Malevolent Acts and Nuclear Power: Additional Protection Under NEPA and the Energy Reorganization Act of 1974

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In November 1972, three hijackers commandeered an airliner, forced the pilot to circle the extensive atomic facilities at Oak Ridge, Tennessee, and threatened to crash the airplane into the nuclear plant if their demands were not satisfied.[1] Although the Atomic Energy Commission [AEC][2] maintained that a successful attack could not have caused an atomic explosion and might have released only a small amount of radiation, the plant was ordered to suspend operations.[3] On another occasion, a teenager threatened the city of Orlando, Florida with nuclear destruction unless he was paid $1 million and bolstered his threat with a detailed drawing of a nuclear weapon. The city had resolved to pay the extortionist, until the AEC determined that the boy could not have had any nuclear material in his possession.[4] Across the Atlantic, Libya's leader, Muammar el-Qaddafi, has made a standing offer of millions of dollars to anyone who will provide him with nuclear weapons.[5] Incidents similar to these are likely to recur. According to a recent study commissioned by the AEC,[6] the possibility of malev-

1. N.Y. Times, Nov. 12, 1972, at 1, col. 8. The nuclear facilities at Oak Ridge date from the World War II atomic bomb project. The facilities include a plant for enriching uranium used in the nuclear fuel cycle.

2. The Atomic Energy Commission [AEC] was established by the Atomic Energy Act of 1954. 42 U.S.C. §§ 2011-296 (1970). The AEC was abolished on February 8, 1975, and its functions divided between two new agencies under the Energy Reorganization Act of 1974. Pub. L. No. 93-438 (Oct. 11, 1974) (codified at 42 U.S.C.A. §§ 5801-91 (Supp. Feb. 1975). See text accompanying notes 69-74 *infra*.

3. N.Y. Times, Nov. 12, 1972, at 73, col. 2.

4. 120 CONG. REC. 6629 (daily ed. Apr. 30, 1974) (remarks of Senator Ribicoff). *See* Anderson, *Will Nuclear Weapons Fall into the Hands of Terrorists?*, Arizona Daily Star, Sept. 29, 1974 (magazine), at 14.

5. Anderson, *supra* note 4, at 12; N.Y. Times, Nov. 24, 1973, at 3, col. 3.

6. D. ROSENBAUM, J. GOOGIN, R. JEFFERSON, D. KLEITMAN & W. SULLIVAN, SPECIAL SAFEGUARDS STUDY (1974) [hereinafter cited as SAFEGUARDS STUDY]. The study is found in 120 CONG. REC. 6622-26 (daily ed. Apr. 30, 1974).

olent acts such as theft, sabotage, and blackmail involving nuclear material is large and growing, and present regulations are entirely inadequate to meet the threat.[7]

The magnitude of the problem contrasts with the limited consideration which the AEC appears willing to accord to the possibility of such events and their environmental effect when licensing private companies to operate nuclear facilities. The National Environmental Policy Act of 1969 [NEPA][8] has, however, been construed to restrict agency discretion not to consider environmental effects.[9] Additionally, the Energy Reorganization Act of 1974[10] requires at least limited consideration of malevolent acts. Thus, the AEC's previously broad discretion not to consider such events and their potential effect on the environent has been called into question. This, coupled with the dramatic increase in the possibility of subversive activity being directed at nuclear facilities, requires a reexamination of AEC discretion and an investigation of the potential vulnerability of the nuclear power industry.[11] The central issue to be examined in this discussion is whether good faith compliance with NEPA and the Energy Reorganization Act mandate AEC consideration of these potential dangers in licensing nuclear power facilities.[12]

In examining this issue, this Note will first describe the nuclear power industry and the threats to the environment posed by malevolent acts directed at that industry. The AEC's refusal to deal with these threats, the legality of this position, and the effect of the obligations imposed by the Energy Reorganization Act and NEPA on this refusal will be assessed. Finally, alternative safeguards will be discussed, with the recommendation that additional security measures be adopted to meet the range of threats from malevolent acts.

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7. *Id.* at 34. Malevolent acts, as used here, is a narrow category which does not include the extremes of a massive attack by the armed forces of another nation, nor relatively minor acts of vandalism. Possible threats to a nuclear facility include: full-scale armed attack, malevolent acts, and industrial sabotage. See discussion note 85 *infra.*

8. 42 U.S.C. §§ 4321-47 (1970).

9. Calvert Cliffs' Coordinating Comm., Inc. v. AEC, 449 F.2d 1109, 1113 (D.C. Cir. 1971). *See* text accompanying notes 127-35 *infra.*

10. 42 U.S.C.A. §§ 5801-91 (Supp. Feb. 1975).

11. Nuclear facilities include power, enrichment, and fabrication plants.

12. The scope of this Note is limited to consideration of the civilian nuclear fuel cycle, which includes nuclear powerplants owned and operated by private industry for the purpose of generating electricity. Excluded from consideration are military reactors, such as those propelling nuclear submarines, and research and test reactors. Most future reactor growth in the United States is projected to be in the field of electrical power generation and not in military or research activity. *See* ATOMIC ENERGY COMM'N, NUCLEAR REACTORS BUILT, BEING BUILT, OR PLANNED IN THE UNITED STATES AS OF DECEMBER 31, 1973, 2 (TID-8200-R29, Dec. 31, 1973) [hereinafter cited as NUCLEAR REACTORS BUILT]. As of December 1973, 93 civilian power reactors were planned, while only 27 test, military, or research reactors were planned. *Id.* at 5.

IDENTIFYING THE THREAT

The Nuclear Power Industry

Present government policy indicates that nuclear power will become the primary source for future electrical energy requirements in the United States,[13] at least until a more desirable source of power becomes commercially feasible.[14] The evaluation of environmental dangers posed by the increased use of nuclear power necessitates an examination of the industry to determine the degree of risk inherent in the use of this source of power.

Nuclear powerplants are similar in design to conventional fossil-fuel generating stations now in use throughout the United States.[15] Both systems utilize heat to create steam which in turn drives turbines to generate electricity. In a nuclear facility this heat is supplied by a nuclear reaction,[16] rather than by burning coal or oil as in a conventional plant. In all nuclear reactor designs,[17] the core containing the nuclear fuel is sealed within a thick-walled reactor vessel which in turn is enclosed by a large concrete and steel containment building, minimizing

13. ATOMIC ENERGY COMM'N, REPORT TO THE PRESIDENT ON THE NATION'S ENERGY FUTURE at vii (1973); 119 CONG. REC. 12889, 12892-94 (1973) (message by President Nixon to Congress); 117 CONG. REC. 18200, 18201 (1971) (message by President Nixon on supply of energy and clean air).

Nuclear energy is projected to provide approximately 23 percent of the electricity in the United States by the year 1980 and to become the predominant source of electric power by the year 2000. ATOMIC ENERGY COMM'N, THE SAFETY OF NUCLEAR POWER REACTORS (LIGHT WATER-COOLED) AND RELATED FACILITIES I-11 (WASH-1250, Final Draft, July 1973) [hereinafter cited as SAFETY OF NUCLEAR POWER]. *See* Hennessy, *The Nuclear Power Plant Licensing Process*, 15 WM. & MARY L. REV. 487, 488 (1974); Shapar & Malsh, *Proposed Changes in the Nuclear Power Plant-Licensing Process: The Choice of Putting a Finger in the Dike or Building a New Dike*, 15 WM. & MARY L. REV. 539, 540 n.5 (1974).

14. Other energy sources in more abundant supply than nuclear energy and without the considerable safety problems are under development but are not expected to be available before the 21st century. *See* text & notes 160-61 *infra*.

15. SAFETY OF NUCLEAR POWER, *supra* note 13, at I-10, figure I-6. Oil or coal fired plants are usually referred to in the scientific literature as fossil fuel plants.

16. The same nuclear reaction which produces heat energy in a reactor is the source of the explosive energy released in an atomic bomb. A. GOBLE & D. BAKER, ELEMENTS OF MODERN PHYSICS 419 (1962). For a brief description of a nuclear reaction, see S. NOVICK, THE CARELESS ATOM 18-23 (1969); Grendon, *Nuclear Power and the Environment*, 8 FORUM 70, 73 (1972). Dilute concentrations of nuclear fuel produce a slow reaction in contrast to the instantaneous reaction occurring in the explosion of an atomic bomb. A. GOBLE & D. BAKER, *supra*, at 422-25.

The fuel used in nuclear reactors is referred to as special nuclear material by the Atomic Energy Act of 1954. 42 U.S.C. § 2014(aa) (1970). Special nuclear material is material "capable of releasing substantial quantities of energy in the course of nuclear fission or nuclear transformation." *Id.* at § 2071. *See* Green, *Nuclear Power: Risk, Liability, and Indemnity*, 71 MICH. L. REV. 479 n.2 (1973).

17. Of several currently available designs, the light water reactor is the most widely employed by United States utilities. SAFETY OF NUCLEAR POWER, *supra* note 13, at 1. *See* NUCLEAR REACTORS BUILT, *supra* note 12. In this reactor, the heat energy from the nuclear reaction is absorbed by water, thereby producing steam which then drives conventional power generators. SAFETY OF NUCLEAR POWER, *supra* note 13, at I-9. A newer type of reactor, the liquid metal fast breeder reactor, is currently under development for future commercial use.

the chance of any radioactivity escaping.[18] In addition, multiple control systems automatically stop the reaction in the event of a malfunction.[19] These additional safety systems are installed on the assumption that all other protective measures may fail, thus giving further assurance that an accident will not expose the environment to harmful radiation.[20]

Potential for exposure of the environment to nuclear material may occur through events other than reactor accidents. The processing of nuclear material frequently requires that it be transported long distances since enrichment and fabrication plants are normally at locations separate from reactors.[21] Uranium ore, for example, requires extensive processing, including chemical transformation and enrichment, before it may be used as reactor fuel.[22] The enriched nuclear material must then be fabricated into fuel elements at a separate plant.[23] After installation in a reactor, these fuel elements deplete gradually, requiring annual replacement and creating additional potential for nuclear hazards. The used fuel is removed from the reactor and temporarily stored at the reactor site to allow some of the accumulated radiation to diminish.[24] The fuel is then shipped in massive casks to fuel reprocessing plants,[25] where the radioactive portions of the spent fuel are isolated and stored until the radioactivity dissipates to a safe level.[26]

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18. J. GREY, NUCLEAR POWER SAFETY 5-7 (Atomic Industrial Forum 1974); SAFETY OF NUCLEAR POWER, *supra* note 13, at 3.

19. SAFETY OF NUCLEAR POWER, *supra* note 13, at 3. The difference between conventional plants and nuclear powerplants is that: "The problem in an ordinary power plant is to keep the fire going; in an atomic power plant the problem is to keep it from getting out of hand." S. NOVICK, *supra* note 16, at 25.

20. SAFETY OF NUCLEAR POWER, *supra* note 13, at 2-5. *See* Florida Power & Light Co., 2 CCH ATOM. EN. L. REP. ¶ 11,259.03 (Atomic Energy Comm'n memorandum decision, Aug. 4, 1967); ATOMIC ENERGY COMMISSION, THE BROOKHAVEN REPORT (WASH-740): CONTENTS & SIGNIFICANCE 5 (TR 7480, May 1973); Green, *Safety Determinations in Nuclear Power Licensing: A Critical View*, 43 NOTRE DAME LAW. 633, 634 (1968); Grendon, *supra* note 16, at 85.

This design philosophy is "defense in depth." It involves anticipation of three circumstances: (1) design the plant for maximum safety in normal operation; (2) assume that accidents will occur and provide safety systems to prevent harmful consequences; and, (3) assume an accident will occur with a simultaneous failure of the safety systems and provide additional protections to prevent harm from these failures. SAFETY OF NUCLEAR POWER, *supra* note 13, at 2-2 to -5.

21. Nuclear shipments are normally transported by a commercial carrier. SAFETY OF NUCLEAR POWER, *supra* note 13, at 8-31.

22. *Id.* at 3.

23. *Id.*

24. *See id.* at 3, 1-35; Grendon, *supra* note 16, at 81. A typical reactor may contain over 100 tons of fuel. S. NOVICK, *supra* note 16, at 25; *see* SAFETY OF NUCLEAR POWER, *supra* note 13, at 1-7, 1-20. The used fuel is stored at the reactor site for about 5 months. *Id.* at 1-36.

25. SAFETY OF NUCLEAR POWER, *supra* note 13, at 1-39; Doub, *Nuclear Power: A Cool Approach*, 10 TRIAL, Jan./Feb. 1974, at 18, 24; Grendon, *supra* note 16, at 81. For a description of the special shipping casks used, see SAFETY OF NUCLEAR POWER, *supra* note 13, at 4-62 to -66.

26. SAFETY OF NUCLEAR POWER, *supra* note 13, at 4-73. For several hundred years, this waste will contain lethal doses of radiation. The radiation level remains sufficiently high to warrant isolation for thousands of years. *Id.* Additionally, long-lived

Some of the spent fuel is reusable and is separated and sent to fuel fabrication or enrichment plants for incorporation into new fuel elements.[27]

In addition to yielding spent fuel, reactors also produce plutonium, itself a fuel for certain reactors.[28] Plutonium separated from spent fuel at reprocessing plants also is transported to fuel fabrication plants for recycling as reactor fuel.[29] Since plutonium is one of the most toxic materials known,[30] the safety hazards attendant upon its transportation are particularly significant. Moreover, much more plutonium is presently being produced in the nuclear fuel cycle than can be consumed.[31] Consequently, large amounts of plutonium are now being stockpiled at reprocessing plants.[32]

The Threat

The present stockpiling of radioactive material within the nuclear industry and the future proliferation of plants and transportation systems create a potential for environmental and public harm through acts of sabotage, theft, or blackmail. The following discussion of such malevolent acts is not intended as an exposition of the necessary consequences of an expanding nuclear power industry. Rather, it is presented as an assessment of the potential dangers that could result if such acts were directed at the industry.

In order to harm the general public or create general hysteria, a radical or subversive group might attempt to sabotage a nuclear facility

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radionuclides would present a hazard if they were to enter the human food chain. The period of time required for the radioactivity to decay to safe levels is so great that storage of these wastes must be considered virtually permanent. *Id.* at 4-76.

27. *See id.* at 3.

28. Willrich, *The Treaty on Non-Proliferation of Nuclear Weapons: Nuclear Technology Confronts World Politics*, 77 YALE L.J. 1447, 1453 (1968).

29. *See* SAFETY OF NUCLEAR POWER, *supra* note 13, at 1-45.

30. *Id.* at 4-94. *See* Ford & Kendall, *What Price Nuclear Power?*, 10 TRIAL, Jan./Feb. 1974, at 11, 12; Green, *Public Participation in Nuclear Power Plant Licensing: The Great Delusion*, 15 WM. & MARY L. REV. 503, 505 (1974). An amount of plutonium as small as one ten-millionth of an ounce injected under the skin of a mouse has caused cancer. Plutonium is also dangerous due to its spontaneous ignition when exposed to air. This burning produces intensely radioactive particles of plutonium dioxide which, if inhaled, would expose cancer sensitive cells to intense localized doses of radiation. J. GOFMAN & A. TAMPLIN, POISONED POWER: THE CASE AGAINST NUCLEAR POWER PLANTS 196-99 (1971).

31. *See* Remarks of K. Osborn, *Panel on National Safeguards Systems*, in PREVENTING NUCLEAR THEFT: GUIDELINES FOR INDUSTRY AND GOVERNMENT 98 (R. Leachman & P. Althoff eds. 1972) [hereinafter cited as *Panel on Safeguards*]; 120 CONG. REC. 4179 (daily ed. Mar. 21, 1974) (statement by Theodore B. Taylor). For each pound of uranium 235 fissioned in a light water reactor, about one-fourth pound of plutonium can be recovered from spent fuel during reprocessing. *See* SAFETY OF NUCLEAR POWER, *supra* note 13, at I-44. The total amount of plutonium which will be recovered industry wide by 1980 is expected to reach 15 tons per year. Kinderman, *National Safeguards*, in INTERNATIONAL SAFEGUARDS AND NUCLEAR INDUSTRY 151 (M. Willrich ed. 1973).

32. Discussion by T. Taylor, following *Panel on Safeguards, supra* note 31, at 103.

or some portion of the fuel production system.[33] Nevertheless, in order to successfully sabotage a nuclear powerplant, for example, these groups would have to penetrate external security systems and gain access to the interior of the plant.[34] Damage extending beyond the plant could be caused only by taking further action to systematically disable the built-in accident prevention systems,[35] thereby causing an overheated reactor core. The hot core then might melt through the containment barriers and release a large amount of radioactivity.[36] Defeating all of these systems, however, would be very difficult, even for a person skilled in the operation of a nuclear powerplant.[37] As a result, an AEC study has minimized this threat; this study, however, considered only the threat posed by an individual saboteur and did not evaluate the possible consequences of group action.[38]

A saboteur also might try to damage a plant by using explosives against the exterior of the facility. To destroy the containment struc-

33. *See* C. MCCULLOUGH, S. TURNER & R. LYERLY, AN APPRAISAL OF THE POTENTIAL HAZARD OF INDUSTRIAL SABOTAGE IN NUCLEAR POWER PLANTS 8 (AEC No. SNE-51, 1968) [hereinafter cited as SABOTAGE APPRAISAL]. The proclivity of such groups to threaten the safety of members of the public has been demonstrated through airplane hijackings, *see* Andrews, *Screening Travelers at the Airport to Prevent Hijacking: A New Challenge for the Unconstitutional Conditions Doctrine*, 16 Ariz. L. Rev. 657, 743 (1974), political kidnappings, and bombings. Some terrorist organizations have recently developed sophisticated methods to achieve their illicit goals with near impunity. *See* SAFEGUARDS STUDY, *supra* note 6, at 1-3.

Although nuclear material is less protected during shipment than while located at a plant, used fuel would tend to present a less desirable target for a potential saboteur since it is highly radioactive and encased in massive protective casks. *See* SAFETY OF NUCLEAR POWER, *supra* note 13, at 4-62 to -66; Doub, *supra* note 25, at 24.

34. SABOTAGE APPRAISAL, *supra* note 33, at 8, 30.

35. *Id.* at 12.

36. This malfunction is known as a loss-of-coolant accident:

> If the flow of coolant were suddenly interrupted, the core's temperature would instantly rise. While the control rods could halt the chain reaction and thus slow the rise in temperature, the radioactive byproducts would continue to generate sufficient heat to melt the fuel and its metal enclosure. Then, within one minute the reactor core would begin to melt; in the next ten to sixty minutes the core would become a molten heap at the bottom of the reactor pressure vessel. Credible sources speculate that within a few hours the molten mass would burn its way through the concrete containment structure and sink into the earth.

Jacks, *The Public and the Peaceful Atom: Participation in AEC Regulatory Proceedings*, 52 TEXAS L. REV. 466, 468 (1974).

37. The saboteur would need a carefully developed plan, requiring a high level of knowledge and technical ability, and would have to disable many components simultaneously in order to cause an overheated reactor. SABOTAGE APPRAISAL, *supra* note 33, at 13. *See also* Discussion of Bray's paper, following Bray, *Basic Information About Reactors*, in NUCLEAR POWER AND THE PUBLIC 28 (H. Foreman ed. 1970); Doub, *supra* note 25, at 20.

> The probability of a saboteur having the required unique prerequisites—(1) motivation sufficiently strong to deliberately endanger the public, (2) the knowledge and technical skill to accomplish catastrophic damage, and (3) the opportunity and necessary logistics support—is believed to be so low that sabotage of a magnitude capable of endangering the public is virtually incredible.

SABOTAGE APPRAISAL, *supra* note 33, at 17. *But see* Nader, *Nuclear Power on Trial*, 10 TRIAL, Jan./Feb. 1974, at 19, 21 (alleging "grossly inadequate safeguards" against sabotage at nuclear facilities).

38. SABOTAGE APPRAISAL, *supra* note 33, at 1.

ture of a reactor, however, a bomb would have to penetrate massive steel and concrete walls. Even then, other safety measures, such as inner containment shields and water deluge systems, would tend to minimize the escape of harmful radioactivity.[39] Thus, the chance of saboteurs successfully causing injury to the public by attacking a nuclear powerplant is not highly probable, although this possibility necessarily increases with the rise in activity and sophistication of subversive groups in recent years.[40]

Despite the improbability of nuclear sabotage, its success could have catastrophic consequences—consequences similar to those of the worst conceivable nuclear powerplant accident.[41] Nuclear plants, however, do not present a threat of nuclear explosion.[42] Rather, the greatest danger posed by sabotage of a reactor is the large amount of radioactivity which would be released.[43] An event of this sort would result in tremendous harm to the environment and general public. One recent study concluded that the released radiation might cause 2,300 deaths, 4,600 injuries, and up to $6 billion in property damage.[44]

Theft by malevolent groups poses another potential threat.[45] The theft of nuclear materials might be attempted by groups other than subversive or radical organizations. For example, another nation, lacking nuclear weapons and prevented from legitimately acquiring them by

39. Florida Power & Light Co., 2 CCH ATOM. EN. L. REP. ¶ 11,259.03 (Atomic Energy Comm'n memorandum decision, Aug. 4, 1967). *See* Consolidated Edison Co., 2 CCH ATOM. EN. L. REP. ¶¶ 11,256.03, 11,256.11 (Atomic Safety & Licensing App. Bd., Apr. 25, 1974); SABOTAGE APPRAISAL, *supra* note 33, at 8, 14; Doub, *supra* note 25, at 20. If the nuclear facilities were located some distance from a populated area, the danger posed by released radioactivity would be reduced through dispersion of the radiation into the environment. *See* 10 C.F.R. § 50, app. A (1974). *See also* Green, *supra* note 20, at 634.

40. *See* SAFEGUARDS STUDY, *supra* note 6, at 1-5.

41. *See* SABOTAGE APPRAISAL, *supra* note 33, at 14.

42. J. GREY, *supra* note 18, at 4; *see* Hall, *The Adaptability of Fissile Materials to Nuclear Explosives*, in PREVENTING NUCLEAR THEFT: GUIDELINES FOR INDUSTRY AND GOVERNMENT 281 (R. Leachman & P. Althoff eds. 1972).

43. "The unique characteristic of nuclear power that imposes an overriding requirement for safety precautions is the generation of large amounts of intensely radioactive materials in the nuclear fuel." SAFETY OF NUCLEAR POWER, *supra* note 13, at 3. *See* S. NOVICK, *supra* note 16, at 5; Davis, *Taming the Technological Tyger—The Regulation of the Environmental Effects of Nuclear Power Plants—A Survey of Some Controversial Issues—Part One*, 1 FORDHAM URBAN L.J. 19, 22 (1972); Green, *supra* note 30, at 503; Murphy, *Atomic Safety and Licensing Boards: An Experiment in Administrative Decision Making on Safety Questions*, 33 LAW & CONTEMP. PROB. 566, 571 (1968).

44. ATOMIC ENERGY COMM'N, REACTOR SAFETY STUDY, AN ASSESSMENT OF ACCIDENT RISKS IN U.S. COMMERCIAL NUCLEAR POWER PLANTS 19-24 (WASH-1400, Draft Summary Report, Aug. 1974) [hereinafter cited as REACTOR RISKS]. Recently, there have been allegations that the AEC has suppressed some safety studies which showed greater hazards than have been publicly acknowledged. N.Y. Times, Nov. 10, 1974, at 1, col. 1. One study allegedly found that a major reactor accident could cause damage equivalent to a "good-sized weapon," killing up to 45,000 people. *Id.*

45. Ford & Kendall, *supra* note 30, at 12; Hall, *supra* note 42, at 276; Lovett, *Who Are the Enemy?*, in PREVENTING NUCLEAR THEFT: GUIDELINES FOR INDUSTRY AND GOVERNMENT 209-14 (R. Leachman & P. Althoff eds. 1972).

the Treaty on the Non-Proliferation of Nuclear Weapons,[46] might desire the political power commensurate with nuclear capability.[47] That nation could direct its own agents to divert nuclear material or might be willing to pay a high price on the black market for nuclear material acquired by organized crime or other groups.[48] Again, a successful theft would require defeating security measures[49] used to protect nuclear material.

While security measures at nuclear facilities may make theft difficult, shipments of nuclear fuel are more vulnerable to attack and diversion.[50] A recent study[51] has warned that the danger of diversion is "large and growing . . . due to the increasing professional skills, intelligence networks, finances, and level of armaments of terrorist groups throughout the world."[52] Thus, although the threat from diversion may be slight, it is greater than the threat from sabotage and cannot be discounted, particularly as transportation networks expand.

Stolen material may be dangerously utilized in numerous ways. A subversive group might attempt to construct an atomic bomb from stolen nuclear material.[53] Some scientists have concluded that a small

46. July 1, 1968, [1970] 1 U.S.T. 483, T.I.A.S. No. 6839. The treaty is intended to prevent the spread of nuclear weapons to nonnuclear nations while at the same time promoting the peaceful uses of nuclear energy. Willrich, *supra* note 28, at 1450. Parties to the treaty who do not have nuclear weapons have pledged not to develop or obtain them. The International Atomic Energy Agency inspects peaceful nuclear activities to ensure that materials are not diverted to the manufacture of weapons. Smyth, *The Need for International Safeguards*, in INTERNATIONAL SAFEGUARDS AND NUCLEAR INDUSTRY 6 (M. Willrich ed. 1973).

47. Hall, *supra* note 42, at 276; *see* text accompanying note 5 *supra*.

48. Hall, *supra* note 42, at 276; Hosmer, *Keynote Remarks*, in PREVENTING NUCLEAR THEFT: GUIDELINES FOR INDUSTRY AND GOVERNMENT 12-13 (R. Leachman & P. Althoff eds. 1972); Lovett, *supra* note 45, at 215; Taylor, *Diversion by Non-Governmental Organizations*, in INTERNATIONAL SAFEGUARDS AND NUCLEAR INDUSTRY 191-92 (M. Willrich ed. 1973) [hereinafter cited as Taylor, *Diversion*]. The suggestion has even been made that "dedicated disarmers" might divert nuclear material, construct weapons with it, and then threaten to detonate those weapons if nuclear-equipped countries refused to disarm. Discussion by J. Stumpf, following Hosmer, *Keynote Remarks*, in PREVENTING NUCLEAR THEFT: GUIDELINES FOR INDUSTRY AND GOVERNMENT 14 (R. Leachman & P. Althoff eds. 1972).

49. See discussion note 85 *infra*.

50. SAFETY OF NUCLEAR POWER, *supra* note 13, at 8-31; Kinderman, *supra* note 31, at 153. The commercial transportation network used for shipping nuclear material is "notoriously insecure." Ford & Kendall, *supra* note 45, at 12.

51. SAFEGUARDS STUDY, *supra* note 6, at 34.

52. *Id.* This warning should be qualified, however, since a large portion of the special nuclear material presently within the industry is insufficiently enriched to be desirable to a nuclear thief. SAFETY OF NUCLEAR POWER, *supra* note 13, at 8-28; Willrich, *supra* note 46, at 1453 n.17. The amount of highly enriched fuel will greatly increase, however, when breeder reactors become widely used. SAFETY OF NUCLEAR POWER, *supra* note 13, at 8-29. Moreover, although the process for enriching uranium is extremely expensive and complex, highly enriched plutonium can be separated from the uranium in breeder reactor fuel by a relatively simple procedure which might be within the capability of a subversive group. *See* Remarks of W. Higinbotham, *Panel on Safeguards*, *supra* note 31, at 95.

53. Hall, *supra* note 42, at 276; Tamplin, *Reacting to Reactors*, 10 TRIAL, Jan./Feb. 1974, at 15, 25; 120 CONG. REC. 4178 (daily ed. Mar. 21, 1974) (statement by Theodore B. Taylor). A quantity of 2,000 kilograms of unenriched uranium contains

group of people with engineering and explosives design ability could secretly build a nuclear weapon without the use of elaborate equipment.[54] Some AEC officials, however, have questioned the probable success of such an attempt.[55] Nevertheless, the harm resulting from a clandestinely-made atomic bomb would be catastrophic, greater in magnitude than any conceivable nuclear powerplant accident.[56] Nuclear material need not be incorporated in a bomb to have lethal potential. A small quantity of stolen plutonium, for example, could cause cancer merely by aerosol dispersal in a populated area.[57] Moreover, the possession of stolen nuclear material would give an ill-inclined person a formidable blackmail or extortion weapon. The hysteria which could be evoked by nuclear blackmail would itself be dangerous.

Although the AEC officially maintains that recently strengthened regulations for the physical protection of nuclear material minimize the possibility of the above events occurring,[58] the *Special Safeguards Study of 1974*, commissioned by the AEC but prepared by scientists outside that agency, found that these regulations still do not sufficiently meet the threats which have been outlined.[59] In response to this study, the AEC has required additional protective measures for nuclear power

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enough fissionable material to make an atomic weapon. Thornton, *Setting New Standards for Safeguarding the Peaceful Atom*, in PREVENTING NUCLEAR THEFT: GUIDELINES FOR INDUSTRY AND GOVERNMENT 71 (R. Leachman & P. Althoff eds. 1972).

54. *See* Ford & Kendall, *supra* note 30, at 12; Hall, *supra* note 42, at 277; Tamplin, *supra* note 53, at 25; Taylor, *Diversion, supra* note 48, at 177. Technical information pertaining to the construction of atomic weapons is increasingly available, as are the persons with the skills necessary to build such weapons. Taylor, *The Need for a Systems Approach to Preventing Theft of Special Nuclear Materials*, in PREVENTING NUCLEAR THEFT: GUIDELINES FOR INDUSTRY AND GOVERNMENT 220 (R. Leachman & P. Althoff eds. 1972) [hereinafter cited as Taylor, *Preventing*]. *See* SAFEGUARDS STUDY, *supra* note 6, at 3.

As part of a television documentary, a 20-year-old college chemistry major was asked to attempt the design of a simple atomic bomb. Although he had no previous knowledge of nuclear engineering, in 5 weeks, using unclassified and readily available source material, he designed a bomb which might have been capable of detonation. Panati, *A Do-It-Yourself A-Bomb*, NEWSWEEK, Mar. 10, 1975, at 40.

55. 120 CONG. REC. 4181-83 (daily ed. Mar. 21, 1974) (testimony of L. Guntzing & statement of E. Giller). The AEC itself, however, reportedly conducted a secret study to determine whether two recent graduates with doctorates in physics could design a workable bomb from information available to the public. The physicists were successful. N.Y. Times, July 14, 1973, § 4, at 17, col. 4.

56. SAFEGUARDS STUDY, *supra* note 6, at 4. *See* Leachman & Althoff, *Preface*, in PREVENTING NUCLEAR THEFT: GUIDELINES FOR INDUSTRY AND GOVERNMENT at ix (R. Leachman & P. Althoff eds. 1972); Willrich, *supra* note 28, at 1456 n.27.

57. NRDC NEWSLETTER, Summer/Fall 1974, at 6 (published by Natural Resources Defense Council); Taylor, *Diversion, supra* note 48, at 191. *See* discussion note 30 *supra*.

58. 120 CONG. REC. 4181-83 (daily ed. Mar. 21, 1974) (testimony of L. Muntzing & statement of E. Giller). *See* statement issued by the AEC accompanying the release, on April 26, 1974, of the SAFEGUARDS STUDY, *supra* note 6, contained in 120 CONG. REC. 6626-27 (daily ed. Apr. 30, 1974).

59. SAFEGUARDS STUDY, *supra* note 6, at 34.

facilities,[60] apparently acknowledging the need for further protection.[61] While the likelihood of a nuclear accident may be small, its potential harmful effects are virtually unlimited. A review of existing statutory and regulatory requirements will reveal that these procedures, as currently applied, do not minimize this potential threat.

ADMINISTRATIVE LAW AND AEC DISCRETION

The AEC Regulatory Scheme

Under the Atomic Energy Act of 1954 [AEA],[62] development and utilization of atomic energy is encouraged "to the maximum extent consistent with the common defense and security and with the health and safety of the public."[63] The AEC was created by the AEA to supervise all uses of atomic energy, including the use and possession of special nuclear material.[64] In performing these functions, the AEC may prescribe any regulations it deems necessary to guard against loss or diversion of such material and to govern the design, location, and operation of nuclear facilities.[65] The Act requires the AEC to establish criteria for licensing facilities which produce or utilize nuclear materials,[66] such as reactors and fuel fabrication, enrichment, and reprocessing plants.[67] A license must be denied if, in the AEC's opinion, issuing the license would be "inimical to the common defense and security or would constitute an unreasonable risk to the health and safety of the public."[68]

Congress recently passed the Energy Reorganization Act of 1974,[69] eliminating the conflict of interest in the AEC's duties under the Atomic Energy Act of 1954—to promote and, at the same time, to regulate atomic energy.[70] This legislation transfers the research and development functions of the AEC to the new Energy Research and Development Administration [ERDA].[71] The AEC is abolished by

60. N.Y. Times, May 1, 1974, at 20, col. 3. *See* 39 Fed. Reg. 40036-40 (1974) (proposed amendments to 10 C.F.R. § 73 (1974), for improved physical security protection of nuclear material in transit and at fixed sites, including a new section 73.55 providing measures specifically for nuclear power reactors). *See also* 39 Fed. Reg. 28164, 37765-67, 38392-94 (1974).

61. *See* statement issued by the AEC accompanying the release, on April 26, 1974, of the SAFEGUARDS STUDY, *supra* note 6.

62. 42 U.S.C. §§ 2011-296 (1970).

63. *Id.* § 2013(d).

64. *Id.* §§ 2031, 2201(b).

65. *Id.* § 2201(i).

66. *Id.* § 2133.

67. The AEC regulations implementing these minimum criteria are found in 10 C.F.R. §§ 50, 73 (1974). Licenses are also required for operators of nuclear facilities, *id.* § 55, and for the possession of special nuclear material. *Id.* § 70. Section 70 regulations are undergoing modification to provide for more accurate control and accounting systems. *See* 39 Fed. Reg. 38392, 37765 (1974). These regulations, however, do not apply to commercial nuclear power reactors. 10 C.F.R. § 70.51(e) (1974).

68. 42 U.S.C. § 2077(c)(2) (1970). *See id.* § 2133.

69. 42 U.S.C.A. §§ 5801-91 (Supp. Feb. 1975).

70. *Id.* § 5801(c). *See* S. REP. No. 93-980, 93d Cong., 2d Sess. (1974).

71. 42 U.S.C.A. § 5814(c). Energy research and development functions of the De-

the Act,[72] and its licensing and regulatory functions become the responsibility of the new Nuclear Regulatory Commission [NRC].[73] Under the new law, AEC regulations will be assumed by the NRC.[74] For convenience, however, this Note will continue to refer to the AEC.

The licensing scheme required by AEC regulations for nuclear facilities is basically a two-stage process.[75] Before any construction begins on a facility, the applicant must submit a detailed application for the proposed operation, including an assessment of the projected risk to the public health and safety and an environmental impact statement.[76] After review and a public hearing, a construction permit is issued if, in the AEC's judgment, the application complies with all regulations.[77] When construction on the facility is substantially complete, the applicant must make a second application, this time for an operating license.[78] This application is also reviewed for compliance with AEC regulations, including those pertaining to security.[79] If the application is approved, an operating license is issued,[80] and the licensee may begin operational testing of the reactor.

It is only at the operating license stage that the applicant must submit a physical security plan for the proposed operation.[81] The AEC does not require evaluation of security measures at the design stage,[82] even though attention to such matters at this stage would afford safe-

partment of the Interior, the National Science Foundation, and the Environmental Protection Agency are also transferred to the Energy Research and Development Administration. *Id.* §§ 5814(e)-(g).

72. *Id.* § 5814(a).

73. *Id.* § 5841(f). The Nuclear Regulatory Commission [NRC] also assumes responsibility for the Atomic Safety and Licensing Board and the Atomic Safety and Licensing Appeal Board. *Id.* § 5841(g). An Office of Nuclear Material Safety and Safeguards is established within the NRC to administer safeguards against threats, thefts, and sabotage involving facilities or materials licensed under the *Atomic Energy Act of 1954*. *Id.* §§ 5844(a)-(b).

74. Orders, rules, and regulations previously established continue in effect until they are modified or terminated by one of the new agencies. *Id.* § 5871(b).

75. *See* Davis, *supra* note 43, at 27.

76. 10 C.F.R. §§ 50.10, 50.34 (1974); 39 Fed. Reg. 26279-81 (1974) (new regulations, §§ 51.5(a), 51.20).

77. 10 C.F.R. §§ 50.40, 50.50 (1974).

78. The AEC, "in the absence of good cause shown to the contrary," will issue an operating license upon the completion of construction. *Id.* § 50.56. The AEC must find that there is "reasonable assurance" that the licensed activities will not endanger the health and safety of the public. *Id.* § 50.57(a)(3).

79. *Id.* § 50.34(c).

80. *Id.* § 50.50. Approval may, however, be conditioned on the completion of modifications which are necessary to bring the facility into compliance with technological advances developed after the construction permit was issued. *See id.*

81. An application for a construction permit must include only a preliminary safety analysis report. *Id.* § 50.34(a). Applications for operating licenses must contain a final safety analysis report and a physical security plan. *Id.* §§ 50.34(b)-(c). Additionally, when application for an operating license is made, the environmental impact statement filed with the construction permit application must be amended to reflect any new data which may have affected the initial conclusions in that statement. 39 Fed. Reg. 26279 (1974) (new regulation, § 51.21).

82. *See* 10 C.F.R. § 50.34 (1974).

guard opportunities not available later, making possible a more secure plant.[83] Although the regulations are concerned with industrial sabotage,[84] at neither the construction permit nor operating license stages do the regulations explicitly require that the possible consequences of malevolent acts be considered.[85]

The delayed consideration of security measures creates an additional inadequacy. At the operating license stage of the process, the

83. AMERICAN NATIONAL STANDARD FOR INDUSTRIAL SECURITY FOR NUCLEAR POWER PLANTS 9 (N18.17, Mar. 23, 1973) [hereinafter cited as AMERICAN NATIONAL STANDARD]. For example, grading, ground cover, and landscaping should not introduce barriers to surveillance of access to facilities. Openings into buildings should be kept to a minimum, and the location of any piping or electrical conduit vital to the security and safety features of the facility should be examined. *Id.* at 9-10.

84. Industrial sabotage, as defined in AEC regulations, excludes attacks by an enemy of the United States. 10 C.F.R. § 73.2(p) (1974).

The disparity in the licensing process between the detailed consideration given accidents and their prevention and that given to intentionally caused incidents, such as theft, industrial sabotage, and terrorist acts, has caused some concern within the AEC. *See* SAFEGUARDS STUDY, *supra* note 6, at 10.

85. AEC regulations do require protective measures against industrial sabotage, which is defined to exclude attacks by an enemy of the United States. 10 C.F.R. §§ 50.34(c), 73.1, 73.2(p) (1974). These protections are not implemented on a design basis, but are add-ons, such as fences, locks, and intrusion alarms. *See id.* § 73.1. It has been recognized, however, that the most effective method for preventing destructive acts is to incorporate protections at the design stage of construction. *See* AMERICAN NATIONAL STANDARD, *supra* note 83, at 9.

Although intentional acts are considered by AEC regulations protecting against industrial sabotage, the regulations may not provide adequate defenses against malevolent acts. The add-on type of protection required would not be a significant obstacle for a determined, well-trained, and well-equipped group of saboteurs or thieves, such as those which have operated in recent years. *Cf.* SAFEGUARDS STUDY, *supra* note 6, at 34. AEC regulations also require protection against theft, but again, these measures are add-ons, incorporated well after the design stage of a facility. *See* 10 C.F.R. § 73.1 (1974).

The extent to which the AEC considers theft and industrial sabotage may be better illustrated by examining specific regulations and other provisions addressing the problems. AEC regulations require privately-owned fissionable material to be protected at a fixed site by physical barriers and intrusion detection devices. *Id.* § 73.1(a). The AEC publication, *Protection of Nuclear Power Plants Against Industrial Sabotage* (Regulatory Guide 1.17) (June 1973), addresses these problems. This guide emphasizes the importance of *designing* structures, systems, and components with a view toward protection against sabotage. The guide also recommends the physical security standards contained in AMERICAN NATIONAL STANDARD, *supra* note 83. These standards require the establishment of three concentric security areas around an installation, with increased security for the inner areas. Also required is the screening of all employees to eliminate persons with potentially aberrant behavior or emotional instability. The AEC guide, however, is not mandatory. Rather than making these requirements mandatory, the AEC has relied on the assumption that the nuclear industry would voluntarily employ adequate safeguards. It has become apparent, however, that this assumption has resulted in inferior security systems. *Cf.* Kinderman, *supra* note 31, at 145-47.

AEC regulations also require that nuclear material be accounted for under a stringent inventory system. The inventory system, which is more useful for detecting than preventing diversion, requires that highly enriched nuclear material be located in areas of exclusive use, with entry and exit strictly controlled and subject to search. 10 C.F.R. § 73.60 (1974). Despite careful inventory systems, on several occasions nuclear material far in excess of reasonable inventory error has disappeared, although there has been no firm evidence of diversion. Smyth, *supra* note 46, at 12-13. *See* Willrich, *supra* note 28, at 1518 n.164.

AEC regulations also provide that when nuclear material is in transit it must either be accompanied by armed guards or carried in vehicles with special security features. 10 C.F.R. § 73.13(c) (1974). Transportation of highly enriched material must be further protected by established procedures afforded "valuable material" and must be hand receipted. *Id.* § 73.30(a).

applicant will have made substantial investments in the project, and it would suffer heavy losses if AEC disapproval of the project necessitated its abandonment.[86] This financial factor could derogate from the effectiveness of this final review by disposing the AEC to grant the license at the sacrifice of security considerations. Indeed, licenses are rarely denied after issuance of a construction permit.[87] Thus, AEC regulations do not provide sufficient safeguards to minimize the potential danger in nuclear power.

Environmental Protection Under the Existing AEC Licensing Scheme

Environmental protection is a subject of evergrowing concern in this country.[88] In view of the massive environmental harm which could result from subversive activity directed at nuclear materials or facilities, the current AEC regulatory scheme raises two issues: (1) May the AEC legally refuse to consider the possible effects of such potential hazards? and, (2) Is the AEC's refusal to consider those breaches at the design as well as the construction and licensing stages within its statutory authority?

The first issue was addressed in *Siegel v. AEC*.[89] Following AEC procedures, the Florida Power and Light Company applied for a construction permit to build two reactors at a site approximately 25 miles south of Miami, Florida. Paul Siegel, an attorney and private citizen, intervened in an AEC hearing on the matter and requested that the potential effect of enemy attack or sabotage, particularly by Cuban forces, be considered at the design stage.[90] Siegel alleged that the

86. Even a delay in construction can be very expensive—from $1 to $5 million per month. SAFETY OF NUCLEAR POWER, *supra* note 13, at 5. *See* Young, *Power Plant Siting and the Environment: The Environmentalist Has His Day in Court—AND in the Hearing Room, Too!*, 26 OKLA. L. REV. 193 (1973).

87. *See* Bronstein, *The AEC Decision-Making Process and the Environment: A Case Study of the Calvert Cliffs' Nuclear Power Plant*, 1 ECOLOGY L.Q. 689 (1971).

88. *See, e.g.*, Hanks & Hanks, *An Environmental Bill of Rights: The Citizen Suit and the National Environment Policy Act of 1969*, 24 RUTGERS L. REV. 230 (1970); Lynch, *Complying with NEPA: The Tortuous Path to an Adequate Environmental Impact Statement*, 14 ARIZ. L. REV. 717 (1972); Sagoff, *On Preserving the Natural Environment*, 84 YALE L.J. 205 (1974); Sive, *Some Thoughts of an Environmental Lawyer in the Wilderness of Administrative Law*, 70 COLUM. L. REV. 612 (1970); *Symposium—Air Pollution*, 10 ARIZ. L. REV. 1 (1968); *Symposium—Governmental Consideration of the Environment*, 5 PACIFIC L.J. 17 (1974); *Symposium—Law and the Environment*, 55 CORNELL L. REV. 663 (1970); *Symposium—The Human Environment: Toward an International Solution*, 12 NATURAL RESOURCES J. 131 (1972); Note, *Toward a Constitutionally Protected Environment*, 56 VA. L. REV. 458 (1970).

89. 400 F.2d 778 (D.C. Cir. 1968). The AEC licensing hearings at issue in *Siegel* are reported at Florida Power & Light Co., 2 CCH ATOM. EN. L. REP. ¶ 11,259.03 (Atomic Energy Comm'n memorandum and order, Aug. 4, 1967).

90. The AEC is required to hold a public hearing on each application for a construction permit and is required to allow intervention by any person whose interest may be affected. 42 U.S.C. § 2239(a) (1970).

In recent years persons concerned with the proliferation of nuclear power have significantly delayed the progress of reactor construction by intervening in AEC licensing

proximity of the planned site to Cuba rendered this consideration particularly relevant to Florida Power's application.[91]

The AEC ruled that the statutory standard that it was required to apply—determining whether licensing a facility would be "inimical to the common defense and security or to the health and safety of the public"[92]—did not necessitate consideration of possible enemy action or the effectiveness of agency regulations in minimizing such a threat. The AEC asserted that nothing in the AEA or its legislative history indicated a congressional intent to include within the terms "common defense and security" or "health and safety of the public" the possibility of enemy attack.[93] The agency thus concluded that neither of these standards necessitated "special design features or other measures for the specific purpose of protection against the effects of enemy attacks and destructive acts."[94] In support of its position, the AEC alleged that anticipating the nature of an enemy attack and designing defenses against it would have been impracticable, that there was a settled tradition of allowing such problems to be handled by the military, and that secret classification of information prevented an effective evaluation of how to prevent such occurrences.[95] The AEC stated that many of the other built-in safety features of a nuclear reactor, such as the massive containment structure and the systems for rapid shutdown of the facility in the event of a malfunction, would offer protection in the event of enemy attack, even though these measures were designed to prevent accidents and not to meet malevolent contingencies.[96]

Siegel appealed the AEC decision to the Court of Appeals for the District of Columbia Circuit.[97] The court upheld the AEC ruling and noted that in enacting the AEA, Congress provided a regulatory scheme "virtually unique in the degree to which broad responsibility is reposed in the administering agency . . . ."[98] Congress, the court continued, felt that the AEC needed this flexibility to properly achieve

hearings and appealing agency decisions to the courts. *See generally* Jacks, *supra* note 36, at 478-88; Young, *supra* note 86, at 193.

91. 400 F.2d at 780.

92. *Id.* at 781.

93. Examination of the congressional debates on the Act reveals no legislative interpretation of the public health and safety standard, and writings on the history of the Act do not indicate a concern for a definition of this standard. *See* Cole, *The Power and Prize—The Development of Civilian Nuclear Power in the United States*, 25 GEO. WASH. L. REV. 471 (1957); Miller, *A Law is Passed—The Atomic Energy Act of 1946*, 15 U. CHI. L. REV. 799 (1948); Ruebhausen & von Mehren, *The Atomic Energy Act and the Private Production of Atomic Power*, 66 HARV. L. REV. 1450 (1953).

94. 400 F.2d at 782.

95. *Id.*

96. *Id.* at 782 n.4.

97. Venue for appeal of all AEC decisions is in the District of Columbia Circuit. *See* 42 U.S.C. § 2239(b) (1970); 28 U.S.C.A. § 2343 (Supp. 1975).

98. 400 F.2d at 783.

statutory objectives in an area where sufficient experience had not yet been accumulated to establish strict statutory guidelines. Thus, the court concurred in the Commission's decision that imposing on a licensee the burden of showing that its facility would be adequately protected throughout its life from enemy attack would "stifle utterly the peaceful utilization of atomic energy in the United States."[99] According to the court, the "common defense and security" standard extended only to ensuring that civilian uses of nuclear materials did not preempt military needs, to securing such material against loss or diversion, and to denying nuclear materials to persons whose loyalties are not to the United States. The court felt that the "public health and safety" standard was directed only toward preventing industrial accidents and the dangers they pose to employees and the neighboring public.[100]

In addition to deferring to AEC judgment regarding the scope of the statutory standards under which it regulates, the courts also have deferred to AEC decisions as to when a standard must be applied in the licensing procedure. Underlying this issue are the broad discretionary powers which have been granted to the AEC. In *Power Reactor Development Co. v. International Union of Electrical Workers,*[101] the United States Supreme Court held that the AEC could validly impose a less rigid public health and safety standard at the time of issuing a construction permit than at the time of granting an operating license, so long as full compliance with the statutory mandate was achieved at the operating license stage.[102] The Court justified this re-

99. *Id.* at 783-84.

100. *Id.* at 784. *Siegel* prompted the AEC to add a section to its licensing regulations exempting an applicant for a construction permit or an operating license from providing for "design features or other measures for the specific purpose of protection against the effects of . . . attacks and destructive acts, including sabotage, directed against the facility by an *enemy of the United States,* whether a foreign government or other person . . . ." 10 C.F.R. § 50.13 (1974) (emphasis added). Identical wording in section 115.9 provides the same exemption for the licensing of facilities which need not comply with the section 50 licensing requirements, such as military operations and projects owned by or under contract to the AEC. *See id.* § 50.11.

A question arises as to whether the regulation exempts potential acts by all ill-intentioned parties or just enemies of the United States. Expanding the *Siegel* holding, the AEC has interpreted the regulation to exclude design basis consideration of all malevolent attacks, regardless of the allegiance or motive of the actor. Consolidated Edison Co., 2 CCH ATOM. EN. L. REP. ¶ 11,256.11 (Atomic Safety & Licensing App. Bd., Apr. 25, 1974). The regulation also has been construed to exclude any consideration of enemy attack in determining the suitability of a particular facility. Philadelphia Elec. Co., 3 CCH ATOM. EN. L. REP. ¶ 11,722.01 (Atomic Safety & Licensing Bd., May 9, 1974).

101. 367 U.S. 316 (1961).

102. *Id.* at 404-08. At the operating license stage the AEC had required a finding "that the final design provides reasonable assurance that the health and safety of the public will not be endangered," *id.* at 407, whereas at the construction permit stage there had to be a finding "that [the AEC] has information sufficient to provide reasonable assurance that a facility of the general type proposed can be constructed and operated . . . without undue risk to the health and safety of the public." *Id.* The first finding was of a definitive nature, whereas the second contemplated a decision based on incom-

sult by noting that under the AEA, the AEC is responsible for determining both what constitutes the public health and safety and for implementing appropriate standards.[103]

In *Crowther v. Seaborg*,[104] the district court recognized the broad discretionary powers granted to the AEC[105] and exercised the limited judicial review evidenced in *Power Reactor*. The *Crowther* plaintiffs had requested an injunction restraining, as dangerous to public health and safety, the AEC's release of radioactive gas contained in an underground cavity.[106] Although the *Crowther* court observed that the AEA required consideration of the health and safety of the public, the court held that review of AEC decisions was limited to evaluating whether that action constituted an abuse of discretion.[107] Thus, so long as the AEC action was within the statutory limits of its power to protect public health and safety, its actions did not constitute an abuse of discretion.[108] Elaborating, the *Crowther* court stated that the AEC's possession of "an extraordinary amount of experience and expertise in the area of atomic energy"[109] required greater deference to its judgment than that norm-

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plete information and concerned only the general type of reactor proposed. *Id.* at 407-08.

Imposing a lesser standard at early stages of the process, however, facilitates sacrificing public health and safety. This is due to the pressure at later stages for a tradeoff between public health and safety and the substantial investment in the plant. See text accompanying notes 86-87 *supra.*

103. 367 U.S. at 404, 407-08.

104. 312 F. Supp. 1205 (D. Colo. 1970).

105. *Id.* at 1220, 1234-35. Siegel v. AEC, 449 F.2d 778 (D.C. Cir. 1968), established the broad discretion allotted to the AEC in defining the parameters of the health and safety standard. *Id.* at 783-84. Crowther v. Seaborg, 312 F. Supp. 1205 (D. Col. 1970), on the other hand, addresses the question of AEC discretion in evaluating compliance with such standards. *Id.* at 1220. Similarly, Power Reactor Dev. Co. v. International Union of Electrical Workers, 367 U.S. 396 (1961), recognized the broad grant of discretionary power exercised by the AEC in establishing procedures to ensure compliance with its statutory standards. *Id.* at 932-36.

106. 312 F. Supp. 1205, 1210 (D. Col. 1970). The cavern was created by an AEC-sponsored nuclear explosion in an experiment designed to determine the feasibility of recovering natural gas. The plaintiffs alleged that the agency had not adequately considered whether radioactive substances in the gas could cause harm to the surrounding populace. *Id.* at 1211.

107. *Id.* at 1220. *Compare* 5 U.S.C. § 701(a)(2) (1970), *with id.* § 706(2)(A). Some federal courts will not review action committed to agency discretion, not even for abuse of discretion. Bramblett v. Desobry, 490 F.2d 405 (6th Cir. 1974); Curran v. Laird, 420 F.2d 122, 131 (D.C. Cir. 1969); Ferry v. Udall, 336 F.2d 706, 712 (9th Cir. 1964), *cert. denied*, 381 U.S. 904 (1965). *Contra*, Littell v. Morton, 445 F.2d 1207, 1211 (4th Cir. 1971); Scanwell Laboratories, Inc. v. Shaffer, 424 F.2d 859, 874 (D.C. Cir. 1970); Wong Wing Hang v. Immigration & Naturalization Serv., 360 F.2d 715, 718 (2d Cir. 1966). Those courts that deny all review, however, apply strict standards in determining whether the action has been committed to agency discretion. Bachawski v. Brennan, 502 F.2d 79, 84 (3d Cir. 1974). Nine factors relevant to determining whether agency action is so committed to discretion as to be beyond judicial review are discussed in Saferstein, *Nonreviewability: A Functional Analysis of "Committed to Agency Discretion,"* 82 HARV. L. REV. 366, 379 (1968). A factor particularly relevant to review of AEC decisions is whether expertise and experience is required to understand the subject matter of agency action.

108. 312 F. Supp. at 1220; *see* K. DAVIS, ADMINISTRATIVE LAW TEXT § 4.02 (3d ed. 1972).

109. 312 F. Supp. at 1220.

ally given to agency action. The court recognized, however, that since the AEC was in almost exclusive possession of nuclear experience and expertise, limited judicial review was necessary to prevent the AEC from ignoring the public interest or disregarding the statutory standards. Apparently applying a reasonableness criterion in assessing the validity of an AEC decision, the court concluded that reasonableness was established if the decision was "made carefully in light of the best of available scientific knowledge. Absolute certainty [was] neither required nor possible."[110] Additionally, the *Crowther* court noted that: "The law provides a strong presumption of validity . . . when administrative officials decide weighty issues within the specific area of their authority . . . ."[111] Thus, although an AEC ruling on public health and safety was held to be subject to substantive review, considerable weight was accorded to the agency's judgment.[112]

The *Siegel* and *Crowther* cases demonstrate that courts have been unwilling to substitute their judgment on the merits for AEC decisions regarding atomic energy safety. Similarly, *Power Reactor* applied limited judicial review to procedural matters. The courts have been hesitant to review decisions because the AEC deals with complicated scientific issues which are perhaps awesome and mysterious to most judges.[113] Even now, it would be difficult for a court to limit AEC discretion regarding safety decisions, since the AEA, as amended in 1974 by the Energy Reorganization Act, continues to reflect an extensive delegation of discretion to the agency.

Pursuant to its discretionary authority, the AEC continues to maintain, as in *Siegel*, that safety features designed to cope with accidents in nuclear facilities also will protect against acts of malevolence.[114] Nevertheless, the standards followed by contractors in designing nuclear installations explicitly exclude malevolent acts as a design consideration.[115] Further, the AEC contends that armed camps would be required to prevent attacks,[116] apparently assuming that all such attacks

110. *Id.* at 1234.
111. *Id.*
112. The review may not have been as deferential as the *Crowther* court indicated since the court exhausted 15 pages in determining that the challenged action was permissible.
113. See Power Reactor Dev. Co. v. International Union of Electrical Workers, 367 U.S. 396, 399 (1961), where Justice Brennan describes the atomic processes in a breeder reactor as "a sort of modern alchemy." In a dissent to the same opinion, Justice Douglas referred to nuclear energy as "the most awesome, the most deadly, the most dangerous process that man has ever conceived." *Id.* at 419.
114. *See* Siegel v. AEC, 400 F.2d 778, 782 n.4 (D.C. Cir. 1968); Consolidated Edison Co., 2 CCH ATOM. EN. L. REP. ¶ 11,256.11 (Atomic Safety & Licensing App. Bd., Apr. 25, 1974).
115. *See* AMERICAN NATIONAL STANDARD, *supra* note 83, at 9.
116. Consolidated Edison Co., 2 CCH ATOM. EN. L. REP. ¶ 11,256.11 (Atomic Safety & Licensing App. Bd., Apr. 25, 1974).

would be full-scale, military invasions. The range of possible malevolent acts, however, extends beyond the possibility of a direct armed attack on a nuclear facility. The more subtle and more likely possibilities of sabotage, theft, and extortion are ignored. Possible solutions to these problems are disregarded[117]—effective solutions which could be readily implemented at the design stage without the need for establishing armed camps.[118] The AEA compels no relief because its standards are not sufficiently specific and because judicial review of their application is limited. The Energy Reorganization Act and NEPA, however, may impose new obligations requiring reconsideration of the threats of malevolent acts.

Protection Under the New Energy Reorganization Act

The Energy Reorganization Act of 1974[119] will partially remedy the AEC's inadequate regard for environmental danger. The Act creates in the Nuclear Regulatory Commission an Office of Nuclear Material Safety and Safeguards and provides that its Director "shall perform such functions as . . . licensing and regulation involving all facilities and materials, . . . including the provision and maintenance of safeguards against threats, thefts, and sabotage of such licensed facilities and materials."[120] This language and the corresponding legislative history indicate that the Commission is required to consider malevolent acts.[121] In so doing, the new provisions clearly go beyond the requirements of the AEA.

117. The AEC has limited its concern to whether the nuclear facility can detect an intrusion and alert the proper authorities. *Id.* The effectiveness of even this limited precaution, however, is not considered until application is made for an operating license—a point when many possible design modifications would be foreclosed. Virginia Elec. & Power Co., 3 CCH ATOM. EN. L. REP. ¶ 11,593.01 (Atomic Safety & Licensing Bd., Feb. 9, 1971).

118. See text accompanying notes 162-68 *infra*.

119. 42 U.S.C.A. §§ 5801-91 (Supp. Feb. 1975).

120. *Id.* §§ 5844(a), (b)(1).

121. Present regulations require only consideration of industrial sabotage. 10 C.F.R. §§ 50.34(c), 73.1(a) (1974). The language of the Energy Reorganization Act of 1974 does not limit sabotage to industrial sabotage. Moreover, legislative history indicates that one of the reasons for the creation of a new regulatory structure was the anticipated increase in nuclear materials coupled with the possibility of terrorist activity. *See* S. REP. No. 93-980, 93d Cong., 2d Sess. (1974), reproduced in U.S. CODE CONG. & AD. NEWS 4481-86 (1974). "This [increased production of plutonium] presents security problems of enormous scope, because it is conceded by the AEC that 44 pounds of plutonium in the hands of skilled terrorists could result in an atomic bomb that poses a 'creditable threat'." *Id.* at 4882.

> [A] recent internal AEC study found the present system of safeguarding the relatively small quantities of explosive radioactive material in the private sector to be "entirely inadequate" to prevent theft and subsequent manufacture into terrorists' bombs. A reason given was that safeguards in the Regulatory Division was not getting the same priority attention as reactor safety.

Id. at 4885. "The revised reorganization is intended to give balance to the new Commission . . . . In particular, safety and safeguards are given equal recognition within the organization." *Id.* at 4886.

The Act, however, does not establish at what point in the licensing process the consideration of malevolent acts and provisions for safeguards must occur. There is no mandatory consideration of safeguards against malevolent acts at the design or construction permit stages.[122] Implementation of the legislative duties of the Office of Nuclear Material Safety and Safeguards would seem to mandate positive action. A simple and effective procedure would be for the agency to promulgate regulations requiring consideration of the possible effects of malevolent acts at the design and construction permit phases of the licensing process. Even absent such agency action, it may be possible to require the AEC to consider these factors through application of existing environmental legislation.

THE NATIONAL ENVIRONMENTAL POLICY ACT AND THE AEC

The Environmental Impact Statement

NEPA[123] was enacted to prevent damage to the environment and to promote public health and welfare.[124] Under this Act, any major federal action significantly affecting the environment must be preceded by a detailed statement of the proposed action's environmental impact.[125] NEPA also requires all federal agencies to review their policies and procedures and to recommend measures which will bring them into conformity with the Act.[126]

Whether AEC procedures were in compliance with NEPA was at issue in *Calvert Cliffs' Coordinating Committee, Inc. v. AEC.*[127] The *Calvert Cliffs'* court differentiated the standards of review for substan-

122. *See* 42 U.S.C.A. §§ 5843(b), 5844(b) (Supp. Feb. 1975).

123. 42 U.S.C. §§ 4321-47 (1970).

124. *Id.* § 4321 (1970). Under the National Environmental Policy Act [NEPA], agencies of the federal government are responsible for making a concerted effort to obtain beneficial uses of the environment without risking the health or safety of the public. *Id.* § 4331(b). *See generally* Hanks & Hanks, *supra* note 88; Lynch, *supra* note 88; Comment, *America's Changing Environment—Is the NEPA a Change for the Better?*, 40 FORDHAM L. REV. 897 (1972). For general discussion of the impact of NEPA on the AEC, see Murphy, *The National Environmental Policy Act and the Licensing Process: Environmentalist Magna Carta or Agency Coup de Grace?*, 72 COLUM. L. REV. 963 (1972); Note, *The Regulation of Nuclear Power After the National Environmental Policy Act of 1969*, 24 RUTGERS L. REV. 753 (1970).

125. 42 U.S.C. § 4332 (1970). AEC regulations require an environmental impact statement to be filed with every nuclear powerplant license application. *See* 39 Fed. Reg. 26279-81 (1974) (new regulation, § 51).

126. 42 U.S.C. § 4333 (1970). AEC regulations promulgated to comply with this requirement were contained in 10 C.F.R. § 50, app. D (1974). These regulations have since been supplemented. *See* 39 Fed. Reg. 26279-81 (1974) (new regulation, § 51).

127. 449 F.2d 1109 (D.C. Cir. 1971). The court was highly critical of the AEC's lack of compliance with NEPA. *See* Bronstein, *supra* note 87; Tarlock, *Balancing Environmental Considerations and Energy Demands: A Comment on Calvert Cliffs' Coordinating Committee, Inc. v. AEC*, 47 IND. L.J. 645, 647 (1972); 40 GEO. WASH. L. REV. 558 (1971).

tive and procedural matters under NEPA.[128] According to the court, the NEPA substantive standard was flexible, leaving room for a reasonable exercise of agency discretion: an agency's decision must be upheld unless the balancing of costs and benefits was arbitrary or clearly gave insufficient weight to environmental values.[129] The procedural provisions of NEPA, however, established a strict standard of compliance, requiring that "environmental issues be considered at every important stage in the decisionmaking process."[130] Moreover, *Calvert Cliffs'* emphasized that the NEPA requirement of compliance "to the fullest extent possible" was not an escape clause making procedural compliance discretionary.[131] A decision must be reversed if procedurally it was reached "without individualized consideration and balancing of environmental factors—conducted fully and in good faith . . . ."[132] Thus, the case established a significantly higher standard of review of the agency's procedures than of its substantive decision as to the acceptability of an environmental consequence.

The importance of considering environmental factors at the preoperating license stage was emphasized in *Calvert Cliffs'*.[133] Although the AEC had attempted compliance with NEPA by requiring environmental effects to be considered at the operating license stage, this was not sufficient. Earlier consideration was necessary to avoid the inevitable conflicts which would arise if these decisions were not made prior to the expenditure of significant sums. The prior financial commitment could influence the decisionmaking process, perhaps disposing the AEC to more tolerance of an environmental harm than if decisions were made at the design stage.[134] As indicated, the AEA does not

128. The court noted that a substantive matter is concerned with the propriety of an agency decision, while procedural matters relate to the method of arriving at a substantive decision. 449 F.2d at 1114.

129. *Id.* at 1112, 1115.

130. *Id.* at 1112, 1118.

131. *Id.* at 1114. In Siegel v. AEC, 400 F.2d 778 (D.C. Cir. 1968), the court agreed with the AEC that considering enemy attacks against the nuclear industry was not necessary because some requisite data was classified and unavailable and because other data, although available, should not have been made public in the licensing process. *Id.* at 782. Arguably, these considerations would excuse AEC compliance with NEPA, even assuming that NEPA requires consideration of enemy acts, because of the conflict between NEPA compliance and the undesirability of disclosing classified information. That is, compliance with NEPA would not be "possible." *Calvert Cliffs'* indicates, however, that NEPA recognizes only a statutory impossibility of consideration—impossibility arising from conflicting duties placed on the agency. *See* 449 F.2d at 1115, 1125 ("clear conflict of *statutory* authority").

132. 449 F.2d at 1115.

133. *Id.* at 1128.

134. *Id.* The importance of an early impact statement was also emphasized in Scientists' Institute for Pub. Information, Inc. v. AEC, 481 F.2d 1079 (D.C. Cir. 1973). In that case, it was found that NEPA required an impact statement for the AEC program to develop a commercial breeder reactor industry, although the program was still in the research and development stage. *Id.* at 1082. As the court stated:

> To wait until a technology attains the stage of complete commercial feasibility before considering the possible adverse environmental effects attendant upon

require the AEC to consider environmentally consequential incidents of malevolence at the design or any other stage.[135] Thus, *Calvert Cliffs'* emphasis on early consideration of environmental effects directly conflicts with the AEC regulatory scheme if the effects of malevolent acts and other security breaches are within the purview of environmental impacts which must be considered in NEPA statements.

Detail of the Impact Statement

NEPA divides agency environmental decisionmaking into three stages. Initially, a determination must be made whether an impact statement is required for a proposed agency action.[136] If an impact statement is necessary, the inquiry shifts to the substance of the statement, that is, how extensively the effects of the action should be considered.[137] The third stage involves a balancing of environmental fact-

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ultimate application of the technology will undoubtedly frustrate meaningful consideration and balancing of environmental costs against economic and other benefits. Modern technological advances typically stem from massive investments in research and development. . . . Technological advances are therefore capital investments and, as such, once brought to a stage of commercial feasibility the investment in their development acts to compel their application. Once there has been, in the terms of NEPA, "an irretrievable commitment of resources" in the technology development stage, the balance of environmental costs and economic and other benefits shifts in favor of ultimate application of the technology.

Id. at 1089-90.

This emphasis in *Scientists' Institute* and *Calvert Cliffs'* contrasts with the holding in Power Reactor Dev. Co. v. International Union of Electrical Workers, 367 U.S. 396 (1961), where the United States Supreme Court held that the AEC could validly impose a less rigid standard at the time of issuing a construction permit than at the time of granting an operating license. *Power Reactor*, however, was rendered prior to the enactment of NEPA and did not address the requirements of that legislation. Nevertheless, it is appropriate to inquire whether AEC findings with regard to environmental harm and consideration of environmental factors may be less definitive at an earlier stage in the decisionmaking process than at a later stage, so long as they are considered throughout the procedure. A negative answer would be contrary to the rationale of *Calvert Cliffs'* and *Scientists' Institute*—which requires an early consideration of environmental factors. *See also* Lathan v. Volpe, 455 F.2d 1111, 1121 (9th Cir. 1971).

This issue has not been raised in the cases, but some decisions suggest that environmental factors must be fully and definitively considered at each stage of the decisionmaking process. Jones v. District of Columbia Redevelopment Land Agency, 499 F.2d 502, 511 (D.C. Cir. 1974) (impact statement must be prepared at initial approval stage —it was not meant to be a *post hoc* environmental rationalization of decisions already fully and finally made); National Helium Corp. v. Morton, 486 F.2d 995, 1002 (10th Cir. 1973) (environmental factors must enter agency decisionmaking on an equal footing with other considerations); Sierra Club v. Froehlke, 359 F. Supp. 1289, 1357 (S.D. Tex. 1973) (agency review must be rigorous and must consider environmental impacts at each step in the review process). These cases indicate that NEPA may now prohibit a federal agency's application of less demanding environmental standards at a preliminary stage of project approval than at a later stage.

135. The AEC now requires preparation at the construction permit stage of impact statements regarding environmental effects other than malevolent acts. 39 Fed. Reg. 26279-81 (1974) (new regulation, §§ 51.5(a), 51.20).

136. "[A]ll agencies of the Federal Government shall . . . include in every recommendation or report on proposals for . . . major Federal actions significantly affecting the quality of the human environment, a detailed statement . . . on . . . the environmental impact of the proposed action . . . ." 42 U.S.C. § 4332(C)(i) (1970).

137. This depends upon the scope of the word impact—how attenuated an effect must be before it need not be considered an impact. *See* Kross, *Preparation of an Environmental Impact Statement*, 44 U. COLO. L. REV. 81, 120 (1972).

ors against the other costs and benefits of a proposal to determine the permissibility of a course of action.[138] It is in the second stage that consideration of malevolent acts is most significant; a determination must be made whether their potential impacts are of sufficient consequence to warrant inclusion in the statement.[139]

Judicial interpretations of NEPA's general purpose are sufficiently broad to include malevolent acts as impacts warranting consideration. NEPA has been held to require full disclosure of the consequences of an action;[140] and the environmental impact statement must provide information sufficient to allow an understanding of environmental consequences and a reasoned decision whether or not to proceed.[141] The information must be presented in such a manner as to allow the public to be informed of the environmental impact of the action.[142] Some insight as to the scope of impact statements is also provided by guidelines published by the Council on Environmental Quality [CEQ].[143] The CEQ standards suggest a discussion of the "probable impact of the proposed action on the environment" and of "[a]ny probable adverse environmental effects which cannot be avoided (such as . . . threats to health . . .)."[144] Arguably, these standards might eliminate malevolent acts from consideration as impacts since such effects are somewhat improbable. The CEQ guidelines, however, are advisory only.[145]

Judicial decisions, to the extent they attempt specificity,[146] exhibit

138. *See* Calvert Cliffs' Coordinating Comm., Inc. v. AEC, 449 F.2d 1109, 1113-15 (D.C. Cir. 1971).

139. Actually, the first stage also may be involved, particularly if the only potential effect of the agency's action would result from malevolent acts. As a practical matter, however, the first stage determination will not be required since most major actions and all nuclear power facilities will have enough other environmental effects to necessitate an impact statement.

140. Calvert Cliffs' Coordinating Comm., Inc. v. AEC, 449 F.2d 1109, 1122 (D.C. Cir. 1971) ("The sweep of NEPA is extraordinarily broad, compelling consideration of any and all types of environmental impact of federal action."); Environmental Defense Fund, Inc. v. Corps of Eng'rs, 325 F. Supp. 749, 759 (E.D. Ark. 1971), *aff'd*, 470 F.2d 289 (8th Cir. 1972).

141. Cape Henry Bird Club v. Laird, 359 F. Supp. 404, 412 (W.D. Va. 1973). *See* Environmental Defense Fund v. Corps of Eng'rs, 492 F.2d 1123, 1136 (5th Cir. 1974); Committee for Nuclear Responsibility v. Seaborg, 463 F.2d 783, 787 (D.C. Cir. 1971).

142. Silva v. Lynn, 482 F.2d 1282, 1285 (1st Cir. 1973); Natural Resources Defense Council v. Morton, 458 F.2d 827, 833 (D.C. Cir. 1972); Sierra Club v. Froehlke, 345 F. Supp. 440, 444 (W.D. Wis. 1972), *aff'd*, 486 F.2d 946 (7th Cir. 1973); Environmental Defense Fund v. Corps of Eng'rs, 325 F. Supp. 749, 759 (E.D. Ark. 1971), *aff'd*, 470 F.2d 289 (8th Cir. 1972). *See* Brooks v. Volpe, 350 F. Supp. 269, 274-76 (W.D. Wash. 1972).

143. The Council on Environmental Quality [CEQ] was created pursuant to NEPA. 42 U.S.C. § 4342 (1970). Its duties and functions are set forth in section 4344 of that Act.

144. 40 C.F.R. § 1500.8(a) (1974).

145. Hiram Clarke Civic Club v. Lynn, 476 F.2d 421, 424 (5th Cir. 1973). *See also* 87 HARV. L. REV. 1050, 1052 (1974).

146. It is not uncommon to find courts holding agencies to standards as vague as "good faith objectivity." Environmental Defense Fund v. Corps of Eng'rs, 470 F.2d

some disagreement over the detail required in an impact statement. One court has stated that, "all known *possible* environmental consequences" of an action must be discussed;[147] another has proposed discussing "all possible significant effects."[148] Yet another has rejected those standards as too broad and would have limited the required discussion to the "*significant* aspects of the *probable* environmental impact"[149] of an action.[150] The diversity of such decisions indicates the need for the development of a standard that can be uniformly applied.

A balancing test would provide a more workable standard for determining whether a particular impact should be considered.[151] The first relevant factor in the test would be the likelihood of a particular environmental effect. Balanced against this probability would be the magnitude of the harm which would be suffered by the environment should the effect actually occur. Thus, an impact with the potential for causing substantial harm would be considered, even if its probability were slight. Conversely, an impact with a likelihood of only minimal harm would require consideration only if it were likely to occur.[152]

289, 296 (8th Cir. 1972). *See* Committee for Nuclear Responsibility v. Seaborg, 463 F.2d 783, 787 (D.C. Cir. 1971); Calvert Cliffs' Coordinating Comm., Inc. v. AEC, 449 F.2d 1109, 1115 (D.C. Cir. 1971). Agencies have also been required to take a "hard look" at the consequences of the proposed action. Natural Resources Defense Council v. Morton, 458 F.2d 827, 838 (D.C. Cir. 1972); Sierra Club v. Froehlke, 345 F. Supp. 440, 444 (W.D. Wis. 1972), *aff'd*, 486 F.2d 946 (7th Cir. 1973).

147. Environmental Defense Fund v. Corps of Eng'rs, 325 F. Supp. 749, 759 (E.D. Ark. 1971), *aff'd*, 470 F.2d 289 (8th Cir. 1972); *see* 26 OKLA. L. REV. 281, 284-85 (1973); *cf.* Hiram Clarke Civic Club v. Lynn, 476 F.2d 421, 427 (5th Cir. 1973).

"The agency need not forsee the unforeseeable, but . . . . [r]easonable forecasting and speculation is . . . implicit in NEPA . . . ." Scientists' Institute for Pub. Information v. AEC, 481 F.2d 1079, 1092 (D.C. Cir. 1973). *See also* Crowther v. Seaborg, 312 F. Supp. 1205, 1225-27 (D. Colo. 1970) (noting, with approval, that the agency had considered a "maximum hypothetical accident" so remote as to be "almost impossible").

148. Sierra Club v. Froehlke, 359 F. Supp. 1289, 1342 (S.D. Tex. 1973).

149. Environmental Defense Fund v. Corps of Eng'rs, 348 F. Supp. 916, 933 (N.D. Miss. 1972), *aff'd*, 492 F.2d 1123 (5th Cir. 1974) (noting that this standard dispenses with the need to discuss remote effects, such as "mere possibilities unlikely to occur as a result of the proposed activity").

150. An intermediate standard has been proposed which emphasizes the necessity of including in the statement a possible effect if, in the opinion of at least one responsible and reputable source, the impact is reasonably foreseeable. D'Amato & Baxter, *The Impact of Impact Statements upon Agency Responsibility: A Prescriptive Analysis*, 59 IA. L. REV. 195, 232 (1973). The responsible person should be one qualified to give a scientific opinion. *See* Committee for Nuclear Responsibility v. Seaborg, 463 F.2d 783, 787 (D.C. Cir. 1971); Lathan v. Volpe, 350 F. Supp. 262, 265 (W.D. Wash. 1972); Environmental Defense Fund v. Corps of Eng'rs, 325 F. Supp. 749, 759 (E.D. Ark. 1971), *aff'd*, 470 F.2d 289 (8th Cir. 1972); *cf.* 81 YALE L.J. 1592, 1595-1601 (1972).

151. For a discussion of the application of a balancing test to the initial determination whether an impact statement is required, see 87 HARV. L. REV. 1050, 1064-65 (1974).

152. Some decisions have used this same rationale in analyzing other problems, such as determining the requisite levels of probable cause for detaining potential airline hijackers, frisking citizens, and searching homes and to determine the materiality of inside information in security fraud cases. *See* Terry v. Ohio, 392 U.S. 1, 20-27 (1968) (frisking); Camara v. Municipal Court, 387 U.S. 523, 534-39 (1967) (administrative search of residence); SEC v. Texas Gulf Sulphur Co., 401 F.2d 833, 849 (2d Cir. 1968) (determining materiality of inside information under 17 C.F.R. § 240.10b-5 (1974));

Use of such a balancing test has been suggested in at least one case[153] and would go far toward reconciling the conflict between other cases. The use of a balancing test to determine the contents of an impact statement also would be consistent with the use of balancing tests to determine the necessity for an impact statement[154] or the permissibility of agency action despite its environmental impacts.[155]

Even if malevolent acts achieved impact status under a balancing test, there may be a further barrier to their consideration in impact statements. The causal relationship between the operation of a nuclear facility and environmental harm resulting from a malevolent act is qualitatively different from the causal relationship between, for example, the operation of a nuclear facility and thermal pollution resulting from normal operation. It is clear that but for the operation of the nuclear facility, the environmental harm would not have occurred in either situation. The former causal relationship, however, involves an intervening cause—the malevolent act. Thus, the former is a case of indirect causation, while the latter is direct. One may go so far as to say that the environmental harm in the former case is caused by the malevolent act, not by the operation of the reactor.

The question then becomes whether clearly indirect effects must

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United States v. Lopez, 328 F. Supp. 1077, 1093-98 (E.D.N.Y. 1971) (hijacking). The cases which have applied this analysis to probable cause indicate that the requisite probability for probable cause may be only a possibility. Under this reasoning, it is the magnitude of the possible harm that allows a mere possibility to satisfy probable cause. *See generally* "Proper Grounds for Investigatory Stops: A Test," 15 ARIZ. L. REV. 593, 708 (1973); 18 WAYNE L. REV. 1173, 1188-90 (1972).

153. Sierra Club v. Froehlke, 359 F. Supp. 1289 (S.D. Tex. 1973):

> The larger the physical size of the environmental amenity at issue, and hence the more readily available for public observation, appreciation, use, or enjoyment, then the greater the likelihood it should be dealt with in the impact statement. . . . Likewise, even if the physical size is miniscule or microscopic, the impact statement should deal with it if the environmental impact on it is apt to be significant.

Id. at 1342.

The only case precluding the sort of balancing test proposed here is Environmental Defense Fund v. Corps of Eng'rs, 348 F. Supp. 916, 933 (E.D. Miss. 1972), *aff'd*, 492 F.2d 1123 (5th Cir. 1974). That case required that an environmental effect be probable in order to be considered in the impact statement. The use of the term probable, however, does not preclude a balancing test. *See* discussion note 152 *supra*. For an argument against the extensive consideration of possible environmental effects, see Murphy, *supra* note 124, at 978-79.

154. *See* Scientists' Institute for Pub. Information, Inc. v. AEC, 481 F.2d 1079, 1094 (D.C. Cir. 1973); First Nat'l Bank v. Watson, 363 F. Supp. 466, 473 (D.D.C. 1973); Students Challenging Regulatory Agency Procedures v. United States, 346 F. Supp. 189, 199-200 (D.D.C. 1972), *rev'd on other grounds*, 412 U.S. 669 (1973). *See also* 87 HARV. L. REV. 1050, 1064-66 (1974).

155. Use of a balancing test at this stage is inherent in the requirement that federal agencies "insure that . . . environmental amenities [are] given appropriate consideration in decision-making along with economic and technical considerations . . . ." 42 U.S.C. § 4332(B) (1970). *See, e.g.*, Calvert Cliffs' Coordinating Comm., Inc. v. AEC, 449 F.2d 1109, 1113 (D.C. Cir. 1971); Daly v. Volpe, 376 F. Supp. 987, 994-95 (W.D. Wash. 1974); Montgomery v. Ellis, 364 F. Supp. 517, 521-23 (N.D. Ala. 1973). *See also* Note, *Cost-Benefit Analysis and the National Environmental Policy Act of 1969*, 24 STAN. L. REV. 1092 (1972).

be considered in an impact statement. The answer appears to be in the affirmative. CEQ guidelines as to the content of environmental statements advise that: "Secondary or indirect, as well as primary or direct, consequences for the environment should be included in the analysis."[156] Moreover, the courts seem to have construed indirect effects as cognizable under NEPA.[157] Finally, indirect effects should be considered as a matter of policy. NEPA focuses on the disclosure, as well as the consideration, of environmental costs. Hence, a given impact should not be ignored because it is partially or wholly outside the control of the responsible agency. All potential impacts, whether primary or secondary, should be evaluated by the balancing test to determine the necessary content of the impact statement.

Diminishing the Threat of Malevolent Acts Through NEPA

The final step of NEPA's mandate for federal agency action requires that the agency strike a cost-benefit balance in determining the desirability of proceeding with a proposed action.[158] In this decision, all cognizable impacts of the proposed action—both harmful and beneficial—must be balanced in considering whether to approve a project. Under the balancing analysis proposed here, harm from malevolent acts would be included in these impacts. Since the potential cost of those acts would be exceedingly high, that cost may easily outweigh the benefits derivable from a nuclear facility. This, coupled with the increasing probability of malevolent acts, could preclude the building of nuclear facilities. Effective safeguards eliminating or greatly minimizing the threat of such acts, however, may not out-cost the benefits, thereby permitting the construction of nuclear facilities.

The most drastic safeguard would be to eliminate nuclear facilities. Before nuclear energy can be eliminated from the future power sources

156. 40 C.F.R. § 1500.8(a)(3)(ii) (1974).

157. As part of an impact statement for the proposed location of a federal jail in a residential area, the responsible agency was required to consider the possibility of riots and disturbances and the dangers of crime to which residents might have been exposed as the consequence of an outpatient treatment center included in the facility. Hanly v. Kleindienst, 471 F.2d 823 (2d Cir. 1972); Hanly v. Mitchell, 460 F.2d 640, 647 (2d Cir. 1972), *cert. denied*, 409 U.S. 990 (1972).

158. *See* 42 U.S.C. § 4331(b)(3) (1970). It has been held that the AEC may not deem an environmental impact as adequately considered in its balance merely because another agency has responsibility for that particular type of environmental impact, and the proposed AEC action complies with the requirements of the other agency. Calvert Cliffs' Coordinating Comm., Inc. v. AEC, 449 F.2d 1109, 1122-27 (D.C. Cir. 1971). Benefits may be so outweighed by the threat of environmental harm that going forward with an action would be impermissible under NEPA balancing standards, regardless of whether the threat is tolerable by the agency charged with primary responsibility for it. *Id.* Thus, if the effects of malevolent acts directed at the nuclear industry are within the scope of environmental impacts required to be considered, the AEC may not deem those effects adequately considered on the ground advanced in Siegel v. AEC, 400 F.2d 778, 782 (D.C. Cir. 1968), that those effects are the military's responsibility.

of the nation, however, other sources must become available.[159] A number of alternative power sources are in various stages of development,[160] but none appears to promise a large reliable source of electrical power in the near future.[161] Thus, nuclear power seems assured of playing a major role in fulfilling the nation's energy needs, and complete foreclosure of nuclear power, therefore, would not be practical.

A more feasible alternative would be to expand security measures at nuclear facilities to meet the range of threats from malevolent acts. The practice of relying on safeguards incorporated after construction of a facility has been completed[162] should be changed to an integrated approach to the implementation of safeguards.[163] The basic need is for safeguard systems which are developed within the same framework as that used to evaluate the accident safety of a nuclear facility.[164] To be accomplished effectively, this development must begin at the design stage. Until NEPA, however, there was no requirement that the environmental harm from malevolent acts be considered at the design stage. Under the balancing analysis proposed here, NEPA appears to mandate such an evaluation.

Experts have suggested measures which would fulfill this mandate. A federal nuclear protection and transportation service would provide security for nuclear material at fixed sites and in transit.[165] Extremely heavy shipping containers, such as those used for shipments of used radioactive fuel, could be used to transport new fuel elements in order to minimize the chances of diversion.[166] Dynamic testing systems could be employed to postulate ways a subversive might thwart protective devices.[167] Finally, ensuring the trustworthiness of employees would be a vital concern of an improved safeguards system.[168] The effective implementation of these security devices would greatly reduce

159. *See* SAFETY OF NUCLEAR POWER, *supra* note 13, at 1.
160. Alternative energy sources include thermonuclear fusion, tidal, wind, and hydroelectric power, and geothermal and solar energy. Rose, *Energy Policy in the U.S.*, 230 SCIENTIFIC AMERICAN, Jan. 1974, at 20, 23.
161. Wind, tidal, and hydroelectric power do not provide sufficient quantities of energy, *id.*, and solar and geothermal energy need more development to become economical sources of power. *Id.* There has been no demonstration that thermonuclear fusion is a feasible energy source, but should it be successfully developed, it would provide a power source that is essentially pollution free and considerably safer than fission power plants. *See* SAFETY OF NUCLEAR POWER, *supra* note 13, at I-20.
162. See text & notes 81-87 *supra*.
163. Taylor, *Diversion, supra* note 48, at 194; Taylor, *Preventing, supra* note 54, at 221-22. This approach would scrutinize the nuclear fuel cycle as a whole, identifying vulnerable points and developing appropriate security measures irrespective of where they are needed in the cycle. *Id.*
164. SAFEGUARDS STUDY, *supra* note 6, at 4.
165. *Id.* at 11-13.
166. Taylor, *Diversion, supra* note 48, at 194.
167. SAFEGUARDS STUDY, *supra* note 6, at 14-15.
168. Kinderman, *supra* note 31, at 152-56.

the likelihood of harm from malevolent acts and would satisfy the requirements of NEPA.

CONCLUSION

The likelihood of adverse environmental consequences resulting from malevolent acts directed at the nuclear power industry has substantially increased because of the growth of that industry. In the past, the response of the AEC, acting under the statutory authority of the Atomic Energy Act of 1954, has not kept pace with the increasing danger. The new Nuclear Regulatory Commission, pursuant to the more specific statutory requirements of the Energy Reorganization Act of 1974, may be more responsive in promulgating regulations which effectively safeguard the nuclear industry. An essential element of a successful safeguards system, however, is advance planning, and the new act does not require such a regulatory scheme. The National Environmental Policy Act, however, does require that before construction begins on a nuclear power facility, the impacts of that facility on the environment be disclosed and considered in an impact statement. Environmentally-damaging effects which are improbable but overwhelmingly harmful, such as sabotage of a nuclear powerplant, should be included in those impacts. This process will not guarantee the elimination of malevolent risks, but it will ensure that they are assumed by society only after carefully considered judgment.