PURPA represented an abuse of commerce clause power and that the provision infringed on the state's sovereignty in violation of the Tenth Amendment.¹⁷⁷ The Supreme Court unanimously concurred on the invalidity of the commerce clause argument, upholding the power of Congress to regulate electric utilities in intrastate as well as interstate commerce.¹⁷⁸ The Court noted that it previously had indicated that "federal regulation of intrastate power transmission may be proper because of the interstate nature of the generation and supply of electric power,"¹⁷⁹ and it found a rational basis in the specific congressional finding that "the regulated activities have an immediate effect on interstate commerce."¹⁸⁰

controls," but favoring resolution of these conflicts so that cogeneration and small power production can be encouraged).

171. 456 U.S. 742 (1982).

172. 461 U.S. 402 (1983).

173. See *infra* notes 206-11 and accompanying text.

174. For discussions of *Mississippi*, see Comment, *supra* note 147, at 173-77; Note, *supra* note 160, at 627-29. For analyses of *American Paper*, see Hagler, *supra* note 169, at 168-71; Comment, *supra* note 147, at 177-82; and Note, *supra* note 160.

175. U.S. CONST. art. I, § 8.

176. Comment, *supra* note 147, at 173.

177. "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people." U.S. CONST. amend. X.

178. See 456 U.S. at 753 (Blackmun, J., for the majority); *id.* at 773 (Powell, J., concurring in part and dissenting in part); *id.* at 775 (O'Connor, J., concurring in part and dissenting in part).

179. *Id.* at 755 (citing *FPC v. Florida Power & Light Co.*, 404 U.S. 453 (1972)).

180. The Court went on to state:

On the Tenth Amendment issue, however, the Court was sharply divided.¹⁸¹ Justice Blackmun's majority prevailed with the argument that because "the commerce power permits Congress to preempt the States entirely in the regulation of private utilities,"¹⁸² "PURPA should not be invalid simply because, out of deference to state authority, Congress adopted a less intrusive scheme and allowed the States to continue regulating in the area on the condition that they *consider* the suggested federal standards."¹⁸³

Less than a year after the *Mississippi* decision, the Court of Appeals for the District of Columbia vacated two of FERC's rules implementing PURPA's section 210.¹⁸⁴ One rule required that state public utility commissions set the rates paid for power purchases from qualifying facilities at "full avoided cost."¹⁸⁵ Section 210(b) of PURPA had provided only

Congress [had] determined that "the protection of the public health, safety, and welfare, the preservation of national security, and the proper exercise of congressional authority under the Constitution to regulate interstate commerce require," among other things, a program for increased conservation of electric energy, increased efficiency in the use of facilities and resources by electricity utilities, and . . . a program to improve the wholesale distribution of electric energy

Id. at 755 (citing 16 U.S.C. § 2601).

The Court also made a reference to congressional support for section 210, stating that "Congress also determined that the development of cogeneration and small power production facilities would conserve energy." *Id.* at 757.

181. The Court split 5-4 on the Tenth Amendment issue, with four of the Justices who had concurred on the commerce clause question dissenting. Justice Powell wrote a separate dissent, and Justice O'Connor, joined by Chief Justice Burger and Justice Rehnquist, wrote a twenty-two page dissent devoted almost entirely to the issue. O'Connor stated that "Titles I and III of PURPA conscript state utility commissions into the national bureaucratic army. This result is . . . antithetical to the values of federalism, and inconsistent with our constitutional history." *Id.* at 775. Note, however, that section 210 is in Title II of PURPA, which Justice O'Connor explicitly excluded from her criticism:

I concur in the Court's decision to uphold Title II, § 210, of PURPA As the Court explains, part of that section permits [FERC] to exempt cogeneration and small power production facilities from otherwise applicable state and federal laws.

This exemption authority does not violate the Tenth Amendment, for it merely pre-empts state control of private conduct, rather than regulating the "States as States."

Id. at 775-76 n.1 (citation omitted). Nevertheless, Justice O'Connor and the other dissenters on this issue were not entirely comfortable with section 210's provisions, upholding them "without foreclosing the possibility that particular applications of § 210's implementation provision might uncover hidden constitutional defects." *Id.* at 776 n.1. The Court considered those implementing provisions, as rules promulgated by FERC, in *American Paper*.

182. *Id.* at 764.

183. *Id.* at 765.

184. At the court of appeals level, the case was designated *American Elec. Power Serv. Corp. v. FERC*, 675 F.2d 1226 (D.C. Cir.), *reh'g en banc denied*, 675 F.2d 1246 (D.C. Cir.), *cert. granted*, 459 U.S. 904 (1982).

Following the Circuit Court's decision, both FERC and the American Paper Institute petitioned the Supreme Court for a writ of certiorari. When the writs were granted, the two dockets were consolidated as *American Paper Inst., Inc. v. American Elec. Power Serv. Corp.*, 461 U.S. 402 (1983).

185. Full avoided cost is the equivalent of the term "incremental cost of alternative energy" used in PURPA, that is, "the cost to the electric utility of the electric energy which, but for the purchases from such cogenerator or small power producer, such utility would generate

that the rate be "just and reasonable," that it "not discriminate against qualifying cogenerators or qualifying small power producers," and that it *not exceed* "the incremental [avoided] cost to the electric utility of alternative electric energy."¹⁸⁶

The other rule vacated by the court of appeals was FERC's requirement that utilities "make such interconnections with any qualifying facility as may be necessary to accomplish purchases or sales."¹⁸⁷ In generally exempting qualifying facilities from regulation,¹⁸⁸ PURPA had provided specifically that certain sections of the Federal Power Act (FPA)¹⁸⁹ concerning interconnection would not be included in the exemption.¹⁹⁰ These sections establish extensive procedures for applying for, and criteria for granting, an order to interconnect; they could have been interpreted as requiring FERC to hold an evidentiary hearing and to make certain findings before permitting interconnection of qualifying facilities.¹⁹¹ Enforcement of these requirements might have prevented interconnection for many qualifying facilities.¹⁹² Instead, FERC promulgated a rule based on a broad interpretation of its own authority, construing one of the relevant FPA sections to mean that the FPA's interconnection authority "should not be interpreted as exclusive of any

or purchase from another source." *American Paper*, 461 U.S. at 406 (citing PURPA § 210(d), 16 U.S.C. § 824a-3(d) (Supp. V 1976)).

186. PURPA § 210(b), 16 U.S.C. § 824a-3(b) (1982).

187. *American Paper*, 461 U.S. at 407 (citing 18 C.F.R. § 292.303(c)(1) (1982)). An interconnection is a physical link that allows electricity to flow from one electrical system to another.

FERC also indicated, in an accompanying regulation, that each qualifying facility must pay the costs of interconnection. 18 C.F.R. § 292.306(a) (1982). The California Public Utilities Commission, however, encouraged the utilities to pay for most of the costs of interconnection.

188. See *supra* text accompanying notes 162-68.

189. 16 U.S.C. §§ 791a-825c (1982).

190. PURPA § 210(e)(3), 16 U.S.C. § 824a-3(e)(3)(B) (1982).

191. Note, *supra* note 160, at 637.

192. Section 210(c) of the Federal Power Act, 16 U.S.C. § 824i(c) (1982), provides that [FERC] may issue an interconnection order . . . only if the interconnection[:] is in the public interest; would encourage overall conservation of energy or capital, optimize the efficiency of the use of facilities and resources, or improve a utility system's reliability; and meets the requirement of FPA Section 212 . . . that the interconnection is "not likely to result in a reasonably ascertainable uncompensated economic loss" for any utility or cogenerator, will not place an "undue burden" on any party, . . . and will not "impair" the utility's ability "to render adequate service to its customers."

American Elec. Power Serv. Corp. v. FERC, 675 F.2d 1226, 1239 (citation omitted).

FPA section 210(b), 16 U.S.C. § 824i(b), further requires FERC to give appropriate notice and afford an evidentiary hearing before issuing an interconnection order. *American Paper*, 675 F.2d at 1239.

These provisions of the FPA were established at a time when the only interconnections taking place were agreements between utilities buying and selling electricity ("wheeling," in utility parlance) in large quantities and in an already heavily regulated market. The provisions would be prohibitive for a small power producer because of the delay and expense associated with satisfying the requirements.

other interconnection authority available under any other law."¹⁹³

The decision by the court of appeals vacating these rules was a serious blow to cogenerators and small power producers, whose projects' viability depended on PURPA's implementation and who were left once again in a position of great uncertainty regarding the statute's interpretation.¹⁹⁴ The Supreme Court, however, reversed the court of appeals' decision on both rules in *American Paper*.¹⁹⁵ Although the court of appeals had rejected the first rule by noting that "FERC has, without convincing explanation, simply adopted as a uniform rule the maximum purchase rate specified in the statute,"¹⁹⁶ the Supreme Court reasoned that FERC realized

the full-avoided-cost rule would not directly provide any rate savings to electric utility consumers, but deemed it more important that the rule could "provide a significant incentive for a higher growth rate" of cogeneration and small power production, and that "these ratepayers and the nation as a whole will benefit from the decreased reliance on scarce fossil fuels"¹⁹⁷

The Court also noted that the full-avoided-cost rule was not absolute or inflexible. A waiver could be obtained if the state regulatory agency demonstrated that the full-avoided-cost rate was unnecessary to encourage cogeneration and small power production,¹⁹⁸ and qualifying facilities and utilities could negotiate for a contract price below full avoided cost.¹⁹⁹ The Court concluded that "[u]nder these circumstances, it was not unreasonable . . . to prescribe the maximum rate authorized by PURPA."²⁰⁰

As for the second rule, the Court of Appeals for the District of Co-

193. 45 Fed. Reg. 33,959 (1980).

194. Note, *supra* note 160, at 626.

195. 461 U.S. 402 (1983).

196. *American Paper*, 675 F.2d at 1233.

197. 461 U.S. at 415 (quoting 45 Fed. Reg. 12,222 (1980)). The original text of the *Federal Register* is worth reproducing:

[I]n most instances, if part of the savings from cogeneration and small power production were allocated among the utilities' ratepayers, any rate reductions will be insignificant for any individual customer. On the other hand, if these savings are allocated to the relatively small class of qualifying cogenerators and small power producers, they may provide a significant incentive for a higher growth rate of these technologies.

45 Fed. Reg. 12,222 (1980). The clear implication is, of course, that individual ratepayers should be subsidizing the federal government's agenda of encouraging alternative energy technologies, an idea clearly at odds with those elements of public utilities commissions that perceive that their responsibility to their constituency is to minimize the overall costs of utility services. Still, there is a good argument to be made that all ratepayers benefit from a national program that decreases reliance on expensive and unreliable sources of imported fuels. FERC seems to have changed its mind since 1980; it is now holding hearings that could lead to new rulemaking proceedings on section 210. See *infra* text following note 221.

198. *American Paper*, 461 U.S. at 416 (citing 18 C.F.R. § 292.403 (1982)).

199. *Id.* (citing 18 C.F.R. § 292.301(b)(1) (1982)).

200. *Id.* at 417.

lumbia had refused to accept FERC's construction, instead interpreting section 210(e)(3) of PURPA as requiring an evidentiary hearing for each interconnection agreement, allowing interconnection only if the proper findings are made.²⁰¹ The Supreme Court once again reversed, reinstating the rule.²⁰² In a unanimous opinion,²⁰³ Justice Marshall found the court of appeals' interpretation to be inconsistent with the intent of Congress,²⁰⁴ noting that if the Supreme Court were to hold that hearings must be provided for any interconnection agreement, it would be "imput[ing] to Congress a purpose to paralyze with one hand what it sought to promote with the other."²⁰⁵

The Supreme Court's support in both *Mississippi* and *American Paper* was central to PURPA's success. The litigation surrounding PURPA had stalled development of cogeneration and small power facilities,²⁰⁶ and investors and utilities alike had been hesitant to commit themselves to contracts based on PURPA's more controversial provisions (particularly section 210) without a clear resolution of the conflict by the Court.²⁰⁷ In *American Paper*, both of the challenged rules were key: the full avoided cost rule because the rate directly controls economic payback and rate of return²⁰⁸ and the interconnection rule because the utilities' reluctance to transmit private power had been a major institutional barrier to the independent power producers.²⁰⁹ The Supreme Court's decisions were a strong endorsement of PURPA and of FERC's rules, and developers welcomed the removal of the last major federal im-

201. *American Paper*, 675 F.2d at 1240-41.

202. *American Paper*, 461 U.S. at 402.

203. Justice Powell took no part in the consideration or decision of the case. *Id.*

204. In reference to the court of appeals' opinion, the Supreme Court stated that:

While the language of § 210(e)(3) of PURPA can be so interpreted, the purposes of PURPA strongly support the Commission's contrary reading of that provision. The purposes of the statute make it most unlikely that Congress could have intended that an evidentiary hearing be held for every interconnection necessary to consummate a purchase or sale of electricity authorized by the Act. . . . Congress itself determined in enacting PURPA that these purchases and sales are in the public interest, and that the development of cogeneration and small power production will help to conserve energy and capital and ensure the more efficient use of the Nation's resources.

Id. at 419-20.

205. *Id.* at 421 (citing *Clark v. Uebersee Finanz-Korporation, A.G.*, 332 U.S. 480, 489 (1947)).

206. Comment, *supra* note 147, at 151-52, 172. Before the Supreme Court's reinstatement of the rules, there had been concern that challenges to PURPA would cripple its programs. See *id.* at 151-52.

207. For example, the standard contract between qualifying facilities and a utility in Maine provides: "If after this agreement becomes effective Section 210 of [PURPA] is repealed or modified so that Buyer is not required to purchase energy and capacity at avoided cost, Buyer reserves the right to terminate this agreement." *Id.* at 172-73 n.204 (citing NAT'L ECONOMIC RESEARCH ASSOC., INC., EXCERPTS FROM COGENERATION CONTRACTS 2 (1982)).

208. See Note, *supra* note 160, at 641.

209. See *id.* at 642.

pediment to their projects.²¹⁰ Further, the decisions were seen as spur-ring reluctant utilities and regulators to approve PURPA projects.²¹¹

c. *The Current Status*

Four years after the *American Paper* decision, PURPA again is being threatened. California utilities are particularly opposed to the law because the state's overly favorable interpretation of PURPA during the early 1980's has resulted in an overabundance of qualifying facility projects coming online and having a major impact on utility operations.

At the beginning of the decade, California faced difficult problems of electrical supply. Highly dependent on oil- and gas-fired generation, the state faced capacity shortages because new plant construction was being delayed by high interest rates, poor price and demand forecasts, and hostility to proposed plant sitings. Moreover, its ratepayers faced higher electrical rates than ever before.²¹² Because of these difficulties, California utilities and the CPUC were particularly receptive to PURPA's goals and gave the statute a more favorable interpretation than did most other states. For example, California gave a generous reading to PURPA's "full avoided cost" requirement, establishing favorable prices for PURPA producers.²¹³ Further, the CPUC and the utilities agreed that PURPA's interconnection requirement should be read so that the utilities and qualifying facilities shared the costs of providing interconnection.²¹⁴ Finally, the CPUC and the utilities agreed on the establishment of a series of standardized contracts, called "standard offer" contracts, for small power producers to use in power purchase agreements with the utilities.²¹⁵ Although most of the contracts utilized prices reflecting short-term fluctuations in energy cost, the CPUC recognized that price certainty was necessary for some of the small power producers to be able to obtain financing for their projects. Accordingly, one of these contracts, Standard Offer Number 4, provided to any qualifying small power producer guaranteed fixed-price payments over a ten-year period, based

210. *Id.* at 644.

211. *Id.*

212. Interview with Ron Luxa, Supervisor, Small Power Contracts, Southern Cal. Edison Co., in Rosemead, Cal. (Mar. 24, 1987).

213. See W. Ahern, Implementing Avoided Cost Pricing for Alternative Electricity Generators in California 3, 9-10 (Jan. 12, 1987) (unpublished report available from California Public Utilities Commission).

214. *Id.* at 8-9.

215. See S. Hulett, The Public Utilities Regulatory Policy Act of 1978: The California Experience 4 (remarks before the FERC, in San Francisco, Mar. 27, 1987). Hulett, President of the CPUC, stated: "Using standard offers reduces concerns that utilities might not negotiate aggressively or reasonably with potential independent producers. . . . We were especially interested in aiding, as much as possible, the development of this nascent industry by ensuring the availability of reasonable contracts to meet a variety of producer needs." *Id.* For a detailed discussion of the CPUC's standard offers, see Kent, *supra* note 162, at 179-87.

on oil forecasts done in 1983.²¹⁶

With the continuing decline in oil prices, California's implementation of these standard offer contracts, some with fixed-price components, proved attractive to a variety of independent power producers. By 1986 the state had over 15,000 megawatts of capacity on contract, and more than 3,600 megawatts online and operating.²¹⁷ In 1986 these small power projects were producing approximately six percent of California's electrical supply.²¹⁸

The growth of the small power producers, however, has created problems for the state's major utilities. First, the utilities argue that they have no need for the additional capacity and that they will not be able to purchase all of the PURPA power without turning off their own baseload plants, some of which are capable of operating at considerably lower costs.²¹⁹ Second, because oil and gas prices have decreased, there is a divergence between the fixed contract prices available to small power producers under Standard Offer 4 and the actual avoided-cost prices.²²⁰ Thus, the utilities—and ultimately the consumers—are paying more to purchase PURPA power than it would cost the utilities to generate that power themselves.

As a result, the CPUC is in the difficult position of having to balance two conflicting goals. On one side of the balance is the short-term goal of addressing the problem of overcapacity and overpricing resulting from the large number of PURPA contracts using Standard Offer 4. On the other side is the long-term goal of continuing to encourage the development of independent power production, which the CPUC feels increases the efficiency, reliability, and flexibility of the electrical supply system.²²¹

The utilities, fearful that PURPA overpayments will encourage large industrial customers to self-generate and therefore to bypass the utilities completely, have been seeking changes in PURPA at every level. In Congress, the utilities are calling for amendments to the statute itself. At FERC, they have requested that the rules implementing PURPA be

216. See S. Hulett, *supra* note 215, at 5, 7.

217. *Id.* at 6.

218. *Id.* at 1.

219. A California Energy Commission forecast predicts that the overcapacity will persist through 1997. See *id.* at 2.

220. See *id.*

221. President Stanley Hulett of the CPUC stated in testimony before FERC that

[u]nder PURPA, cogeneration and renewable resources have helped defer construction of some new utility plants [R]enewables are displacing oil and gas consumption, and cogeneration units . . . are burning gas more efficiently than utility plants. . . . PURPA has spurred the development of new, alternative energy sources, improving the diversity of California's resource mix and reducing the risks of overdependence on any single technology.

Id. at 1.

amended to eliminate the full-avoided-cost requirement. And at the state level, they are again seeking rule revisions.

So far, the attempts at the federal level have been unsuccessful, and support for PURPA has been stronger than expected.²²² In California, where the problems are most serious, the CPUC feels that it can address adequately the short-term problems while essentially retaining its interpretations of PURPA. For example, the Commission suspended the availability of interim Standard Offer 4 in 1985²²³ and is now developing a new long-term standard offer in which prices are directly based on the cost of energy deferred by the utilities.²²⁴ In addition, the CPUC is taking steps to minimize the amount of overpayment by discouraging the full construction of the remaining facilities for which the CPUC contracted under the suspended interim standard offer.²²⁵

The CPUC feels strongly that its own response adequately addresses the problems encountered with PURPA, and that there is no need for change at the federal level. Commission President Stanley Hulett, in his testimony before FERC, stated:

If states have problems with independent power producers, it is due to implementation problems that are best resolved by state PUC's; problems are not due to the FERC regulations. Changes to the FERC regulations could very well cause unnecessary and irreparable harm to [a] growing industry, one which will have dramatically increasing importance to this nation's energy supply.²²⁶

In spite of its problems, PURPA has developed into an effective approach for encouraging competition and innovation in an industry not known for either of these qualities. By breaking down market barriers to electricity generation by independent power producers, PURPA has served a useful role in encouraging a diversified and efficient electrical generating industry.²²⁷

2. *The Role of the Tax Credits and Other Tax Incentives*

The federal and California energy tax credits were instrumental in encouraging investment in the wind energy industry. In addition to the tax credits themselves, interest and depreciation deductions provided large tax benefits to investors in commercial wind energy systems.

222. See *PURPA Hearings Underway in Washington D.C.*, Energy Bus. Update, June 11, 1986, at 2.

223. See W. Ahern, *supra* note 213, at 10-11; S. Hulett, *supra* note 215, at 9.

224. S. Hulett, *supra* note 215, at 9.

225. See *id.* at 8-9. These steps include: (1) negotiating with holders of Standard Offer 4 contracts who have not yet come online and who ask for contract modifications (the CPUC is expected to be less accepting of such modifications in the future), and (2) avoiding future problems by more accurately predicting the costs of resources that utilities defer by purchasing electricity from qualifying facilities. *Id.*

226. *Id.* at 13.

227. See Hagler, *supra* note 169, at 174.

Though these tax incentives spurred growth, this analysis suggests that the structure of the credits was flawed and that these flaws limited the effectiveness of the programs and led to their eventual elimination.

a. The Tax System as a Tool for Public Policy

Tax credits are a valid public policy tool for shifting incentives in capital markets. Tax credits lower the cost of investment and can be used to encourage investment in certain capital sectors when public policy concerns suggest that the level of private investment without the credit is inadequate.²²⁸ The energy sector is a good example. The market price of energy tends to reflect only immediate production costs and not so-called "external" costs, such as the long-term effects on the environment, the costs of excessive reliance on nonrenewable fuels, or the strategic costs of dependence on oil from other countries. The price of wind energy, on the other hand, does not reflect its environmental benefits.²²⁹ From a societal perspective, a kilowatt-hour of electricity generated from wind is worth more than the same unit of electricity generated from oil. Because the market fails to recognize this additional worth, it is appropriate for government to take steps to subsidize socially beneficial energy technologies.²³⁰

The administrations of the 1970's, and in particular the Carter administration, embraced tax credits as a valuable tool to encourage development of alternative energy sources. Even before the first wind energy development took advantage of the tax credits, the credits were recognized as a valuable mechanism for promoting alternative energy technologies²³¹ because the small-scale, diverse technologies lent themselves to entrepreneurial development to a degree unthinkable for large, capital-intensive fuel-burning power plants. Indeed, some analysts argued that "income tax credits have the greatest potential for promoting the use of solar energy."²³² Later, when the solar energy tax credits were up for extension, another observer testified that "the cost of tax credits to the Treasury is amply repaid to the Nation by the value of the energy

228. See Bezdek, *supra* note 29, at 340.

229. Resource economist Stephen McDonald addressed this issue in grudgingly accepting that the tax credits may serve a useful purpose:

Ideally, we should internalize the external cost of insecure supply in the case of oil and allow free oil and gas prices to provide the incentives to conserve oil and gas and develop other energy sources. There may be, however, some extenuating circumstances relating to competitive imperfections that would justify some temporary special tax treatment of renewable energy sources.

McDonald, *The Energy Tax Act of 1978*, 19 NAT. RESOURCES J. 859, 868 (1979).

230. As McDonald said, "[I]t may be that ignorance or other competitive imperfection, including imperfection of capital markets, supports the use of a subsidy for a time to introduce a new technology of energy production or use." *Id.*

231. See Minan & Lawrence, *supra* note 11, at 5.

232. Minan & Lawrence, *supra* note 116, at 843.

saved."²³³ The following statement sums up the prevailing attitudes of those who favored the credits:

While the Treasury will suffer a loss of billions of dollars of revenue based on the energy tax credits . . . , every dollar represents a step toward energy self-sufficiency in the United States. The effect of these incentives is not only to create new tax benefits for business and individuals, but also to relieve, in part, the reliance of the United States on foreign oil.²³⁴

Recent attempts to extend the solar energy tax credits were based not on the argument that these energy technologies deserved special treatment, but rather that they deserved the same treatment the traditional energy technologies receive. The federal government long has provided favorable tax treatment to the coal, oil, gas, and nuclear industries. This treatment has cost billions of dollars and continues even though these incentives no longer can be justified on the basis of encouraging technological development.²³⁵ Until the NEA established similar incentives for the renewable energy sector, the subsidies for conventional energy technologies put renewable technologies at a relative disadvantage, both because those subsidies made it difficult for renewable technologies to attract investment capital and because they reduced the average cost of energy produced from the traditional technologies,²³⁶ making it harder for the new technologies to compete in the energy marketplace.

Some economists argued, of course, that rather than perpetuate what was already bad policy—artificial stimulus in the energy sector—by establishing subsidies for yet another set of technologies, the government should eliminate support for traditional and alternative energy technologies alike, allowing them to compete freely in the market.²³⁷ The diffi-

233. *Joint Hearing on Renewable Energy Industry*, *supra* note 145, at 25 (statement of Joel Weiss, Chairman, Government Relations Committee, Solar Energy Industries Association).

234. Friedmann & Mayer, *supra* note 17, at 504. The Senate Finance Committee recognized the value of tax incentives in a report on the Energy Tax Act:

The committee believes [tax incentives] will be more effective than an approach which relies largely on tax increases to reduce demand for energy. . . . The cost of these tax incentives will be very small in relation to the economic and strategic costs of failing to take decisive action to deal with the energy import problem.

S. REP. NO. 529, 95th Cong., 1st Sess. 3 (1977), *reprinted* in 1977 U.S. CODE CONG. & ADMIN. NEWS 7942, 7943.

235. *Hearing on Renewable Energy Incentives*, *supra* note 23, at 146 (statement of Warren D. Noteware, Commissioner, California Energy Commission).

236. *Id.*

237. *See generally* McDonald, *supra* note 229. The Reagan administration gave lip service to this idea when calling for the elimination of the solar and wind energy tax credits:

With respect to tax credits . . . the President has addressed a larger economic issue in his proposed reform of our tax system. This reform depends on the elimination of a large number of special tax incentives, which have . . . made our tax system so complex, and have [so] allowed some corporations and individuals to escape a fair share . . . of their tax obligations, that the time has come to dramatically alter our approach to taxation. This means that many beneficiaries of the current tax system must give up their special benefits. All Americans will benefit from lower tax rates, greater incentives for capital formation, and a more efficient economy where energy options can compete on their own merits.

culty with this otherwise attractive theory is that eliminating tax subsidies for conventional technologies has proved politically impossible, as the Reagan administration discovered in the Tax Reform Act of 1986.²³⁸

Seen in this light, the renewable energy incentives were an attempt by Congress to put the emerging technologies on an even playing field, to "help provide parity . . . in relation to the level of subsidies provided in the past to conventional energy sources . . . at levels sufficient to make solar energy competitive with conventional fuels today."²³⁹

Although Congress saw the justification for subsidizing renewable energy, there still were difficult questions. What form should the subsidy take? How long should the industry be subsidized? And to what extent? As discussed below, the answers to these question had a dramatic effect on the development of the wind energy industry.

b. The Costs of the Incentive Programs

After 1981, PURPA and the energy tax credits combined to create a major incentive for investment in wind energy facilities and led to a huge influx of investment from the private sector. This remarkable growth, however, cost the federal and California treasuries a significant amount in terms of forfeited revenues. A report recently published by the California Energy Commission offers the first comprehensive analysis of the impact of the tax incentives on government revenues.²⁴⁰ Table 3 shows

Hearing on Renewable Energy Incentives, supra note 23, at 18 (statement of Donna Fitzpatrick, Acting Assistant Secretary for Conservation and Renewable Energy, Dep't of Energy). Yet at the same time, the President proposed the continuation of existing subsidies for conventional energy technologies but not for alternative technologies:

Provisions of the U.S. tax code have long been used to maintain a strong domestic oil and gas industry by providing special incentives for the exploration, development and production of oil and natural gas. The President's tax reform proposal retains only those incentives necessary to maintain our energy security.

Id. at 35 (statement of John Herrington, Secretary, Dep't of Energy). The goal of maintaining our energy security was interpreted very broadly, so that the existing favorable treatment for costs of exploration and drilling for new oil were to be maintained in full. *Id.*

238. Pub. L. No. 99-514, 100 Stat. 2085 (codified in scattered sections of U.S.C.); *see also* STAFF OF JOINT COMM. ON TAXATION, *supra* note 45 (full text of principal provisions of Tax Reform Act).

239. Bezdek, *supra* note 29, at 340.

240. CAL. ENERGY COMM'N, *supra* note 136. The report was produced by Polydyne, Inc. and Associates, a consulting firm based in Berkeley, California, under contract with the County Supervisors Association of California and the California Energy Commission. It is the most thorough analysis to date of the financial impact of the tax incentives established by the federal and California state governments to encourage the development of alternative energy technologies.

The figures cited from the report assume that investments in wind electric systems were made by high income individuals whose marginal tax rates were at the maximum federal (50%) and state (11%) levels. The data on tax rates, tax credits, and depreciation schedules were based on federal Internal Revenue Service (IRS) and California Franchise Tax Board publications. *Id.* at 5-5, 5-8.

the net fiscal impact of the credits granted to federal and California taxpayers during the five-year period.²⁴¹ The conclusion to be gleaned from

TABLE 3: Net Fiscal Impact of Wind Energy Tax Credits (ETC's)

(All financial figures are in thousands of 1984 dollars)

Year	Federal ETC	Total Federal	State ETC	Total State
1981	\$ 5,137	\$ 12,460	\$ 8,562	\$ 11,997
1982	25,852	52,407	43,087	61,370
1983	59,531	116,388	99,217	139,316
1984	114,742	213,012	191,238	260,618
1985	137,104	240,306	228,506	300,926
TOTAL	342,366	634,573	570,610	774,227

the California Energy Commission report is that the federal and California state treasuries lost approximately \$630 million and \$770 million, respectively, that would have been paid as taxes but for the implementation of the solar energy tax credit programs.²⁴²

c. *The Tax Credit Program's Flaws and Demise*

Although the financial incentive programs were effective in attracting investment funding for the wind industry, they were not efficient. There were two problems with the structure of the credits. The fundamental problem was that the credits rewarded capital investment (in wind turbines and associated equipment) rather than production of

241. *Id.* at 5-25. The report defines these amounts as the gross impacts on the federal and state treasuries, less the impacts of the alternative purchases and investments that would have been made in the absence of wind energy investment opportunities. *Id.* at 5-4. The first and third columns of Table 3 list the cost of the tax credits alone, while the second and fourth columns list the cost of the tax credits plus depreciation and interest deductions.

At the federal level, the net impacts on revenues ranged from approximately \$12 million in 1981 to a peak of \$240 million in 1985, before dropping to approximately \$100 million in 1986 with the expiration of the federal energy tax credit. In general, the tax credits amount to between one-fourth and one-half of the total gross federal tax losses associated with commercial wind energy systems. *Id.* at 5-20. The federal net losses generally were 30-35% lower than the gross losses.

The fiscal impacts at the California state level differ from those at the federal level in that the secondary effects are offset to a large degree by the gains to state revenues from additional employment and development in California. At the federal level, by contrast, the secondary tax effects more or less equal the losses associated with the tax credits alone.

The values for "total federal" and "total state" revenue losses are the net present value of the combined direct, indirect, and induced impacts of 15-year tax obligations including the tax credits. These impacts include other direct tax effects from interest and depreciation deductions, as well as secondary tax effects from increased personal income, corporate income, and employment in the industries supporting the manufacture, distribution, and sales of these systems. *Id.* at 5-11.

242. These figures were derived from Table 3, *supra*, by adding the columns listing total federal and total state tax losses for the years 1981-85. They do not include the losses from 1986.

energy.²⁴³ This distinction is an important one. The intent of Congress was to encourage the production of energy from alternative technologies, not simply to encourage investment in energy-producing equipment. Yet the credits provided favorable tax treatment based simply on investment in the equipment, with little regard for whether that equipment was well designed or was installed in a good location. As a result, investors obtained tax benefits whether the equipment performed adequately or not. Because the expected revenue from the sale of electricity was a small fraction of the initial return from the investment, investors had little incentive to ensure that the windfarm projects were designed and constructed properly. As a result, the credits were subject to abuse,²⁴⁴ and fly-by-night operators were permitted to compile investments, in some cases fraudulent or even criminal,²⁴⁵ that were clearly at odds with the policy goals of the credits.

The second problem critics of the tax credits pointed to was the tax sheltering qualities of investments in wind energy. Investment opportunities were tailored to individuals who could invest perhaps \$150,000 so as to benefit from tax credits totalling \$75,000 in the first year alone.²⁴⁶ Some developers required investors to provide evidence of a net worth of at least \$600,000.²⁴⁷ Because investors had to have high tax bills to benefit from major tax reductions, it is understandable that the vast majority of investors fit the image of the wealthy taxpayer sheltering income.

The poor design of the tax credits and the abuse of their income sheltering qualities led to the elimination of the tax credit programs. The federal energy tax credit expired at the end of 1985, and the California energy tax credit expired one year later. The hostility toward a tax credit program that directly benefitted only the very rich prompted Congressman Pete Stark, whose California district includes the country's largest windfarm development, to say, "They're not wind farms, they're tax farms."²⁴⁸ The media's often negative image of wind energy as a tax shelter contributed to the political feasibility of eliminating the tax credits. The Reagan administration's opposition to "unproductive tax shel-

243. CAL. ENERGY COMM'N, *supra* note 136, at 1-15.

244. *Id.* at 1-15, 7-4.

245. *Id.* at 7-4.

246. These are the financial benefits from the credits alone. One published article stated that a \$150,000 investment would yield \$75,000 in federal and state tax credits, \$138,000 over five years from depreciation deductions, and \$12,000 per year in revenues from the sale of electricity. See Lamar, *Gone with the Wind*, TIME, Jan. 20, 1986, at 23.

247. Zond Systems, Inc., Private Placement Offering Memorandum: Victory Garden 2-1 (Sept. 1983).

248. Lamar, *supra* note 246, at 23. Stark went on to say that taxpayers would be better off "hiring thousands of little kids to sit on bicycles and pedal away to produce power for our toasters. It would be cheaper." *Stark Attacks Wind Power Industry as Scheme to Rip Off Taxpayers*, Tri-Valley Herald, Mar. 22, 1984, at 13, col. 2.

tering opportunities"²⁴⁹ was another contributing factor, although the administration seemed to define this term narrowly enough to continue supporting tax shelters in oil and gas.²⁵⁰

Still another factor contributing to the demise of the credits might be that the wind energy industry was, quite simply, a victim of its own success: the perception in Congress and elsewhere was that the industry had developed so rapidly and had attracted so much investment capital that it might be ready to stand on its own. This factor might explain why the Tax Reform Act reinstated the federal energy tax credits for a number of other solar industries but not for wind energy.²⁵¹

Whether the elimination of the wind energy tax credits was good public policy is a difficult question. It seems that wind energy has progressed to the point where it is able to compete at some level with other generating technologies, and it no longer requires the full amount of the state and federal credits.²⁵² Perhaps the greatest damage to the wind energy industry will result not from the absence of the support, but from the abruptness with which the support was terminated; the wind industry would have fared much better, for example, with the elimination of the ten percent investment tax credit first, then a three-year phaseout of the fifteen percent solar energy tax credit at five percent per year.²⁵³ This would have allowed investors to respond with more certainty to the market for wind energy development and would have eased the industry's transition to a post-tax-credit environment.

d. An Improved Tax Credit Program for the Future

The problems faced by tax credits could have been avoided or at least mitigated. Indeed, Congress considered alternative programs that

249. *Hearing on Renewable Energy Incentives*, *supra* note 23, at 30 (testimony of Donna Fitzpatrick, Acting Assistant Secretary for Conservation and Renewable Energy, Dep't of Energy).

250. One component of the administration's original Treasury II proposal called for accelerated depreciation benefits for coal-fired power plants. The loss of revenues from this measure was estimated at between \$3 billion and \$4 billion per year—enough to pay for *all* the solar energy and conservation credits for four years. *See id.* at 4 (remarks of Rep. Markey, Subcomm. Chair).

251. *See* STAFF OF JOINT COMM. ON TAXATION, *supra* note 45, at 24.

252. On the other hand it may be, as one study concluded, that "the availability of solar/wind tax credits beyond 1985 is essential to maintain and nurture the current solar industry." *Hearing on Tax Incentives for New Energy Technologies*, *supra* note 105, at 205 (statement of William H. Babcock, Booz Allen & Hamilton Inc.) (referring to a study performed for the Solar Energy Industries Association, the Renewable Energy Institute, and the American Wind Energy Association).

253. When support for the credits had disappeared from the White House and was fading in Congress, advocates of the tax credit extensions proposed some bills that would have phased out the credits for wind energy. None of these was well received in either house. *See supra* notes 104-15 and accompanying text.

included significant improvements over the existing credits.²⁵⁴ These alternative incentive programs had several qualities in common.²⁵⁵ First, they would have tied the level of subsidy to energy production rather than to capital investment. Second, the programs would have provided incentives that decreased over time, as economies of scale in manufacturing and construction were achieved. Third, the programs would have distinguished among different technologies by providing different levels of support—less for technologies approaching cost-effectiveness, and more for technologies in an early developmental stage—so that the benefits of the tax programs could accrue to a variety of technologies rather than to just one or two. Finally, the programs would have provided for incentives that were paid out over time, rather than as a lump sum with the initial investment.

These changes would create incentives for the efficient production of energy and would make tax credits less attractive as a short-term tax shelter. They “would encourage the commercial development of high performance, cost-effective technologies with good longevity, and would diminish substantially the potential for abuse, by tying the return on investment to the amount of energy produced by the plant over its lifetime.”²⁵⁶

One improved incentive plan was offered in H.R. 2498, the Alternate Energy Production Tax Act of 1985,²⁵⁷ introduced by Representative Lujan of New Mexico.²⁵⁸ The proposal involved a “commercial alternate energy production tax credit.”²⁵⁹ As Lujan testified:

a production credit would only provide support to those alternate energy projects that successfully produce energy. It would directly address the criticisms that have been raised in the past in connection with various types of non-productive tax shelters and tax avoidance arrangements by requiring potential investors to base their investment decisions on the technical viability of a proposal [sic] project rather than on purely tax avoidance considerations.²⁶⁰

This performance-based tax incentive would have been phased out if oil prices increased,²⁶¹ would have varied with the technology being uti-

254. *See id.*

255. CAL. ENERGY COMM'N, *supra* note 136, at 1-22.

256. *Id.*

257. H.R. 2498, 99th Cong., 1st Sess. (1985).

258. *See Hearing on Renewable Energy Incentives, supra* note 23, at 8 (statement of Rep. Lujan).

259. *Id.* at 9.

260. *Id.*

261. *Id.* Tying the phaseout to oil prices was based on the principle that alternative technologies become more cost-effective, and therefore need less support, as the price of conventional fuels increases. The phaseout would have occurred at an oil price level of between \$29 and \$35 per barrel in 1984 dollars. *Id.* at 8-9.

lized,²⁶² and would have been paid out over time based on the production of energy.²⁶³

Another alternative incentive plan that recognized the shortcomings of the original tax credit program was proposed in a study published by the California Energy Commission.²⁶⁴ The Commission's suggested approach—similar to Representative Lujan's proposal, rejected by Congress the year before—was to provide direct subsidies for energy produced from solar and wind energy systems in lieu of some or all of the energy tax credits. The most interesting conclusion of the Commission's analysis is found in its comparison of the subsidy needed to provide further incentives for wind energy development with the subsidy currently provided for oil. The Commission found that its recommended subsidy would displace oil with wind energy at a cost of \$1.38 per barrel of oil equivalent,²⁶⁵ whereas the ongoing subsidy for oil was \$7.35 per barrel.²⁶⁶ The analysis concludes that the total subsidy required to bring about the full commercialization of wind energy is about one-fourth that of the ongoing oil subsidy and that "even this relatively modest subsidy would essentially terminate in the 1990's."²⁶⁷

The tax incentives were extremely effective at stimulating investment in a previously nonexistent industry—exactly the role they were intended to play. Without them, the industry would never have attracted anything approaching its level of investment funding and would not have developed as rapidly as it did. Nonetheless, the particular form the tax credits took created a number of problems. Either of the alternative tax incentive programs discussed above would have avoided these problems

262. The recommended amount of the credit was 1.6 cents per kilowatt-hour for wind, *id.* at 10 (appendix to statement of Rep. Lujan), or approximately one-fourth of the average retail kilowatt-hour price in the United States. Recommended amounts for other technologies were higher: \$0.034/kWh for solar thermal; \$0.074/kWh for biomass; \$0.080/kWh for geothermal; and \$0.089/kWh for photovoltaic energy. *Id.* at 9-10 (appendix to statement of Rep. Lujan). Lujan testified that varying the amount provided "a more accurately targeted tax credit." *Id.* at 9 (statement of Rep. Lujan).

263. See *id.* Representative Lujan also noted that "the need for solar and other forms of alternative energy is just as real today as it was in 1974 . . ." *Id.* at 8. In testifying before the Committee on Energy and Commerce, he recognized the need for tax reform, saying:

I support the President's [sic] in his historic challenge to base our tax system on a model "of fairness, simplicity, efficiency, and compassion, to remove the obstacles to growth and unlock the door to a future of unparalleled innovation and achievement."

In considering tax reform, our alternate energy tax program should be no exception.

Id. at 9 (quoting President's Message to the Congress Transmitting Proposed Legislation, 1985 PUB. PAPERS 707, 707 (May 29, 1985)). Lujan argued, however, that "[o]ur overall national security requirements demand a well-balanced domestic program, emphasizing development of promising energy reserves such as renewable energy resources." *Id.* at 8.

264. CAL. ENERGY COMM'N, *supra* note 136.

265. *Id.* at 1-20.

266. *Id.* at 1-13 (citing B. CONE, AN ANALYSIS OF FEDERAL INCENTIVES USED TO STIMULATE ENERGY PRODUCTION (1980) (Pacific Northwest Laboratory Report PNL-2410)).

267. *Id.* at 7-7.

and would have substantially improved the effectiveness of the federal government's support for renewable resources. It also would have decreased the potential for abusive tax sheltering, thereby leading to the development of more efficient wind energy installations. Because it remains in our long-term interest to develop a base of diverse, decentralized, renewable energy sources, it might be necessary or useful to renew financial incentives for investment in renewable energy.²⁶⁸

IV

CALIFORNIA'S WIND ENERGY INDUSTRY: THE LESSONS LEARNED

The drawbacks of the federal and state tax credit programs resulted in the development of a wind energy industry in California with some measure of waste and inefficiency. Nevertheless, by the standards set by other energy sources, wind energy is a tax bargain. Although the wind energy tax credits cost the federal and California state governments an average of \$200 million per year over their six-year lifespan, energy subsidies to the fossil fuel and nuclear energy industries, which also take the form of tax credits and accelerated depreciation benefits, amount to billions of dollars per year and have been in place for thirty years or longer.²⁶⁹ One study revealed that, of approximately \$30 billion in energy tax subsidies in 1984, traditional energy technologies received \$28 billion; the nuclear power industry alone received \$15 billion, whereas renewable energy technologies received \$1.7 billion.²⁷⁰ The support for wind energy amounted to less than one percent of total federal energy subsidies.²⁷¹ Wind energy, moreover, has produced a greater relative payback than the synthetic fuels or nuclear fusion programs,²⁷² which absorbed billions of dollars with little result. Seen in this light, the revenue losses attributable to the tax benefits for the wind energy industry appear insignificant.

Additionally, of the alternative energy technologies favored by the

268. Robert Stobaugh and Daniel Yergin, the authors of *Energy Future*, have this to say: [I]f the market is to resolve the problems, its distortions must be corrected so that all energy sources, including conservation and solar, will be able to compete on an equal economic footing. . . . Although both incentives and sanctions have a role to play in the process of equilibration, the emphasis should be placed on incentives.

R. STOBAUGH & D. YERGIN, *supra* note 1, at 298.

269. See *supra* note 56 and accompanying text.

270. *Alternative Energy Supporters Set Reform Strategy*, TAX NOTES, Oct. 21, 1985, at 232 (citing R. MORGAN, *THE HIDDEN COSTS OF ENERGY* (1985) (Center for Renewable Resources Report 85-9253)). The study argued that government energy subsidies "are distributed with no regard for technological feasibility" and pointed out that the nuclear industry received approximately half of the subsidy while producing only 2% of the nation's energy. *Id.*

271. Gipe, *supra* note 7, at 78-79.

272. See M. MERRIAM, *supra* note 76, at 5.

NEA, wind energy is one of the most cost-effective from the point of view of competing energy technologies. Because wind is a freely available resource, the cost of wind energy is driven primarily by initial capital costs, which will not increase as costs for fossil fuel rise. Thus, the technology will become increasingly cost-effective in less windy areas as its costs remain stable relative to other energy sources. Because wind energy is available in concentrations of 600-800 watts per square meter in many parts of the world (several times the average concentration of solar energy even in sunny areas),²⁷³ wind energy could make a much greater contribution to energy supplies if oil prices increase significantly. For example, throughout the northern Great Plains, in the Pacific Northwest, and in many parts of New England, wind energy will produce cost-effective electricity at a price equivalent to approximately \$40 per barrel of oil.²⁷⁴

Evaluating the success of wind energy, however, requires a searching look beyond the electricity sales gained and the tax revenues lost. There are both advantages and disadvantages to the development of wind energy that transcend a dollars-and-cents analysis. The industry should be evaluated in light of a number of other factors that reflect on wind energy's importance relative to other energy technologies.

The wind energy industry gained prominence and acceptance more rapidly than other emerging energy technologies because of certain attractive characteristics. First, it is a relatively simple and unsophisticated technology and requires little in the way of technological development. The basic aerodynamic principles involved in rotor design are well understood, and newer machines have achieved a proper balance between efficiency and reliability. Generator design is even less problematic, because most wind turbines have used off-the-shelf generators. The simplicity in the design of the wind energy technology has resulted in reliability and low costs. The only element of technical complexity in most windfarm installations involves the use of switching and monitoring equipment controlled by microprocessors.

Second, the technology lends itself to diverse applications. Although recent development has focused on generating electricity for utility-scale applications, windmills can be used even more efficiently for electricity generation in isolated nonutility applications,²⁷⁵ especially when combined with battery storage or pumped storage.²⁷⁶ In addition

273. Interview with Mel Manalis, Research Physicist, University of California, Santa Barbara, in Santa Barbara, Cal. (Mar. 27, 1987). The day/night average solar flux at the Earth's surface is 173 watts per square meter. P. EHRLICH, A. EHRLICH & J. HOLDREN, *supra* note 19, at 46.

274. Luxa interview, *supra* note 212.

275. P. EHRLICH, A. EHRLICH & J. HOLDREN, *supra* note 19, at 477.

276. *See id.* at 481-82.

to electrical applications, windmills can be used for mechanical tasks such as pumping water.

A third factor favoring wind energy development is that it lends itself to multiple land uses. That is, with respect to land, it is a "nonconsumptive" energy technology. Windmills require minimal land area, just enough for pads and towers. Thus, they can coexist with ranching and agriculture. For example, most of the land in Altamont Pass, home of the world's largest wind energy development, is grazing land leased from ranchers who have continued to use their property in its traditional manner. In fact, one of the early problems encountered by one windfarm developer who used towers supported by guywires was that the cows were springing the taut cables when they ambled up to scratch their backsides.²⁷⁷ The cows' comfort aside, the multiple-use aspect of wind energy technology is important. Photovoltaics, by contrast, must cover very large surface areas to produce significant quantities of energy, and most oil, gas, and coal technologies are too industrial or pollution-intensive to coexist with other land uses. It is not too fanciful to imagine the American farm crisis being alleviated at least in small part if some farmers were to lease a fraction of their land (two to three percent is the typical space occupied by the wind turbines at Altamont) for wind energy applications or to install the turbines themselves and collect the revenue from sales to the local utility.

The benefits of wind energy thus are particularly apparent when compared to traditional energy sources. The superior environmental characteristics of wind energy conversion as a generating technology and the strategic advantage of decreasing reliance on expensive and unreliable sources of imported fuels are taken up more thoroughly in the next section. Here, it suffices to say that the success of the wind energy industry is evidence that domestic renewable energy technologies can play an important role in alleviating the environmental, institutional, and strategic difficulties associated with our existing energy infrastructure. The wind energy industry has sold over 3.7 billion kilowatt-hours of wind-generated electricity to California utilities since 1981; to generate this much electricity in a conventional oil-burning power plant, using low-sulfur oil, would have required the combustion of approximately 6.5 million barrels of oil and would have resulted in the emission of an additional thirty-nine million pounds of pollutants into the atmosphere.²⁷⁸

There are, however, costs involved in relying on wind energy for any significant percentage of our electrical generating capacity. First, there is the problem of availability. Wind is a fluctuating, unreliable resource,

277. Hopson, *They're Harvesting a New Cash Crop in California Hills*, SMITHSONIAN, Nov. 1982, at 123.

278. Assumes 582 kilowatt-hours of electricity and six pounds of pollutants per barrel of oil. See Energy Bus. Update, Sept. 3, 1985, at 1; Energy Bus. Update, Aug. 19, 1985, at 5.

subject to unpredictable changes in flow patterns that can be caused by anything from minor temperature fluctuations to major storm fronts. Even in regions where winds blow frequently and steadily, variations in the magnitude and direction of the wind have a profound effect on electrical production. As wind turbine arrays become more common in windy areas around the country, these variations might become less important because low wind levels in one area tend to be offset by increases in another. Nonetheless, many utilities object to relying on wind energy because they cannot rely on the wind being available when their customers demand the electricity.²⁷⁹ Wind turbines cannot be turned on and off at the touch of a button, as can many of the utilities' own generators. Thus, windfarms cannot be considered a complete substitute for the more reliable traditional sources of generating capacity.²⁸⁰ Scientists are working on developing applications for flywheels, batteries, and superconductors that would alleviate the reliability problem, but no clear solution is in sight.²⁸¹

Another cost of relying on wind energy is that, like other energy technologies, it has some adverse environmental impacts. Although wind energy is environmentally benign compared to any of the traditional fuel-burning technologies, it is not entirely free of environmental impacts. For wind energy, the most serious physical impact is the potential for erosion, because high-wind areas—at least in California—tend to be dry, hilly, and relatively bare, making them particularly prone to the natural erosive forces of the wind. Erosion has been a problem in California only during the construction phase, however, and the impacts can be minimized easily and at low expense.²⁸² A second environmental concern is the danger to birds, especially for wind energy developments near bird migratory routes. This danger has not been well documented, but there have been a number of bird kills reported at some California wind farms.²⁸³ Yet a third concern is aesthetic: some people living near or travelling through wind energy developments are likely to find that they intrude on the landscape. Aesthetic concerns are compounded by the tendency to locate windfarms in rural areas and, in particular, on ridgelines where their exposure to winds—and their visibility—is maximized.

The long-term environmental impacts of wind energy development, however, are minimal when compared to the severe negative impacts of

279. A utility's power load typically fluctuates above a baseload level, reaching "peak" loads at times of day when industrial and residential consumers are using the greatest amounts of power. See *supra* note 9.

280. Cf. CAL. ENERGY COMM'N, *supra* note 235, at 4-14 (describing the "mismatch between wind availability and the requirements for firm capacity delivery during peak summer periods").

281. Manalis interview, *supra* note 273.

282. Dehlsen interview, *supra* note 17.

283. *Do Windmills Kill Birds of Prey?*, Contra Costa Times, Jan. 13, 1988, at 5A, col. 1.

conventional generating technologies. Moreover, although other alternative technologies, such as direct solar, small hydropower, and cogeneration are free of some of these impacts, they present problems of their own.²⁸⁴

In five years, the wind energy industry in California grew from conception to adolescence, through several generations of technological development, to the point where wind energy now can make a significant contribution to global energy supplies and can do so at costs competitive with some conventional generating technologies.²⁸⁵ Although the growth of the industry was not without its problems, the fact that the industry grew so quickly in the energy sector is particularly impressive. Edward Teller recently stated that "[t]echnology can accomplish anything in fifty years; in five years, it can accomplish nothing."²⁸⁶ Yet five years is all it took for the wind energy industry to grow from a dozen windmills on a blustery hillside to 17,000 wind turbines interconnected with the nation's largest utility grid, generating electricity for nearly 300,000 homes.

V

IMPLICATIONS FOR FUTURE POLICY

A. *Energy: What Does the Future Hold?*

Continued reliance on nonrenewable fuels for electricity generation constitutes a major threat to the environment.²⁸⁷ Acid rain,²⁸⁸ the so-called "greenhouse effect,"²⁸⁹ and the health, safety, and environmental impacts associated with the fossil fuel production cycle (extraction, refining, transportation, and combustion)²⁹⁰ are considerable environmental problems.

Excessive reliance on fossil fuels—particularly imported oil—also is

284. P. EHRLICH, A. EHRLICH & J. HOLDREN, *supra* note 19, at 391-92.

285. See *supra* text accompanying notes 38-43.

286. Teller, *Natural Energy Sources*, 30 MERCER L. REV. 445, 445 (1979).

287. See P. EHRLICH, A. EHRLICH & J. HOLDREN, *supra* note 19, at 425-29.

288. Acid precipitation caused by nitrogen and sulfur oxides emitted from power plants is a major economic and political, as well as environmental, problem in large parts of the Northern Hemisphere. See Ehrlich & Ehrlich, *Back From the Abyss*, SIERRA, Mar.-Apr. 1987, at 56-58.

289. See generally P. EHRLICH, A. EHRLICH & J. HOLDREN, *supra* note 19, at 32-63 (describing the processes and interrelationships of atmosphere and climate). The continuing buildup of atmospheric carbon dioxide from the burning of fossil fuels already is affecting global climate through the so-called "greenhouse effect." Carbon dioxide plays a crucial role in the Earth's climate because of its role in maintaining the Earth's energy balance. The concentration of carbon dioxide already has increased by over 10% because of the burning of fossil fuels. The higher concentrations are expected to cause a corresponding increase in the average global surface temperature—an increase that could lead to significant changes in atmospheric circulation and to extensive melting of sea ice. *Id.* at 682-83.

290. See generally *id.* at 411-29 (describing fossil fuel energy technologies, including environmental effects).

a strategic problem, with both political and economic consequences. Oil continues to be the industrialized world's most precious commodity.²⁹¹ The importance of a reliable oil supply to the United States, therefore, cannot be underestimated. At a minimum, disturbances in oil supplies can lead to inflation and disruption in the economy.²⁹² The dependence of the United States on foreign oil is a key factor driving the prices of most consumer goods²⁹³ and thus contributing to the trade deficit.²⁹⁴ At worst, the strategic importance of oil may be a contributing factor to the next major global conflict.²⁹⁵ Increased domestic production is not a realistic solution for reducing our reliance on oil imports. In spite of massive oil drilling and exploration efforts during the late 1970's,²⁹⁶ few major domestic reserves of oil were discovered in the last decade, and national production peaked with the first flow of Prudhoe Bay oil in 1970.²⁹⁷ Although scattered finds in the outer continental shelf and in

291. H. HEEDE, R. MORGAN & S. RIDLEY, *THE HIDDEN COSTS OF ENERGY* 11 (1985).

292. "In the last three decades, the Middle East has been subjected to a dozen wars, a dozen revolutions, and innumerable assassinations and territorial disputes. Dependence [on imported Middle Eastern oil] reinforces the twin vulnerabilities—interruption of supplies and major price increases." R. STOBAUGH & D. YERGIN, *supra* note 1, at 5. Although the United States continues to benefit from OPEC's internal conflicts, the cartel's agreement at a 1987 meeting in Geneva signals that its members may be able to overcome their differences and once again gain partial control of the oil market. See Johnston, *Energy Prices Surge 9.9%*, *Contra Costa Times*, Feb. 14, 1987, at 1A, col. 5. The fraction of United States imports coming from OPEC jumped 50% in the first three quarters of 1986. OPEC imports now make up nearly half of total imports. See ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, *MONTHLY ENERGY REVIEW: SEPTEMBER 1986*, at 46-47 (1986).

293. Oil's importance to the national economy recently was reinforced when, in January 1987, a surge in energy prices (including a 15.7% increase in gasoline prices, the highest single-month jump since the Labor Department began monitoring energy statistics) led to a corresponding increase in domestic wholesale prices of 0.6%. *Wholesale Prices Up 0.6%; U.S. Vacation From Inflation Over*, *Los Angeles Times*, Feb. 13, 1987, at I-2, col. 1. This problem may get worse as the United States becomes more dependent on foreign oil. The share of United States oil consumption coming from imports started rising again in 1982 after several years of decline; by 1987, imports were up to 34.6% of total consumption. See ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, *MONTHLY ENERGY REVIEW: AUGUST 1987*, at 36-37 (1987) (nine-month average of net imports as fraction of petroleum products supplied).

294. At a 1985 Senate Finance Committee hearing, David Gorin of the Solar Energy Industries Association testified:

The U.S. is dependent upon foreign sources for one-third of our energy supply. These imports alone represent almost half of the total U.S. trade deficit and have made us a debtor nation for the first time since 1917. This energy comes from areas of the world where political instability abounds. Acts of terrorism or actual war have in the past severely limited supplies available to us and can, at almost any moment, recreate the energy shortages we experienced in 1973 and 1978 and the resultant economic recessions.

Solar Industry Warns That Low Energy Prices Lull U.S. Into Complacency, *Energy Bus. Update*, July 29, 1985, at 2 [hereinafter *Solar Industry*] (quoting Gorin).

295. See P. EHRLICH, A. EHRLICH & J. HOLDREN, *supra* note 19, at 908-10.

296. See ENERGY INFO. ADMIN., *supra* note 292, at 68.

297. R. STOBAUGH & D. YERGIN, *supra* note 1, at 19. Production peaked at 11.3 million barrels per day, compared to an average of 8.7 million barrels per day during the 1980's. See ENERGY INFO. ADMIN., *supra* note 292, at 40.

remote regions such as Alaska will provide limited new reserves, it seems increasingly likely that United States oil production will continue its long-term decline.²⁹⁸

Nor do other traditional domestic resources and technologies show great promise for replacing oil as the fuel of choice. Natural gas, which tends to accompany petroleum deposits, burns more cleanly and efficiently than oil but is subject to the same constraints on availability as domestic oil and is more difficult to transport. Coal, which this country has in large quantities, would be a good transition fuel for the future, but coal is the worst polluter of the fossil fuel technologies,²⁹⁹ and environmental concerns may limit its future use in the United States.

Furthermore, hydropower and nuclear power, the two other major sources of electrical generating capacity in the United States, offer little hope of meeting all our energy needs. Hydropower is out of favor because the best dam sites already have been utilized, leaving few sites that are both economically and environmentally acceptable.³⁰⁰ Nuclear power faces widespread opposition because significant questions of plant safety and long-term waste disposal remain unanswered,³⁰¹ providing a seemingly intractable political, if not economic, obstacle to further nuclear power development.

There is currently a sense of complacency in the United States regarding the availability of relatively low cost energy; yet the era of cheap and plentiful fossil fuels—from which Americans reaped many rewards—has passed its prime and started into decline. For all practical purposes, fossil fuels are fixed in quantity. Yet they are consumed at tremendous rates and are relied on to fuel the world's industrial economies. Although analysts disagree over whether society can continue to rely on these limited resources for twenty years or for two hundred, they agree that eventually there must be a transition from a global economy fueled by oil, gas, and coal to one driven by renewable energy resources.³⁰² Indeed, the important question for the future is whether the end of that era will come as a shock to the economy of the United States or whether a transition to renewable energy resources can be accom-

298. R. STOBAUGH & D. YERGIN, *supra* note 1, at 10.

299. P. EHRLICH, A. EHRLICH & J. HOLDREN, *supra* note 19, at 427.

300. J. GEVER, R. KAUFMAN, D. SKOLE & C. VÖRÖSMARTY, *BEYOND OIL: THE THREAT TO FOOD AND FUEL IN THE COMING DECADES* 23 (1986).

301. See P. EHRLICH, A. EHRLICH & J. HOLDREN, *supra* note 19, at 448-53.

302. The most important potential exception is nuclear energy, which is nonrenewable without the use of plutonium-breeding reactors, but which nevertheless could have a major role to play in the nation's energy future. Nuclear energy is a wild card: until difficult questions of plant decommissioning and waste disposal are addressed, the future growth in the number of conventional fission reactors in the United States is likely to be minimal; but if technical, economic, and environmental obstacles can be overcome, breeder reactors and fusion reactors could play a major role in the nation's electrical supply. For an excellent discussion of these issues, see *id.* at 430-63.

plished gracefully. The challenge is to wean ourselves from fossil fuel dependence slowly but steadily—to avoid going “cold turkey.” Making a gradual transition to renewable resources will require planning and preparation. The experience of the wind energy industry in California demonstrates that a properly formulated energy policy can aid the transition.

B. The Role of Government Intervention in the Energy Sector

In spite of the painful lessons of the last decade and the positive results from the incentives established for alternative energy sources, the United States seems to have abandoned its national energy policy in favor of a purportedly free-market approach.³⁰³ The Reagan administration, arriving in office in 1981 with the elements in place for a comprehensive energy policy favoring alternative energy technologies and conservation,³⁰⁴ has proved unconcerned about energy availability and uninterested in reducing our reliance on traditional energy resources. At first, the administration justified its policies by advocating a “free market” in energy,³⁰⁵ but its words turned out to be empty rhetoric: the President abolished financial support for renewable energy technologies while retaining subsidies for fossil fuels and nuclear power.³⁰⁶ This policy, although politically expedient, is contrary to the nation’s long-term interest in securing adequate supplies of energy at a reasonable cost. One analyst called the administration’s policies “unbalanced, short-sighted, and irresponsible,”³⁰⁷ and some members of Congress were very critical of the administration’s position.³⁰⁸ In fact, the harsh irony of the Reagan

303. The administration’s only attempt at a comprehensive energy policy was the poorly conceived 1985 National Energy Policy Plan Projections. OFFICE OF POLICY, PLANNING & ANALYSIS, U.S. DEP’T OF ENERGY, NATIONAL ENERGY POLICY PLAN PROJECTIONS TO 2010, at 3-28 (1985). In the development of the projections, the Department of Energy ignored the role government plays in shifting incentives by formulating policy and refused to consider anything other than free market effects as triggering conservation and alternative energy development. The projections assumed that more efficient products will find a niche in the marketplace, without having to overcome the obstacles that new technologies inevitably face: barriers to entry, lack of economies of scale, lack of full information among consumers, and competition with the heavily subsidized fossil-fuel technologies.

304. The Carter administration had paid the political price for the establishment of the NEA. The Reagan administration could have perpetuated the policies of the NEA at no political cost and little additional economic cost.

305. See R. STOBAUGH & D. YERGIN, *supra* note 1, at 287-90.

306. *Hearing on Renewable Energy Incentives*, *supra* note 23, at 1.

307. *Solar Industry*, *supra* note 294, at 2 (quoting David Gorin, Exec. Vice-President, Solar Energy Indus. Ass’n).

308. Congressman Markey, for example, labeled the current stance the “animal farm energy policy” because “everyone is equal but some are more equal than others.” Markey went on to say:

If this free market philosophy were being applied by the administration across the board in all energy sources and sectors, I could understand what the administration stood for, but that is not the case. Instead, the administration has concluded

administration's policies is that not only have they discouraged development of energy alternatives, but they have encouraged continued reliance on fossil fuels.³⁰⁹ Wind energy and other renewable energy technologies

that the Federal Government must be big brother to the oil and gas industry and to the nuclear industry.

Hearing on Renewable Energy Incentives, *supra* note 23, at 1 (statement of Rep. Edward J. Markey, Subcomm. Chair). At one point in the hearings, Congressman Markey had asked the Secretary of Energy, John Herrington, to appear and defend the administration's position. Secretary Herrington declined to appear, but sent Donna Fitzpatrick, an Acting Assistant Secretary of Energy, in his place. Markey let Fitzpatrick have it with both barrels: "We understand that you are nothing more than a sacrificial lamb placed upon our subcommittee table this morning because no one in any real position of responsibility wants to have to come up here and defend this nonsense." *Id.* at 49. Markey ended his tirade by asking Fitzpatrick to relay a message:

I . . . urge you to apprise the Secretary of Energy that this chairman is not impressed with his Department's attempt to excuse its failure to analyze the distortions in energy incentives by saying that it is difficult to do so. The fact is the Department [of Energy] is a living contradiction. On the one hand, it issues dire warnings about energy complacency, electricity brownouts and import dependence to support its activities on behalf of the oil, gas, and nuclear industries; on the other hand, it issues cheery pep talks about the virtues of deregulation and the free market to justify its active opposition to every Federal initiative to conserve energy.

It is plain that you shy away from any serious comparative policy analysis because it would only heighten public awareness of this contradiction and increase public understanding that the only principles guiding this Department are political calculation and political gain.

Id. at 52-53 (statement of Rep. Markey).

309. Two recent examples indicate the extent of the administration's willingness to favor short-sighted, near-term satisfaction over wiser long-term policies.

First, the administration has opposed the continuation of measures for reducing automobile fuel consumption, despite the fact that such measures have significantly reduced the nation's demand for oil. See *Automobile Fuel Economy Standards: Hearing Before the Subcomm. on Energy Conservation and Power of the House Comm. on Energy and Commerce*, 99th Cong., 1st Sess. 380, 381 (1985) [hereinafter *Hearing on Automobile Fuel Economy Standards*] (statement of Marc Ledbetter, Policy Director, Energy Conservation Coalition). Starting in 1975 as part of the Energy Conservation and Policy Act, 15 U.S.C. § 2002 (1982) (originally enacted as Pub. L. No. 94-163, § 502, 89 Stat. 871, 902-05 (1975)), the federal government established the Corporate Average Fuel Economy (CAFE) standards, requiring slowly but steadily increasing fuel economy from the nation's automobile manufacturers, with penalties for manufacturers who failed to comply. The Reagan administration, however, concluded that the regulations imposed unnecessary constraints on the manufacturers and rolled back the CAFE standards from 27.5 mpg to 26 mpg. 51 Fed. Reg. 35,594 (1986); see also *CAFE Standard Lowered to 26 MPG for 1987-88; NHTSA Cites Job Losses, Foreign Competition*, 17 [Current Developments] ENV'T REP. (BNA) 858. The National Highway Traffic Safety Administration has estimated that the rollback will increase fuel consumption for the 1986 fleet alone by an estimated 36 million barrels of oil. See *Hearing on Automobile Fuel Economy Standards*, *supra*, at 385.

Second, and even more troublesome, the administration opposed an almost universally endorsed attempt to increase the efficiency of major energy-consuming appliances. See S. REP. NO. 6, 100th Cong., 1st Sess. 4 (1987); H.R. REP. NO. 11, 100th Cong., 1st Sess. 30 (1987). A series of scientific and economic analyses had indicated that the measures not only would conserve energy, but would be very cost-effective. See *id.* at 28. The higher initial costs for more efficient units would be recovered in as little as one year through energy savings, with additional savings for consumers over the remainder of the appliances' operating lifetimes. A. ROSENFELD, RESIDENTIAL ENERGY EFFICIENCY: PROGRESS SINCE 1973 AND FUTURE POTENTIAL 15 (1985) (report of the Applied Science Division, Lawrence Berkeley Laboratory). The energy savings involved were hardly trivial: approximately seventeen quads of energy by

are thus forced to compete on an uneven playing field with subsidized fossil fuels rather than being given the chance to compete based on their own economic merits.

Even the most ardent supporters of *laissez faire* economics recognize that market imperfections, especially in the energy sector, can prevent an efficient allocation of resources.³¹⁰ Energy issues are dominated by political and social externalities, such as strategic concerns about the availability of oil and environmental concerns about its extraction, refining, and combustion. As a result, there is no "free market" in energy—indeed, there never has been—and the Reagan administration's compulsive opposition to any form of government intervention in the energy sector is unjustified.³¹¹ Thus, the choice is not between government intervention and nonintervention in the energy sector: all governments, regardless of political ideology and economic philosophy, inevitably affect the pattern of investment and development in their energy economies.³¹² Rather, the choice is between ad hoc intervention in response to short-term political pressures and intervention that takes the form of comprehensive government planning for long-term goals.

Other nations have been very successful in coordinating the efforts of the private and public sectors to achieve long-term goals.³¹³ Government planning, for example, was a key element in the responses of some industrialized nations to the energy crisis, and it is no coincidence that,

the year 2000, H.R. REP. NO. 11, *supra*, at 30, equivalent to three billion barrels of oil. These savings amount to nearly three times the expected total yield from proposed offshore oil development along the entire Pacific Outer Continental Shelf region south of Alaska (which yields a risked mean estimate of 1.03 billion barrels of oil equivalent). 1 MINERALS MANAGEMENT SERVICE, U.S. DEP'T OF THE INTERIOR, PROPOSED 5-YEAR OUTER CONTINENTAL SHELF OIL AND GAS LEASING PROGRAM, MID-1987 TO MID-1992, FINAL ENVIRONMENTAL IMPACT STATEMENT II-18 (1987) (table II.A.1.b-1). When the proposal was introduced in Congress, it was supported by utilities, consumer groups, and the appliance manufacturers themselves. S. REP. NO. 6, *supra*, at 4. There was literally no opposition to the bill; it passed without objection in both the House and the Senate. *Id.* President Reagan vetoed the bill, claiming that it "intrudes unduly on the free market . . ." National Appliance Energy Conservation Act of 1986: Memorandum Withholding Approval of H.R. 5465, 22 WEEKLY COMP. PRES. DOC. 1516, 1516 (Nov. 1, 1986). The bill was passed again, over his veto, and became law in March 1987. Acts Approved by the President, 23 WEEKLY COMP. PRES. DOC. 287 (Mar. 20, 1987).

310. See, e.g., McDonald, *supra* note 229, at 868; see also R. STOBAUGH & D. YERGIN, *supra* note 1, at 287-88 ("[I]t became obvious during 1981-82 that gross market imperfections would continue to encourage the overuse of energy, thereby penalizing energy efficiency, solar energy, and other new energy sources in the marketplace for many, many years."). See generally *supra* notes 228-30 and accompanying text (discussing use of tax incentives to remedy imperfections in the energy market).

311. See generally R. STOBAUGH & D. YERGIN, *supra* note 1, at 287-90 (discussing the shortcomings of Reagan's free-market concept).

312. See I. MAGAZINER & R. REICH, *supra* note 142, at 6.

313. For example, the Japanese government has adopted explicit policies to promote particular investments by the private sector. These policies increasingly have been successful in improving Japan's international competitiveness. *Id.*

although more heavily dependent on imported oil than the United States, these nations were more successful in maintaining economic growth and controlling inflation during that period.³¹⁴ By contrast, the United States government often ends up formulating its policies in response to lobbying pressure from well-established and politically influential industries.³¹⁵ This has been particularly true in the energy sector, which has been dominated by a handful of companies for over 100 years.³¹⁶ By failing to develop a coherent energy policy, leaving the formation of such policy to politically and financially strong—but self-interested—energy industries, the United States has significantly compromised the future health of its energy sector.³¹⁷

What is needed is a set of long-term goals that help us begin the transition to increased efficiency, reduced consumption of fossil fuels, and development of alternative energy sources, combined with a set of short-term measures to implement these goals.³¹⁸ The social costs of reliance on traditional energy technologies are higher than reflected market prices for fuels³¹⁹ and should be recognized in planning a comprehensive energy policy. These high costs justify the governmental support that may be necessary for the assimilation of new energy technologies. Moreover, support for the renewable energy sector is justified because of the need to break through market barriers: a number of the technologies are still in an early developmental stage and cannot benefit from economies of scale in manufacturing and construction.

The government traditionally has utilized two different techniques for encouraging technological development. The first has been to rely on direct government subsidy. Nuclear power and large-scale hydropower are prominent examples of technologies that relied to a large extent on direct federal funding either for research or development or for both.

314. See *id.* at 1.

315. *Id.* at 6.

316. R. STobaugh & D. Yergin, *supra* note 1, at 20.

317. I. MAGAZINER & R. REICH, *supra* note 142, at 6.

318. The automobile and appliance efficiency standards discussed above are both examples of a form of "taxation" through regulation: imposing a particular mandate on an industry, thereby requiring an expensive program of research and development, the cost of which is passed on to consumers in the form of higher prices. Such regulations are effective for encouraging energy conservation, but encouraging alternative energy production requires a different approach because it involves the development of entirely new technologies rather than marginal improvements in established technologies.

Furthermore, imposing efficiency mandates on particular industries and on the housing sector can be very significant in conserving energy, which is perhaps the single most important step in planning a sustainable energy future. Reducing energy demand, however, is only half the picture. Finding domestic, sustainable substitutes for traditional energy sources is also essential.

319. In *Energy Future*, Robert Stobaugh and Daniel Yergin calculate the social cost of oil—"that is, the market price plus the costs to the society of future price hikes and economic disruptions that might result from increasing demand"—to be between \$65 and \$100 per barrel. R. STobaugh & D. Yergin, *supra* note 1, at 9.

The second method for encouraging development of energy technologies is to subsidize the technology indirectly through tax credits and deductions. This method—traditionally used in the oil and gas industries where the depletion allowance and “wildcatting” incentives are prominent examples—is responsible for the remarkable development of the wind energy industry in California.

Both of these techniques can—and should—play a role in the nation’s energy future. Developing adequate sources of alternative energy will require continued investment in research and development. Legislation such as PURPA is needed to break through institutional barriers and to help promote competition in the market. Additionally, private sector incentives such as tax credits, low interest loans, and other subsidies are needed to encourage entrepreneurial efforts.

The timing of these policies is likely to be almost as important as the development of the policies themselves. Many of the problems associated with the NEA can be attributed to the aura of crisis that surrounded the nation in the late 1970’s and the resulting pressure on national leaders to do something—anything—to remedy the difficult situation. To avoid the pitfalls of forced decisions made during a crisis, the government must lead by establishing priorities for the nation’s long-term energy needs and by formulating policies consistent with those goals.

This leadership will not be an easy task: the NEA was, in many respects, a bitter lesson in the complexity and difficulty of efficient and effective government planning. Although there were flaws in the plan, this Comment has shown that certain aspects of the policy were effective in achieving the goal of diversifying the nation’s energy supply by developing renewable energy technologies. The rapid development of the wind energy industry in California could have come about only through coordinated establishment of legislation breaking through market barriers and of incentives for private investment. The NEA was a step in the right direction—a step that collapsed with the Reagan administration’s abandonment of any comprehensive energy policy.

The lesson learned from focusing on the boom/bust of the wind energy industry is that active development of energy policies can have an extraordinary influence on the unraveling of our energy future. These policies can encourage—or discourage—the development of a new generation of energy technologies that have the potential to make significant inroads against our overreliance on fossil fuels. Tax credits and institutional incentives designed to encourage a diverse, sustainable energy future can—and should—be an integral part of the nation’s energy plan.

CONCLUSION

The growth of the California wind energy industry is a prominent

example of the NEA's success in encouraging renewable energy technologies. With the benefits provided by the NEA, the wind energy industry matured quickly and now can compete economically with traditional energy technologies such as oil, gas, and coal. Of course, the high price of oil and the shortage of generating capacity in California contributed to the industry's success by providing additional economic incentives for investment in energy, but market forces were not enough to trigger renewable energy investment. PURPA broke the utilities' monopoly on electricity generation by removing institutional obstacles to independent power production, and the federal and state energy tax credits provided the impetus to attract billions of dollars of investment in commercial wind energy development.

PURPA is essential to the continued success of independent power producers. PURPA increased the efficiency and diversity of the electrical supply system while retaining enough flexibility to allow individual states to tailor the implementation of the statute to their specific needs. Short-term fluctuations in energy price and supply should not be allowed to undermine the statute, because our long-term interests are better met by preserving its unique approach to encouraging decentralized and efficient electricity generation. Any changes to PURPA can and should come at the state regulatory level, not at the federal level.

The structure of the financial incentives provided by the solar energy tax credits was flawed, but those incentives were effective in encouraging investment in wind energy. The recent decline in oil prices makes it more difficult for wind energy to compete economically with traditional energy technologies, but the industry has matured sufficiently so that financial incentives are no longer needed to enable the wind energy industry to survive.

On the other hand, the continued presence of subsidies to coal, oil, gas, and nuclear energy prevents alternative energy technologies from being able to compete economically without the aid of tax credits or legislation such as the NEA. Because it appears that the elimination of subsidies for the traditional technologies is politically impossible, and because renewable energy technologies are preferable for both strategic and environmental reasons, it is in the nation's interest to provide additional incentives for renewable energy technologies, including wind energy.

One possibility would be a production-based energy tax credit. A production credit would provide an additional incentive to the renewable energy sector at a cost much lower than that of ongoing subsidies to traditional energy technologies. It would minimize the potential for abusive income sheltering, which caused significant problems in the early years of the wind energy industry. Finally, a production-based credit would correct the distortions caused by subsidies to the traditional en-

ergy technologies, allowing alternative technologies to compete on an equal economic footing.

The energy crisis of the 1970's was not a fluke of history. It was a warning that continued reliance on traditional energy supplies will cause chaos in the United States' economy and conflict around the world. The current complacency by the government regarding the future of our energy supplies is dangerous. An appropriate response requires the development of a sensible long-term energy policy that reflects the strategic and environmental costs of conventional fossil fuel resources, especially the costs of imported oil. Two key elements of this policy should be the maintenance of existing institutional incentives established by PURPA and the creation of new financial incentives for the production of energy from domestic renewable energy resources.