How the Price-Anderson Act Failed the Nuclear Industry

I. INTRODUCTION

When the U.S. government began to promote private development of nuclear technology in the 1950's,[1] the potential for public liability remained a major obstacle.[2] For this reason, Congress passed the Price-Anderson Act ("Price-Anderson").[3] Congress designed Price-Anderson as a temporary, catalytic measure[4] to facilitate the entry of private industry into the nuclear field by creating an insurance substitute and limiting the industry's public liability in the event of a nuclear accident.[5] The Act, therefore, served both to promote nuclear policy and to create an alternative compensation system. Thirty years later, however, Price-Anderson remains a permanent feature of nuclear policy in the United States. The 1988 Amendment[6] extended the Price-Anderson Act until the year 2002. This note argues that from the perspective of its original objectives, Price-Anderson is a failure and the 1988 Amendment serves only to reinforce the Act's deficiencies. Price-Anderson is no longer needed as a promoter of nuclear technology and indeed the Act no longer functions in this capacity. Today, the nuclear industry is in jeopardy, plagued by obstacles which were not foreseeable when Congress passed Price-Anderson. Rather than propose new solutions to these problems, the 1988 Amendment overlooked them. As an alternative compensation system, Price-Anderson is inadequate and the Amendment

1. Formerly, the government had maintained a monopoly over nuclear power. In the 1950's, however, increased competition from other nations and pressure to win the global race for atomic energy led the government to reverse this policy. See H.R. 2181, 83rd Cong., 2d Sess. 2 (1954) *See also* Green, *Nuclear Power: Risk, Liability and Indemnity*, 71 MICH. L. REV., 479, 480 (1973).

2. Green, *supra* note 1 at 480.

3. 42 U.S.C. § 2210 (1982 & West Supp. Dec. 1988).

4. The Act was set to expire ten years following its passage, in 1967. W. WOOD, INSURING NUCLEAR POWER: LIABILITY, SAFETY AND ECONOMIC EFFICIENCY 5 (1982) (citing 1956 Hearings).

5. Green, *supra* note 1 at 489. When passed in 1957, Price-Anderson limited the nuclear industry's liability to $560 million.

6. Price-Anderson Amendments Act of 1988, Pub. L. No. 100-408, 102 Stat. 1067 (1988).

failed to change this in any meaningful way. When Congress passed the Amendment, it delayed the formulation of a responsible nuclear energy program. The continued extension of Price-Anderson in its present form forces the industry to operate under outdated theories and false assumptions, causing uncertainty for both the nuclear industry and the public.

Part II of this Note examines the current provisions of the Price-Anderson Act. Part III analyzes the impact of Price-Anderson on the public and concludes that any benefits are minimal. Part IV provides a brief history of the nuclear industry. Part V examines the long-term effects of Price-Anderson on the development of the nuclear industry, concluding that Price-Anderson exerted a negative influence on both the quality and quantity of nuclear construction.

II. CURRENT PROVISIONS OF THE PRICE-ANDERSON ACT

Price-Anderson establishes the insurance, liability and compensation requirements for the nuclear power industry. The Act creates a system to guarantee the availability of funds to pay the costs of an accident, but limits the industry's aggregate potential liability.[7] In addition, the Act designates basic guidelines for the industry to follow in settling compensation issues with victims after an accident.

A. *Price-Anderson's Financing Scheme*

Price-Anderson places responsibility for the costs of a nuclear accident on two sources.[8] Currently, the combined funds avail-

7. Price-Anderson is not unique in establishing liability limitations on an industry. Other federal liability limiting initiatives include the Trans-Alaskan Pipeline Authorization Act, Workmen's Compensation, the Swine Flu Act, Superfund, Toxic Waste Laws, the Tauzin Amendment and the Warsaw Convention (an international agreement). Price-Anderson is unique in the degree to which it limits victims' ability to obtain additional compensation by suing manufacturers of equipment and other responsible parties. For an excellent discussion of other liability limiting laws, *see* Anderson, *Limits on Liability: The Price-Anderson Act Versus Other Laws*, 45 JOURNAL OF RISK AND INSURANCE 4 (1978).

8. Formerly a third source of funds was provided by means of a government indemnity. When Price-Anderson was originally enacted, the government provided a $500 million indemnity to the industry for a fee of $30 per thousand kilowatts of thermal energy capacity. The average cost for each large commercial reactor totalled about $90,000. Today, this controversial aspect of the financing scheme has been phased out. *See* Lowenstein, *The Price-Anderson Act: An Imaginative Approach to Public Liability Concerns*, 12 Forum 594, 600 (1977).

able in event of a nuclear accident would total about $7 billion.[9] The first source of funds would be provided by the licensee itself, which generally maintains a liability insurance policy.[10] Price-Anderson directs the Nuclear Regulatory Commission ("NRC") to require that licensees of nuclear production or utilization facilities acquire and maintain "financial protection. . .to cover public liability claims."[11] The second source of funds would be provided by qualifying nuclear plant operators under the retrospective premium payment system.[12] These operators would be liable for up to $10 million annually for a maximum of seven years. It is important to note that under Price-Anderson the industry need not set aside funds for future use. Price-Anderson merely designates which parties would be expected to bear the financial burden at a future date.

B. *Compensation Plans*

Price-Anderson establishes general guidelines for the industry to follow while working toward a settlement plan following a nuclear accident. The NRC is directed to make a survey of the causes and extent of the damage and to report to the Joint Committee, the Congressmen and Senators of affected districts and, subject to national security requirements, the public.[13] The Act places a U.S. district court in the district of the nuclear incident in charge of handling compensation claims. The NRC must submit to the district court a plan for the disposition of claims taking into account "appropriate amounts for personal injury claims, property damage claims and possible latent injury claims which may not be discovered until a later time. . . ."[14]

To facilitate the goal of compensating accident victims quickly and efficiently, Price-Anderson imposes a waiver of certain legal

9. The precise amount depends upon the number of nuclear plants in operation at the time of the accident. At this writing there are approximately 105 nuclear plants in operation.

10. Liability insurance for nuclear accidents remains limited. The scarcity of such insurance was the reason the industry lobbied for Price-Anderson in the first place. Only two pools or groups of insurers provide private insurance to the nuclear industry: American Nuclear Insurers and Mutual Atomic Energy Liability Underwriters. Wood, *supra* note 4 at 129.

11. 42 U.S.C. § 2210(a) (1982).

12. 42 U.S.C. § 2210 (1982).

13. 42 U.S.C. § 2210(i) (1982).

14. 42 U.S.C. § 2210(o) (1982).

defenses upon licensees involved in an "extraordinary nuclear occurrence" ("ENO").[15] The first waiver provision eliminates the defenses of contributory and comparative negligence, imposing strict liability upon a licensee to the extent of its financial protection as outlined above. The second waiver eliminates the defenses of charitable and governmental immunities. The final waiver removes a statute of limitations defense against any claimant who institutes a suit within three years from the date that the injury and its cause have been discovered or reasonably could have been discovered, provided that the suit is initiated within twenty years of the date of ENO.[16] If the NRC does not declare a particular accident an ENO, nuclear plant operators are not required to waive these defenses. Victims would then have to litigate their claims in court. The industry's liability, however, would still be limited.

C. *1988 Amendment to Price-Anderson*

The 1988 Amendment extended the nuclear industry's coverage under Price-Anderson until the year 2002. The Amendment's most significant change is the increase in the industry's liability limit from $560 million to about $7 billion. Legislators achieved this by raising the retrospective premium to $63 million per licensee, payable in maximum annual installments of $10 million. Although this change — long overdue — is an important gain for the public, the liability limit may still be insufficient to cover the full costs of a nuclear accident.[17] In addition, the 1988 Amendment neglected to modify other aspects of the inadequate alternative compensation system and to terminate the unnecessary promotion of nuclear power. The current version of the Act is outdated and misguided from both the standpoint of its original objectives and the industry's current needs.

15. The definition of "extraordinary nuclear occurrence" is set forth in 42 U.S.C. § 2014(j) (1982) as a dispersal causing substantial radiation levels and substantial damages to persons or property off-site as determined by the NRC without review by an official or court.

16. 42 U.S.C. § 2210(n) (1982).

17. Liability limits for the nuclear industry have been set in an arbitrary manner under Price-Anderson. *See* Green, *supra* note 1 at 482 - 83. *See also* Berkovitz, *Price-Anderson Act: Model Compensation Legislation? - The Sixty-Three Million Dollar Question*, 13 HARV. ENVTL. L. REV. 1, 54 (1989).

III. Public Protection Under Price-Anderson

A. *Price-Anderson's Unique Feature: Aggregate Liability*

The 1988 Amendment of Price-Anderson continues to limit liability on an aggregate basis. This unusual mechanism establishes an inverse relationship between the damage caused and the compensation received.[18] The flaw with this type of liability mechanism is that it makes victims' damage awards dependent upon the number of other injured victims. If a nuclear accident occurs in an isolated or remote region with few inhabitants, victims will receive proportionately more compensation than victims of the same accident near a major population center. The effect is to "make those living in proximity to nuclear power plants subsidizers of. . .[those] who may live substantial distances from the plant."[19] Considering the incentives Price-Anderson creates for the nuclear industry to overexpand and to locate near metropolitan areas, which will be examined in Part IV, this result is alarming.

B. *Inadequate Insurance Financing and Planning*

Price-Anderson's unique method of financing liability insurance is detrimental to the public. The retrospective premium system permits the industry to avoid present payments for insurance coverage. The industry's cost of business does not accurately reflect the potential level of risk that would otherwise be reflected in annual insurance premiums.[20] In addition, Price-Anderson takes over the function of the insurance system and prevents the indus-

18. Price-Anderson's liability limit was challenged as unconstitutional in Carolina Environmental Study Group, Inc., v. United States Atomic Energy Comm'n, 432 F. Supp. 203 (W.D.N.C. 1977). The district court held that the liability limitation provision of Price-Anderson violated the due process clause of the fifth amendment and the equal protection component of that clause in three respects: 1) the amount of the limit was not rationally related to potential losses from a nuclear accident, 2) the liability limit irrationally encouraged irresponsibility among nuclear plant owners, and 3) the Act abolished state tort law remedies without providing potential nuclear victims with a quid pro quo. "The Supreme Court reversed the district court, holding that Price-Anderson did not violate the due process clause and suggesting it did not deny equal protection." Duke Power Co. v. Carolina Environmental Study Group, 438 U.S. 59 (1978). For a detailed analysis of the case, *see* Dickerson, *Limited Liability for Nuclear Accidents: Duke Power Co. v. Carolina Environmental Study Group*, 8 Ecology L. Q. 163, 167 (1979).

19. Reitze and Rowe, *The Price-Anderson Act—Limited Liability for the Nuclear Industry*, 17 Envtl. L. Rep. 10185, 10189 (1987).

20. For this reason, Price-Anderson has been criticized as creating only the illusion of coverage. *See* Reitze and Rowe, *supra* note 19, at 10185.

try from making business decisions based on traditional risk assessment analysis. If Price-Anderson had expired in 1967 as planned, this effect would have been limited and minimal. The industry would have been forced to make safety concerns and risk assessment a normal part of the industry's business planning. But Congress has adopted Price-Anderson as a permanent feature of nuclear policy, and the long-term effect of removing the natural forces of the market from the nuclear industry has been detrimental to both public safety and the industry's growth.

C. *Inadequate Settlement Guidelines*

Although enacted to serve as an alternative compensation system, Price-Anderson defers responsibility for establishing a settlement plan to a court. The Act provides little guidance as to how a plan would be administered. The court assigned to apportion funds would face a difficult challenge because it would need to provide both immediate relief to victims with current injuries and safeguard additional funds for victims whose damages are latent.

D. *Waivers of Legal Defenses*

The value of Price-Anderson's waiver of contributory and comparative negligence is minimal given the current state of tort law. Under the doctrine of res ipsa loquitur, most jurisdictions today would probably impose strict liability on a nuclear licensee based upon the finding that a nuclear facility is "abnormally dangerous." [21] This minimizes the value of the waiver of contributory and comparative negligence. The second waiver — charitable and governmental immunities — applies only to nuclear research facilities.[22] The final waiver — which removes a statute of limitations in certain instances — is likely to benefit only the small category of claimants whose injuries are not immediate or obvious but whose damage is discovered within twenty years.[23]

21. Note, *Nuclear Power and the Price-Anderson Act: Promotion Over Public Protection*, 30 STAN. L. REV. at 411 (citing M. FRANKLIN, INJURIES, AND REMEDIES: CASES AND MATERIALS ON TORT LAW AND ALTERNATIVES 626 (1971)).

22. Commercial nuclear facilities are not affected by this waiver. Even publicly-owned utilities lack governmental immunity. *See* Reitze and Rowe, *supra* note 19.

23. Medical experts believe that about five-sixths of the cancers caused by radiation dose emerge more than twenty years after the exposure. *See* Note, STAN. L. REV., *supra* note 21, at 416.

E. *Difficulty of Proving Causation*

Victims of a nuclear accident have the burden of proving causation. This poses a difficult, if not impossible challenge to plaintiffs seeking compensation from radiation-induced injuries. The legal system has resisted the use of statistical and epidemiological data to prove causation.[24] All human diseases arising from radiation-induced inherited disorders have not been identified. The limited extent of scientific knowledge about the biological effects of human exposure to radiation poses a handicap to victims attempting to prove causation.

To serve the purpose of an alternative compensation system, Price-Anderson should set out a comprehensive, detailed plan to be followed in event of a nuclear accident. Problems which can be anticipated — insufficient funds, apportionment of damage awards and proof of causation — should be resolved in advance of an accident rather than placing the burden on a court in the future. Price-Anderson simply works to defer responsibility and resolution of important issues. The above criticisms of Price-Anderson apply equally to the earlier versions of the Act.[25] Public protection under Price-Anderson has always been minimal.[26] Although Congress had the opportunity to improve these critical features of the Act when Price-Anderson expired in 1987, the 1988 Amendment did nothing to strengthen public protection. This was not the only shortcoming of the Amendment. In addition, it overlooked the more recent developments, to be examined in Part IV, which have placed the future of the entire nuclear industry in jeopardy. The 1988 Amendment left the public unprotected against the risk of nuclear accident and the industry vulnerable to collapse.

IV. A Brief History of the Nuclear Industry

In its thirty year history, the U.S. nuclear industry has witnessed dramatic changes. Initially, military use dictated control of nuclear energy and the government maintained a monopoly over its development. In the 1950's, other countries began to develop

24. Reitze and Rowe, *supra* note 19, at 10188 (citing McElveen & Eddy, *Cancer and Toxic Substances: The Problem of Causation and the Use of Epidemiology*, 33 Clev. St. L. Rev. 29 (1984)).

25. Act of Sept. 2, 1957, Pub. L. No. 85-256, 71 Stat. 576 (codified at 42 U.S.C. § 2210); Pub. L. No. 89-210, 79 Stat. 855 (1965); Pub. L. No. 94-197, 89 Stat. 1111 (1975).

26. For a detailed discussion, *see* Note, Stan. L. Rev., *supra* note 21.

nuclear energy. In an effort to maintain a competitive edge, the U.S. government began to promote the private development of nuclear power. In 1954 Congress amended the Atomic Energy Act[27], abandoning former prohibitions against private production of nuclear materials. The Act permitted nuclear development for production of heat and power under stringent federal licensing requirements. Initially reluctant, private industry began to participate in the development of nuclear energy following the passage of Price-Anderson and the advent of limited liability. In the 1950's, the nuclear industry ordered six nuclear reactors.[28] In the 1960's the industry expanded and placed orders for eighty-eight reactors.[29] The early 1970's witnessed the most dramatic growth and changes in the industry. In 1972, thirty-eight new reactors were ordered; in 1973 the number rose to forty-one, and the industry reached its peak.[30] By the end of the decade, the industry had placed orders for 155 reactors. This trend did not last, however. After fifteen years of steady expansion, flaws in U.S. nuclear policy surfaced, leading to a decline of reactor orders and critical, lasting problems for the U.S. nuclear industry.

Early projections of the growth of the nuclear industry were based upon faulty assumptions. Electric demand in the U.S. had grown at seven percent annually for over forty years, and the industry had expected this rate to remain constant. The energy crisis made nuclear power seem more vital than ever. The Nixon Administration's Project Independence counted on nuclear power to provide forty percent of U.S. electricity by 1990.[31] But electric growth rates declined in the 1970's. From 1973 to 1976 demand for electricity grew only 2.3 percent.[32] At the same time, the costs of producing nuclear energy skyrocketed. The average construction cost per kilowatt of net summer capability rose from $161 between 1968 and 1971 to $2,416 between 1985 and

27. Pub. L. No. 83-703, 68 Stat. 919 (1954)(codified as amended in scattered sections of 42 U.S.C.).

28. DEPARTMENT OF ENERGY, ENERGY INFORMATION ADMINISTRATION, U.S. COMMERCIAL NUCLEAR POWER 1988, 87, Appendix E (1988).[hereinafter COMMERCIAL NUCLEAR POWER 1988].

29. *Id.* at 87-89.

30. *Id.* at 90-91.

31. Cook, *Nuclear Follies*, FORBES MAGAZINE 89 (1985).

32. *Id.*

1986,[33] representing an increase of over 1,400 percent. Because of these price increases, most nuclear plants are no longer competitive with coal.[34] For instance, Duke Power's McGuire 2 Station produces electricity at $932 a kilowatt. These two trends, together with the growing concern over the safety of nuclear power, caused public alarm. In 1975, twenty-four state legislatures introduced fifty bills that proposed to substantially restrict or prohibit the development of nuclear power.[35] A California initiative proposed to halt all construction on nuclear power plants and require gradual elimination of operating nuclear plants.[36] Polls demonstrated the shift of individual preferences away from nuclear power. In the three year span from 1976 to 1979, the percentage of people who would be against the construction of nuclear power plants increased from forty-five to sixty.[37] In 1986, seventy-three percent of people polled did not want a nuclear power plant constructed in their community.

Today, the industry's growth has ceased and public confidence in nuclear power is waning. Beginning in the late 1970's, the industry experienced a growing number of plant cancellations. Between 1978 and 1985, seventy-five plants were canceled, including twenty-eight already under construction. The Tennessee Valley Authority canceled eight out of seventeen projects; Public Service Electric & Gas, five of eight; Duke Power, six of thirteen; Detroit Edison, three of four.[38] No new nuclear plants have been ordered since 1983.[39] Of the total 249 reactors ordered throughout the life of the industry, 130 have been canceled, indefinitely deferred, shut down permanently or

33. ENERGY INFORMATION ADMIN. OFFICE OF COAL, NUCLEAR, ELECTRIC AND ALTERNATE FUELS, U.S. DEPT. OF ENERGY, COMMERCIAL NUCLEAR POWER 1988, DOE/EIA-0438 (88) at 11.

34. Cook, *supra* note 31, at 83.

35. Murphy, La Pierre, *Nuclear "Moratorium" Legislation in the States and the Supremacy Clause: A Case of Express Preemption*, 76 COLUM. L. REV. 392 (1976).

36. *Id.* at 424.

37. G. GALLUP, THE GALLUP POLL, PUBLIC OPINION 1986, at 142-44 (1987). Misgivings about the safety of nuclear power plants increased dramatically following the explosion at the Soviet nuclear power reactor at Chernobyl. In 1986 more Americans (73%) than in the immediate aftermath of the Three Mile Island accident (60%) opposed construction of nuclear power plants near their homes.

38. Cook, *supra* note 31, at 82.

39. DEPARTMENT OF ENERGY, ENERGY INFORMATION ADMINISTRATION, NUCLEAR POWER PLANT CONSTRUCTION ACTIVITY 1987, at 5 [hereinafter NUCLEAR POWER PLANT CONSTRUCTION ACTIVITY 1987].

indefinitely, or rejected.[40] Five units have been deferred with more than one percent completion and thirty-one units have been cancelled at above one percent completion. Others have been retired or shut down temporarily. This leaves approximately 105 operating reactors in the U.S. today.[41]

It is against this background that Congress passed the 1988 Amendment to Price-Anderson. When the Act expired in 1987, Congress had the opportunity to respond to these changes in the nuclear industry and incorporate new solutions to develop a responsible energy program for the future. Instead, Congress extended the outdated version of Price-Anderson in an attempt to continue fostering long-term growth of nuclear power without acknowledging that critical changes have taken place.

V. LONG-TERM EFFECT OF PRICE-ANDERSON ON THE NUCLEAR INDUSTRY

Although the primary purpose of Price-Anderson was to promote the development of a private nuclear power industry, the unforeseen long-term effects of the legislation backfired. Price-Anderson has fostered irresponsible decision-making and mismanagement within the nuclear industry. The Act facilitated the uncontrolled expansion of nuclear technology and encouraged the industry to site plants in a way which maximized potential public risk.[42] This behavior turned the public against nuclear power.[43] As a result, the nuclear option is in jeopardy today.[44] It is important to note that the absence of private insurance was one of the primary reasons that policy makers created Price-Anderson. Following the passage of the Atomic Energy Act of 1954, the private insurance industry signaled the high degree of risk associated with nuclear power plants by limiting the availability of insurance.[45] By placing a liability limit on the nuclear industry

40. COMMERCIAL NUCLEAR POWER 1988, *supra* note 28, at 87.

41. COMMERCIAL NUCLEAR POWER 1988, *supra* note 28, at 7 and 21.

42. The net effect of Price-Anderson has been to permit the industry to externalize social costs by encouraging the industry "to make decisions on technological and economic bases without reckoning with the full social costs that may result in event of an accident." Green, *supra* note 1, at 504-05. This was possible because the government isolated the industry from normal market risks. *See* Tomain, *Law and Policy in the Activist State: Rethinking Nuclear Regulation*, 38 RUTGERS L. REV. 187, 195 (1986).

43. *See* Murphy and La Pierre, *supra* note 35, at 392.

44. *See* Wald, *10 Years After Three Mile Island*, N.Y. Times, March 23, 1989, at D1, col. 2.

45. *See* Green, *supra* note 1, at 484-85.

through Price-Anderson, the government preempted the insurance industry's risk analysis function and undermined the purpose it served. Doing so facilitated the rapid development of a high-risk technology and effectively precluded the conventional method of signaling risk aversion that the insurance industry serves.

A. *Limited Liability and Long-Term Safety*

The most critical long-term effect of limited liability on the nuclear industry is a reduction in safety. If Price-Anderson had remained a temporary measure and expired in 1967 or 1977, it would have succeeded in promoting the initial development of the industry without sacrificing safety in the long run. But because the Act has been continuously extended, it has encouraged utilities to build plants without the normal safeguards other industries must use to seek to avoid the costs of marketing a defective product.[46] In doing so, the Act isolates the nuclear industry from normal market risks while imposing those risks on the public.[47] Consequently, the Act drastically reduces the deterrent effect of liability because it removes incentives to increase safety measures and to limit investment in plants with progressively larger power capacity.[48]

Several factors influence utility behavior.[49] Even without the threat of unlimited liability, the nuclear industry has an interest in safe operation. The industry still must comply with federal safety regulations promulgated by the NRC and it also has an interest in earning public trust.[50] These forces are, however, insufficient. Economic studies indicate that "the regulated firm with limited liability will accept higher probabilities of an accident and also

46. Tomain, *supra* note 42, at 195.

47. *Id.* at 195. To counteract the effect of limited liability on safety, Harold Green proposed exposing a minimum of $25 million in utility assets to damage claims in order to correct safety incentives. This would insure that the industry would bear direct consequences in the event of an accident. *See* Green, *supra* note 1, at 509.

48. As capacity increases, more nuclear material is stored and the potential damage from an accident correspondingly increases. *See* Green, *supra* note 1, at 503.

49. *See* Wood, *supra* note 4, at 27.

50. The Legislative Drafting Research Fund of Columbia University argued that federal regulation, on-site property loss and adverse public reaction were sufficient incentives for safe operation. *See* L. Rockett, Financial Protection Against Nuclear Hazards: Thirty Years' Experience Under the Price-Anderson Act 77 (1984) (available in Columbia Law School Library).

will locate to raise the damage from an accident."[51] This conclusion has alarming consequences for the population centers located near nuclear plants. The studies also indicate that although "safety drops when liability drops" this result can be guarded against by government regulation that consistently exploits cost-effective safety measures.[52] Price-Anderson's liability limitation therefore increases the importance of regulatory agencies. But the regulatory history of the nuclear industry reveals that safety has not been adequately monitored.

Safety has not been a consistent priority in U.S. nuclear policy. The Atomic Energy Commission ("AEC") was established to promote the use of nuclear technology and to ensure its safety. The AEC was vested with this dual responsibility until 1975. This "structure was something of a constitutional anomaly within the U.S. government" because the AEC was acting both as a regulatory commission responsible for safety and an executive agency responsible for promotion of nuclear energy.[53] The AEC, however, began to place more emphasis on regulatory guidelines and licensing standards in the 1970's.[54] The AEC's licensing function passed to the NRC in 1975 when Congress split the AEC into two separate organizations — the NRC and the Energy Research and Development Administration ("ERDA") which was responsible for promotion.[55] This division had little impact, however, until the accident at Three Mile Island ("TMI") in 1979.[56] At this point, the NRC instituted special inspections to all operating power plants to examine safety and sabotage protection.[57] Inspectors detected safety weaknesses at forty-three sites. The NRC, however, decided to select only "worst" sites for corrective action.[58] The NRC noted that different sites received a "vastly different quality" of protection.[59] For example, one power plant was protected by 1) magnetic alarms on gates and guard house, 2)

51. Wood, *supra* note 4, at 42.

52. Wood, *supra* note 4, at 13-42.

53. The Nuclear Energy Policy Study Group, NUCLEAR POWER ISSUES AND CHOICES 237 (1977).

54. DEPARTMENT OF ENERGY, U.S. COMMERCIAL NUCLEAR POWER: HISTORICAL PERSPECTIVES viii (1988) [hereinafter HISTORICAL PERSPECTIVES].

55. Tomain, *supra* note 42, at 198.

56. *Id.*

57. NATIONAL TECHNICAL INFORMATION SERVICE, U.S. DEPT. OF COMMERCE, SECURITY AT NUCLEAR POWER PLANTS AT BEST, INADEQUATE (1977) at 4. ORNL/NUREG/NSIC-118.

58. *Id.* at 4.

59. *Id.* at 3.

an infrared alarm system, 3) a closed circuit television system, 4) a computerized key-card system for important entry points, and 5) an attack-resistant guard house with bullet-resistant glass and steel-plated ceilings.[60] By contrast, another site's primary protection consisted of an eight-foot fence topped with barbed wire.[61] This stark contrast reveals the failure of both the NRC and the nuclear industry to adopt consistent and standardized safety policies.

The accident at TMI unit 2 in Pennsylvania[62] undermined public confidence in the safety of nuclear plants.[63] It also served as a turning point for safety regulation within the industry. Although the accident was brought under control before a worst-case core meltdown occurred, it serves as a constant reminder that accidents do happen. Studies of the sequence of events leading up to TMI indicated that the role of human error in causing such an accident had been understated or ignored in previous accident studies.[64] Following the accident at TMI, two independent investigatory bodies — The President's Commission on the Accident at Three Mile Island and a special inquiry group funded by the NRC — conducted separate investigations. Both groups' findings criticized various NRC departments, particularly those with the responsibilities of licensing reactors and resolving safety issues.[65] In response to TMI, the NRC began to increase safety inspections, step up enforcement and develop emergency preparedness rules.[66]

The NRC identified a list of seventeen "unresolved safety issues" in 1979.[67] The Commission defined such issues as matters "affecting a number of nuclear power plants that pose important questions concerning the adequacy of existing safety requirements for which a final resolution has not yet been developed and that involves conditions not likely to be acceptable over the life-

60. *Id.* at 3.

61. *Id.* at 3.

62. The accident occurred on March 28, 1979 due to a loss of cooling water at the reactor. Operators attempted to restart the reactor cooling pump for sixteen hours but were unable to fully diagnose the problem before radiation was released.

63. J. CAMPBELL, COLLAPSE OF AN INDUSTRY: NUCLEAR POWER AND THE CONTRADICTIONS OF U.S. POLICY (1988) at 5.

64. Rockett, *supra* note 50, at 7.

65. HISTORICAL PERSPECTIVES, *supra* note 54, at ix.

66. *See* Tomain *supra* note 42, at 198.

67. U.S. NUCLEAR REGULATORY COMMISSION, IDENTIFICATION OF UNRESOLVED SAFETY ISSUES RELATING TO NUCLEAR POWER PLANTS, 1 (1979) PB 291-507.

time of the plants affected."[68] The Commission also stated that such matters are those for which resolution is necessary in order to "(1) compensate for a possible major reduction in the degree of protection of the public health and safety or (2) provide a potentially significant decrease in the risk to public health and safety."[69] That same year, the NRC shut down five reactors upon discovering that key components in these plants could be inadequate in the event of local earthquakes.[70] As late as 1979, with the industry already past its peak and public confidence declining, the NRC acknowledged that safety measures at operating nuclear facilities were inadequate.

B. Uncontrolled Growth of Nuclear Technology

The nuclear power industry has expanded in an imbalanced and uncontrolled manner during its thirty year history. No policy exists to control or monitor the growth of the nuclear industry on a national level.[71] Instead, U.S. nuclear policy is primarily promotional. This philosophy begins at the licensing stage. The NRC is required to grant licensing approval before plant construction begins. However, the Commission routinely grants construction permits while safety issues remained unsolved. This was the case regarding Shoreham, which is located in Brookhaven, New York about fifty miles from New York City.[72] The practice of granting permits despite unsolved safety issues is problematic because it delays consideration of safety questions until the plant is

68. *Id.* at 10.

69. *Id.*

70. HISTORICAL PERSPECTIVES, *supra* note 54 at ix.

71. The government encouraged private industry to enter the nuclear field by offering research assistance. The AEC launched a power demonstration program in 1955 to demonstrate the commercial viability of nuclear power. Under the program, the AEC allocated government laboratories for nuclear research, financed manufacturing of reactor cores and supplied nuclear fuel free of charge. In another attempt to encourage private industry, the government began operations at a model commercial nuclear power plant at Shippingport, Pennsylvania. *See* H. GREEN & A. ROSENTHAL, GOVERNMENT OF THE ATOM: THE INTEGRATION OF POWERS, 15, 42 (1963).

72. During the construction permit hearings of Shoreham, intervenors raised the difficulty of evacuating the Long Island area in the event of an accident. The Licensing Board ruled in 1973 that a "detailed emergency plan need not be prepared or considered until the plant was complete and ready to operate." This decision foreclosed consideration of whether any effective emergency plan could be developed until the Long Island Lighting Company applied for an operating license. After years of controversy, Shoreham remains non-operational and it is doubtful that it will ever operate.

built, at which time the drive to license it overrides most other concerns.

The absence of regulatory guidelines for plant expansion permits the NRC to license construction of nuclear power plants without taking into account important external factors that affect the entire industry, such as the number of other plants and their locations.[73] The criteria for siting of nuclear power plants, which were officially adopted in 1962,[74] require the operator to meet guidelines concerning the population density in the surrounding area[75] and seismic and geologic criteria.[76] But even where unfavorable characteristics of a proposed site exist, the NRC may still

73. In Calvert Cliffs' Coordinating Comm. v. United States Atomic Energy Comm'n, 449 F.2d 1109, 1128 (1971) the U.S. Court of Appeals for the District of Columbia determined that the AEC must conduct a detailed environmental analysis and environmental impact statement before issuing construction licenses. The Court held that the National Environmental Policy Act of 1969 (NEPA) "requires that an agency must — to the *fullest* extent possible under its other statutory obligation — consider alternatives to its actions which would reduce environmental damage." This duty is "subject to a much more strict standard of compliance." The *Calvert* Court invalidated AEC rules precluding environmental review between the construction permit stage and the operating license hearings. The court noted that "where environmental costs were not considered in granting a construction permit, it is very likely that the planned facility will include some features which do significant damage to the environment and which could not have survived a rigorous balancing of costs and benefits." In this way, the Commission would "effectively foreclose the environmental protection desired by Congress. . . . If 'irreversible and irretrievable commitment[s] of resources' have already been made, the licensing hearing . . . may become a hollow exercise. . . . This hardly amounts to consideration of environmental values 'to the fullest extent possible.' "

74. Reactor Site Criteria, 10 C.F.R. § 100 (1988).

75. Siting of Nuclear Facilities ORNL/NUREG-NSIC-118 (1976) p. 2. Nuclear plants must meet three conditions of distance: exclusion area, low population zone and population center distance. 10 C.F.R. § 100.3 (a) defines exclusion area as that area surrounding the reactor, in which the reactor licensee has the authority to determine all activities including exclusion or removal of personnel and property from the area. Residence in the exclusion area is normally prohibited. The area may, however, be traversed by a highway, railroad or waterway. Section 100.3 (b) defines low population zone to be the area immediately surrounding the exclusion area which contains residents, the total number and density of which are such that there is a reasonable probability that appropriate protective measures could be taken in their behalf in event of a serious accident. The code does not specify numbers, indicating that this would vary based upon many factors influencing evacuation measures. Section 100.11 (2) requires that the low population zone be of such size that an individual located at any point in its outer boundary who is exposed to the radioactive cloud would not receive a total radiation dose to the whole body in excess of 25 rem. Section 100.3 (c) defines population center distance as the distance from the reactor to the nearest boundary of a densely populated center containing more than 25,000 residents. Section 100.11 (3) requires a population center distance of at least one and one-third times the distance from the reactor to the outer boundary of the low population zone.

76. *See* 10 C.F.R. § 100 (Appendix A) (1988). NRC siting criteria require that the population density out to thirty miles not average more than 500 persons per square mile at the

permit the construction of a nuclear facility "if the reactor design includes compensating engineered safety features. . . ."[77] The Commission considers each nuclear plant proposal within an individual and narrow framework without considering factors external to the particular plant.[78] If a proposal meets safety and site guidelines on the merits, it cannot be denied a permit because of the number of other plants, its proximity to them, or the utility's need for additional generating capacity.[79]

Under this permissive licensing process the nuclear industry developed rapidly in this country.[80] The government did not begin to promote private development of nuclear power until the 1950's. Only six nuclear reactors were ordered in this decade, one of which was ordered by the government as a demonstration program at Shippingport, Pennsylvania.[81] From 1960 to 1975, with government nuclear policy firmly established and Price-Anderson in place, private utilities constantly increased their orders for nuclear reactors.[82] After a fifteen year growth spurt, the nuclear industry faced critical problems, and a self-imposed moratorium on nuclear reactor orders followed. Pending construction permits continued to decrease after 1974, with none pending since 1983.[83] And those that had been ordered or built faced serious obstacles.[84] With an emphasis on promotion of nuclear technology, the industry expanded so rapidly that there was no time to alter development patterns in accordance with shifting energy and cost trends. As a result, the industry overexpanded and large number of utilities faced critical problems.

Today, despite the promotional policy of Price-Anderson and the 1988 Amendment, the industry is no longer building new nu-

time of initial plant operation and not more than 1000 persons per square mile in the plant's projected operating lifetime.

77. *Supra* note 75 at 3.

78. 10 C.F.R. § 100.10 (1988). "Factors considered in the evaluation of sites include those relating both to the proposed reactor design and the characteristics peculiar to the site."

79. *Id.*

80. Dr. James Schlesinger, former Chairman of the AEC, has likened the evolution of nuclear power technology since 1954 to compressing the entire history of commercial aviation from Kitty Hawk to the Boeing 747 into less than twenty years. *See* Green, *supra* note 1 at 508 (1984).

81. COMMERCIAL NUCLEAR POWER, supra note 28 at 87.

82. *Id.* at 87-92.

83. NUCLEAR POWER CONSTRUCTION ACTIVITY 1987, *supra* note 39 at 5.

84. *See* Cook, *supra* note 31.

clear plants. The 1988 Amendment failed to address the critical problems facing the industry and to formulate new promotional strategies to assist the failing industry. If Price-Anderson had remained a temporary measure, market forces and insurance rates would have imposed a moratorium on the industry long before it was permitted to deteriorate to its present state.

C. *Disproportionate Development of the Industry*

The rapid expansion of the nuclear industry has exposed certain regions of the country to an increased degree of nuclear risk. Because policy makers ignored the location of existing facilities and failed to control the development of the industry in a balanced manner, large clusters of nuclear facilities now exist in certain regions of the country while other areas have few or no nuclear plants.

Nuclear power is highly concentrated along the East coast. A second major cluster of plants exists in the East North Central area, which includes Illinois, Indiana, Michigan, Ohio and Wisconsin.[85] The five states with the highest percent of their electric power supply produced by nuclear power are all located along the East coast: South Carolina (66%), Maine (55.7%), Connecticut (55%), New Jersey (54.7%) and Virginia (51%).[86] Regionally, New England ranks first in dependency on nuclear power (30.5%), followed by the Middle Atlantic states (25.5%) and South Atlantic states (23.9%).[87]

Although nuclear power plants exist in all regions of the country, there is a dramatic imbalance in their placement. Sixty nuclear units are in operation in eastern states. Another operable twenty-four units exist in the East North Central states.[88] The other regions of the country have a much smaller nuclear plant population. The Northern Pacific states (Washington, Oregon and Idaho) have three nuclear plants; Southern Pacific states (California, Nevada and Arizona) have eight units; the South Western states (Texas, New Mexico, Oklahoma, Arkansas and Louisiana) have four units; and the Mountain and West North Central states (Colorado, Utah, Wyoming, Montana, North Dakota, South Dakota, Nebraska, Kansas, Iowa and Missouri) have a total of six

85. NUCLEAR POWER PLANT CONSTRUCTION ACTIVITY 1987, *supra* note 39.
86. *Id.*
87. *Id.*
88. NUCLEAR POWER PLANT CONSTRUCTION ACTIVITY 1987, *supra* note 39 at 16.

units between the two regions.[89] Sixteen states have no nuclear facilities at all: Delaware, Idaho, Indiana, Kentucky, Montana, Nevada, New Hampshire, New Mexico, North Dakota, Oklahoma, Rhode Island, South Dakota, Texas, Utah, West Virginia and Wyoming.[90]

The plants along the East coast and in the East North Central states are generally centered near highly populated metropolitan areas. Thirty percent of our entire nuclear power capacity is centered in four primary locations: eleven plants operate in Illinois near the city of Chicago; nine plants operate in the New York-New Jersey metropolitan area; and a cluster of eight plants center on the border of North and South Carolina and six of the seven operating plants in Pennsylvania are located near Philadelphia.[91] More than seven million people live within a fifty-mile radius of the Zion plant outside Chicago, and more than seventeen million live within range of New York's Indian Point plant.[92] The location of nuclear facilities is particularly alarming because Price-Anderson imposes an aggregate liability limit on the industry without taking into account the amount of damage produced or injuries caused. If an accident occurred near a metropolitan area, victims would receive less compensation than if the same accident had occurred in a remote region of the country.

Price-Anderson facilitated this warped development of the nuclear industry. Because the Act limits utilities' public liability in the event of a nuclear accident, Price-Anderson encourages the industry to build plants in convenient areas — near heavily populated cities where energy demand is large — rather than in remote regions.[93] The Act provides an incentive for the nuclear industry to expose large sectors of the population to the increased risk of a multiplicity of nuclear plants. The 1988 Amendment failed to correct this unbalanced plant siting policy. Absent from current nuclear policy is a mechanism that forces utilities to internalize and therefore minimize the costs of increased risk. Price-Ander-

89. *Id.*

90. NUCLEAR POWER PLANT CONSTRUCTION ACTIVITY 1987, *supra* note 39 at 18.

91. *Id.* at 16.

92. NUCLEAR REGULATORY COMMISSION, DEMOGRAPHIC STATISTICS PERTAINING TO NUCLEAR POWER REACTOR SITES, NUREG-0348 (1979).

93. For a detailed discussion of novel siting concepts, such as offshore siting and underground containment of power reactors, *see* Fontana, Nucl Safety 2(3): 31-34 Underground Containment of Power Reactors (1961) and Anderson, Nucl Safety 12(1): 9-14 (1971) Offshore Siting of Nuclear Energy Stations (1971).

son does precisely the opposite; it permits utilities to externalize the social costs of nuclear power and maximize its risks.[94]

New technologies which are still in developmental stages or which present a high degree of risk should be developed in a controlled environment and implemented in stages, rather than expanded in such an unchecked manner.[95] One virtue of the traditional liability and insurance mechanisms is that it promotes a relatively slow, step-by-step advance in technology. Price-Anderson removed the nuclear industry from this check and promoted unsound policy. In the end, the industry's interest in profit maximization and the government's interest in expanding the development of nuclear technology precluded a cautious approach.

A more responsible nuclear-development policy was suggested by Senator Gore and Representative Holifield in the 1950's. They would have implemented nuclear technology on a small-scale basis in isolated regions of the country before it was widely implemented in major population centers.[96] The Gore-Holifield bill authorized and directed the AEC to construct six nuclear power facilities in various parts of the country at a cost of $400,000,000.[97] Alternatively, nuclear power might have been implemented initially with the aid of Price-Anderson in the 1950's and 60's. After a decade or so of promotion, the government could have removed the limited liability feature of the Act without disturbing the alternative compensation mechanism, thereby allowing the industry to adjust to normal development under market forces.

Premature and uncontrolled expansion is one of the primary reasons nuclear power faces an uncertain future in this country.[98] If development had proceeded more cautiously and responsibly — with fewer plants built and in isolated regions — the industry would have adjusted to market forces more easily and could have demonstrated safety and responsibility to the public, making nu-

94. For a detailed discussion of internalization of costs and risks, *see* Rockett, *supra* note 50 at 80.

95. For example, before drugs are made available to the public, the FDA distributes them in small controlled studies.

96. *See* Green, *supra* note 1 at 507.

97. The AEC opposed the bill as "fundamentally incompatible" with its theories on development of nuclear power, and the bill was eventually rejected. H. GREEN & A. ROSENTHAL, GOVERNMENT OF THE ATOM 256 (1963).

98. Cook, *supra* note 30.

clear a more favored energy option in this country. Instead, the government made the decision to promote the technology on a wide scale basis through private industry under the Price-Anderson Act, believing that it would provide low-cost energy, that electricity demand would continue growing at the same rate as in the past, and that the public favored the nuclear option. Legislators deliberately decided to remove the nuclear industry from the forces of the insurance market, knowing that the normal function of the market would have been to implement nuclear technology in a more controlled manner. Since the decision to promote nuclear power was made, changes in these critical circumstances have never been fed back into the system.

VI. CONCLUSION

Price-Anderson benefitted the nuclear power industry in the short term because it provided the industry with the opportunity to develop nuclear technology without the risk of unlimited liability. When enacted, Price-Anderson was intended to be a temporary measure. As such, it might have succeeded in giving the industry the initial boost it needed, without providing an indefinite crutch and compromising the long-term interests of the industry. Instead, however, Price-Anderson remained a permanent feature of nuclear policy in this country, and the long-term effects proved harmful for both the public and the nuclear industry.

When Price-Anderson was enacted, legislators claimed its purposes to be twofold: promotion of the nuclear industry and protection of the public.[99] Some commentators concluded that Price-Anderson achieved the former goal at the expense of the latter.[100] In the early years following the passage of Price-Anderson this conclusion was warranted. Although critics of Price-Anderson were immediately able to detect the diminished protection the Act imposed upon the public, the Act's implications for the nuclear industry were less clear.[101] It is now clear that Price-Anderson has not served the long-term interests of either the industry or the public. The legislation reduced the incentive for safe operation and increased the incentive to build progressively larger plants near major urban areas. This, together with the

99. Reitze & Rowe, *supra* note 19, at 10186.

100. Reitze & Rowe, *supra* note 19. *See also* Note, STAN. L. REV., *supra* note 21.

101. Berkovitz, *Price-Anderson Act: Model Compensation Legislation?—The Sixty-Three Million Dollar Question*, 13 HARV. ENVTL. L. REV. 1 (1989).

overly optimistic forecasts about the use and public acceptance of nuclear power, encouraged the industry to overexpand in an uncontrolled manner. The 1988 Amendment continues to promote this philosophy and does nothing to put the U.S. nuclear program back on track. The Amendment maintains the harmful aspects of former versions of the Act and contributes to the further deterioration of the nuclear industry. Given the industry's present self-imposed moratorium, it is doubtful that the Amendment has any utility at all. A new, comprehensive initiative is needed to aid the failing nuclear industry and to protect the public from the risks of nuclear power.

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