

**REPORT ON THE PRICE-ANDERSON ACT
AND ITS POTENTIAL EFFECTS ON EUREKA COUNTY, NEVADA**

prepared for:

The Board of Eureka County Commissioners
Eureka, Nevada
and
Abigail C. Johnson Consulting
Carson City, Nevada

prepared by:

David S. Ziegler, AICP
Ziegler Technical
Carson City, Nevada

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I. INTRODUCTION

To encourage development of the nuclear energy program, the United States Congress acted in 1957 to shield the nuclear industry from liability and, at the same time, compensate those who might be damaged by a radiological incident. By enacting the Price-Anderson Act, the Congress, in effect, created a large insurance policy for the benefit of both energy providers and the public at large.

This report, prepared on behalf of Eureka County, Nevada, examines the provisions of the Price-Anderson Act (after this, "Act" or "PAA"), its legislative history, and its application in accidents and incidents since 1957. Eureka County's interest in the Act stems from the fact that rail and truck transportation of spent nuclear fuel (SNF) and high-level radioactive waste (HLW) to the proposed geologic repository at Yucca Mountain, Nevada, could pass through or near the County, exposing it to possible physical damage, legal liability, or both.

The main purpose of this report is to provide information that Eureka County and others can use to make plans and adopt policies for the future.

II. SUMMARY REMARKS

In a nuclear incident or precautionary evacuation, the PAA covers the liability of any person who may be liable for damages. It provides for a pool of money to compensate those who have suffered damages. The Act defines "person" broadly, to include every possible individual or entity other than the Department of Energy (DOE) and Nuclear Regulatory Commission (NRC) themselves.

The PAA applies to nuclear power plants licensed by the NRC, and to facilities and activities conducted by contractors for the DOE--such as transportation of spent nuclear fuel.

The PAA channels liability. In the event of a nuclear incident or precautionary evacuation, it directs all claims arising from the legal liability of any person to one source of funds. At present, the Act provides liability protection of \$9.43 billion without the need for Congressional appropriations. Ultimately, the indemnification comes from the public as a whole, through tax and utility payments.

Since its enactment, the PAA has compensated persons who suffered damages in nuclear incidents. Some cases were resolved somewhat expeditiously through settlement of litigation. Based on a review of the Act's history, the best chances for recovering for damages appear to be associated with the most severe incidents. In the absence of an incident causing a release of radioactivity or an authorized evacuation, the PAA provides no liability protection or compensation at all.

In the most extreme incidents, known as "extraordinary nuclear occurrences" or ENOs, the Act restricts a defendant's ability to shift liability to someone else. Also, the Act provides that a person affected by an ENO may make a personal injury claim within three years of discovering an injury, such as cancer, regardless of how long it has been since the incident. Normally, State statutes of limitations apply.

The determination whether a nuclear incident involving transportation of SNF and HLW through Eureka County is an ENO would fall under the DOE's rules, set forth in the *Code of Federal Regulations*. The nation's largest nuclear incident, the accident at Three Mile Island, did not qualify as an ENO under the NRC's rules, which are the same as the DOE's.

Despite its broad coverage, the Act excludes from coverage shipments from an independent fuel storage installation, and transportation accidents where material is stolen and later released.

In the unfortunate event of a nuclear incident in Eureka County (or any other county), some residents could suffer immediate, predictable, deterministic effects, or random, latent, "stochastic" effects from radiation. Regarding latent effects, an expert witness in a personal injury case, arguing that radiation released in an incident caused someone's cancer, faces a daunting task. It may be extremely difficult, if not impossible, to prove causation.

III. PROVISIONS OF THE PRICE-ANDERSON ACT

The coverage of the PAA extends to a wide range of installations and activities associated with the production of nuclear energy in the United States. Its provisions cover large commercial power reactors; small research and test reactors; fuel reprocessing plants; enrichment facilities; incidents that occur through the operation of nuclear plants; and incidents that occur through the transportation and storage of nuclear fuel and radioactive wastes. The Act covers accidents that might occur while SNF and HLW are in transit from nuclear power plants and DOE facilities to the proposed Yucca Mountain repository [DOE, 2002, p. M-24].

The PAA indemnifies (i.e., protects against possible damages) any person with whom an indemnity agreement is executed, and any other person who may have public liability for a nuclear incident. The term "person" is broadly defined to include every possible individual or entity, except the Nuclear Regulatory Commission (NRC) or the DOE [DOE, 1997].

Definitions. The Act, as amended in 1988, defines a "public liability action" as "any suit asserting public liability." "Public liability" means "any legal liability arising out of or resulting from a nuclear incident or precautionary evacuation," with certain exceptions. Coverage excludes:

- (i) claims under State or Federal workmen's compensation acts of employees of persons indemnified who are employed at the site of and in connection with the activity where the nuclear incident occurs; (ii) claims arising out of an act of war, and (iii) . . . claims for loss of . . . property which is located at the site of and used in connection with the licensed activity where the nuclear incident occurs [42 USC 2014].

"Nuclear incident" means any occurrence, including an extraordinary one, causing bodily injury, sickness, disease, or death, or loss or damage to property, or loss of use of property, arising out of or resulting from the radioactive, toxic, explosive, or other hazardous properties of source, special nuclear, or byproduct material [42 USC 2014, in DOE, 2002, p. M-23].

"Precautionary evacuation" means an evacuation of the public in a specified area near a nuclear facility or transportation route, in the case of an accident involving transportation of source material, special nuclear material, byproduct material, SNF, HLW, or transuranic waste. The evacuation must be the result of an event that is not classified as a nuclear incident but poses an imminent danger of injury or damage from the radiological properties of nuclear materials and causes an evacuation. It must be initiated by an official of a state or political subdivision who is authorized by state law to initiate such evacuation and who reasonably determined it was necessary to protect the public health and safety [DOE, 2002, p. M-24]. In Nevada, the governor may order an evacuation during a state of emergency or declaration of disaster. If the governor is unable to communicate with a stricken area, a local government may have authority under an emergency plan to order an evacuation. (See *Nevada Revised Statutes* 414.040 through 414.070.)

Extent of coverage. Indemnification extends to state and local governments incurring legal liability, including reasonable costs, in the course of responding to a nuclear incident or an authorized precautionary evacuation. State and local governments may be reimbursed for such costs as police, ambulance, fire protection, securing an accident site, confining materials to an accident site, and conducting evacuations [DOE, 2002, pp. M-23 to -25; Niles and Turner, 1998, pp. 3,4; Court of Appeals, 1999, p. 11].

The legislative history of the original Price-Anderson Act (enacted in 1957) says that the Act protects utilities, prime contractors, and any other person who might be liable in an incident, including subcontractors of a licensee, designers, and suppliers of parts. The history says that any person is to be indemnified, no matter what the contractual relationship, and indemnification would include, for example, an airline whose plane crashes into a reactor [Brownstein, 1984, pp. 17, 18]. A contractor is fully indemnified for public liability, even if the liability stemmed from acts of gross negligence or willful misconduct, because the damage to the public is the same [DOE, 1997].

Channeling and omnibus coverage. The Act provides "omnibus coverage" and "channels" payment of all claims arising from the legal liability of any person to one source of funds. This eliminates the need to sue all potential defendants or to allocate legal liability among multiple defendants. Regardless of who is found legally liable for a nuclear incident resulting from DOE contract activities or activities licensed by the Nuclear Regulatory Commission (NRC), the indemnification covers the claim [DOE, 2002, p. M-25]. The same protection available for a covered licensee or contractor extends to any person who may be legally liable, regardless of their identity or relationship to a licensed activity [ANS, 2001; DOE, 1999, p. 12].

Waiver of certain defenses. In addition to channeling and omnibus coverage, the PAA contains other provisions intended to minimize protracted litigation and eliminate the need to prove fault or allocate liability among potential defendants. In the case of an "extraordinary nuclear occurrence" or "ENO," the Act requires the waiver of any defense related to the conduct of the claimant or the fault of any indemnified person [Section 170(n) of AEA, in DOE, 1999, p. 12].

These required waivers result in what is known as "strict liability," as well as the elimination of charitable and governmental immunities, and "the substitution of a 3-year discovery rule in place of statutes of limitations that would normally bar all suits after a specified number of years [DOE, 2002, p. M-26]." In the 1975 amendments to the Act, the outside limit on the statute of limitations waiver was extended from 10 to 20 years. In 1988, the outside limit was eliminated altogether. Thus, a defendant must waive any statute of limitations more restrictive than a 3-year discovery rule [Section 170(n), in PCCNA, undated, p. 5]. This means that a person affected by an ENO must make a personal injury claim within three years of discovering the injury, such as cancer, regardless of how long it has been since the incident.

The impact of a determination of an ENO has mainly to do with the issues that may be involved and the defenses that may be used in a lawsuit for damages from a nuclear incident:

The presence or absence of an [ENO] determination does not concomitantly determine whether or not a particular claimant will recover on his claim. In effect, it is intended primarily to determine whether certain potential obstacles to recovery are to be removed from the route the claimant would ordinarily follow to seek compensation for his injury or damage. If there has not been an [ENO] determination, the claimant must proceed (in the absence of a settlement) with a tort action subject to whatever issues must be met, and whatever defenses are available to the defendant, under the law applicable in the relevant jurisdiction. If there has been an [ENO] determination, the claimant must still proceed (in the absence of a settlement) with a tort action, but the claimant's burden is substantially eased by the elimination of certain issues which may be involved and certain defenses which may be available to the defendant [DOE, 1984, p. 507].

The ENO determination. The DOE or the NRC, as appropriate, determines whether or not an incident involving radioactive materials is considered an ENO [Niles and Turner, 1998, p. 3; PCCNA, undated, p. 1]. A nuclear incident affecting transportation of SNF and HLW through Eureka County would fall under the DOE's rules [Lewis, 2003; Young, 2003], set forth in the *Code of Federal Regulations*, 10 CFR part 840, "extraordinary nuclear occurrences." The NRC's rules, found in 10 CFR part 140, are virtually identical.

The DOE itself may initiate a determination whether there has been an ENO. Also, any affected person and any person with whom an indemnification agreement has been executed may petition the DOE for a determination. If the DOE needs information to make a determination, it must publish a notice in the *Federal Register*, requesting information to be submitted [DOE, 1984, p. 507].

To make the determination, the DOE applies a two-part test. The first part is to determine whether a discharge or dispersal constitutes a substantial amount of nuclear material, or has caused substantial radiation levels offsite. (The Act defines "offsite" to mean away from the location defined in a Price-Anderson indemnity agreement [42 USC 2014(j)].) The intent of the first part of the test is to determine whether something exceptional and unexpected has occurred, raising the possibility of damage to persons or property. To make a determination that an ENO may have occurred, the DOE must make one of two findings: (1) that one or more persons offsite were or might have been exposed to radiation resulting in a dose in excess of levels published in a table in the regulations, or (2) surface contamination of offsite property has occurred that exceeds levels in a second table, also contained in the regulations [DOE, 1984, pp. 506-508].

If the DOE makes one of these two findings, the second part of the DOE's ENO determination is to decide whether there have been or will probably be substantial damages to persons or property offsite. In this part, the DOE must make one of four findings: (1) there has been a death or hospitalization of five or more people within 30 days of the incident, showing objective evidence of physical injury from exposure to nuclear material, (2) property damage greater than or equal to \$2.5 million to one person or \$5 million in the aggregate has occurred, (3) property damage greater than or equal to \$5,000 to 50 or more persons and \$1 million or more in aggregate has

occurred, or (4) there has been a financial loss resulting from appropriate protective actions [DOE, 1984, pp. 506-508].

Jurisdiction. The Act, as amended in 1988, provides for consolidation of public liability actions in one federal district court [Court of Appeals, 1999, pp. 11, 12]. The U.S. District Court in the district where a nuclear incident occurs has original jurisdiction over any case resulting from the incident. Cases brought in another court must be removed to the federal district court with jurisdiction, upon a motion of the defendant, the NRC, or the DOE [DOE, 1999, p. 11; 42 USC 2210(n), in DOE, 2002, p. M-25].

Relationship to State laws. The PAA says that the substantive rules of decision in any public liability action must be derived from the law of the State in which the nuclear accident occurs [Section 11(b), PAAA of 1988, codified at 42 USC 2014(hh), in Court of Appeals, 1999, p. 13]. Thus, the tort law of the state in which a nuclear incident occurs applies, with respect to determining liability and damages, and a claimant's ability to show proof of causation of injuries is also determined under state law [Niles and Turner, 1998, pp. 3, 4].

However, the uniform rules prescribed by the PAA, such as the limit on awards of punitive damages and--in the case of an ENO--the waiver of certain defenses, may supersede certain provisions of state law [DOE, 2002, p. M-25; DOE, 1997]. Section 170(f) of the PAA prohibits a court from awarding punitive damages against a person on behalf of whom the United States is obligated to make payments under an indemnification agreement [DOE, 1997].

How the PAA works for nuclear power plants. In general, one can divide civilian nuclear power activities in the United States into two categories: facilities and activities licensed by the NRC (e.g., nuclear power plants) and facilities and activities conducted for the DOE (e.g., experimental reactors; transportation of nuclear waste). As it applies to nuclear power plants, the PAA provides for primary and secondary financial protection. Primary protection comes from a requirement that all operators of reactors carry \$200 million in liability insurance for each reactor. American Nuclear Insurers (ANI), a joint underwriting association of insurance companies formed in 1956, provides all of the primary protection.

The secondary level of protection is a "retrospective assessment program" to pay for public damages above the \$200 million primary insurance requirement. Any damages over a reactor's primary coverage are assessed equally against *all* operating reactors, up to a current limit of \$83.9 million per reactor per accident, plus a possible 5 percent surcharge for legal costs [SECC, undated]. These assessments are payable in annual installments of \$10 million or less [ANS, 2001]. Since there are 103 operating nuclear reactors in the program, the potential insurance pool is \$9.43 billion (as of August, 1998), consisting of the primary and secondary protection, combined [SECC, undated; Public Citizen, 2001].

In summary, the PAA limits the liability of the nuclear industry (plant operators, suppliers, and vendors) in the event of a major nuclear accident. Neither the owner of a unit that has a major accident nor the entire utility can be held liable for more than \$200 million in liability insurance plus \$83.9 million for each reactor [Nader, undated, p. 6].

If the damage from an accident were to exceed the combined primary and secondary caps, currently \$9.43 billion, payment of damages would require Congressional action [SECC, undated; DOE, 2002, p. M-24] (Note that some reports say that damage could exceed the caps by a large margin.) Under sections 170(e) and (i) of the Act, Congress would review the incident and take whatever action it determines to be necessary, including approval of compensation plans and appropriation of money, to provide full and prompt compensation to the public [PCCNA, undated, p. 4; DOE, 1999, pp. 15, 16].

Sections 170(m), (n), and (o) of the PAA provide, respectively, for: establishment of coordinated procedures for prompt handling, investigation, and settlement of claims; a caseload management panel to consolidate claims, establish priorities, and implement measures to encourage prompt, equitable, and efficient resolution of claims; and development of a plan for distribution of funds where such a plan is appropriate [DOE, 1999, p. 11].

How the PAA works for DOE activities. The Price-Anderson Act applies to DOE activities in much the same way as it applies to NRC licensees. The main difference is the source of the \$9.43 billion indemnification. Instead of the system of primary and secondary protection for nuclear reactors, the indemnification for DOE activities comes from the public as a whole, acting either as federal taxpayers or utility ratepayers, as explained in the next paragraphs [ed.]. If there were a reduction in the number of operating commercial power plants, the DOE indemnification would still remain constant, at \$9.43 billion [DOE, 1999, p. 16].

For nuclear activities conducted for the DOE, the Act achieves its objectives by requiring the DOE to include an indemnification in each contract that involves the risk of a nuclear accident [DOE, 1999, p. 1; DOE, 2002, p. M-23]. Protected persons could include contractors, subcontractors, shippers, transporters, emergency response workers, health professional personnel, workers, and victims [DOE, 2002, p. M-25]. The Act's broad definition of an indemnified "person" (see 42 USC 2214) would include both paid and volunteer emergency workers, but not persons who are covered by workers' compensation laws and employed in connection with the activity where the nuclear incident occurs [ed.].

The DOE itself (via the taxpayers) provides the indemnification; it self-insures against an incident, even if a contractor caused the incident through gross negligence or willful misconduct. The DOE incurs no out-of-pocket costs for insurance [SECC, undated; ANS, 2001; DOE, 1999, pp. 1, 2].

However, liability arising from activities funded by the Nuclear Waste Fund (e.g., the operation of a geologic repository for SNF and HLW) would be paid from that fund, which comes from fees on electricity generated by commercial nuclear power reactors [SECC, undated; 42 USC 10222]. These fees are included in consumers' power rates. The PAA says, "The Nuclear Waste Fund would be the source of the DOE indemnification with respect to any nuclear incident relating to the transportation, storage, disposal or other activities involving a repository for civilian spent fuel to the extent such activities were funded by the Waste Fund. In all other aspects, the DOE indemnity would operate exactly the same as it does with respect to other DOE activities that involve the risk of a nuclear incident [DOE, 1999, p. 20]."

The DOE indemnification covers all contractual activities conducted for the DOE in the United States with the potential to cause a nuclear incident [DOE, 1999, p. 18]. Companies hired by the DOE to transport SNF or HLW to a repository would be covered [Tetreault, 2001] from the moment when they take ownership of the SNF or HLW at the gate of an NRC-licensed facility [Lewis, 2003; Young, 2003]. If there were an accident during transportation but no nuclear incident, the DOE indemnification would cover any precautionary evacuation ordered by an authorized state or local official [DOE, 1999, p. 21]. However, the Act excludes from coverage shipments from an independent fuel storage installation, and transportation accidents where material is stolen and later released [Niles and Turner, 1998, pp. 2, 3]. Regarding an incident where payments would exceed \$9.43 billion, the Act requires the President to submit to Congress a plan for full and prompt compensation for all valid claims, within 90 days after a determination by the courts that the damage might exceed the DOE indemnification [DOE, 1999, p. 16].

DOE safety enforcement program. The DOE has adopted nuclear safety rules applicable to any person or organization involved in a contract to support work with nuclear materials. These rules are set forth in the *Code of Federal Regulations* [Brookhaven Natl. Lab., undated]. Section 234A of the Atomic Energy Act authorizes the DOE to impose maximum civil penalties of \$100,000 per violation per day on any contractor, subcontractor, or supplier covered by the indemnification who violates a nuclear safety requirement. Each violation and each day constitutes a separate violation. This amount has been adjusted for inflation and is now \$110,000 per violation per day. Seven specific non-profit institutions and their for-profit subcontractors are exempt from civil penalties, however [DOE, 1999, pp. 3, 22].

As of January 1999, the DOE's Office of Enforcement and Investigations had issued 33 proposed notices of violation to DOE contractors, including 28 civil penalties totaling \$1,995,000. All civil penalties issued to for-profit contractors had been paid [DOE, 1999, pp. 7, 8]. Over five years, DOE has fined about 65 firms a total of \$6 million for nuclear safety violations [Tetreault, 2001]. Indemnified DOE contractors are responsible for timely identification and reporting of noncompliance with safety requirements, and for their prompt correction. The DOE tracks enforcement actions on its website; one may view or download enforcement letters and actions [Brookhaven Natl. Lab., undated].

Other DOE-related aspects. The DOE generally self-insures against non-nuclear risks and reimburses contractors for property damage and third party liability claims resulting from such risks, except in cases of willful misconduct, lack of good faith, or failure to exercise prudent business judgment on the part of the contractor [DOE, 1999, p. 13]. The DOE has created citizen advisory boards at major sites to establish formal and informal communications between DOE and its stakeholders [DOE, 1999, p. 9].

All motor vehicles carrying SNF or HLW are required by the Motor Carrier Act (42 USC 10927) and implementing regulations (49 CFR 387) to maintain financial responsibility of at least \$5 million. Federal law does not require rail, barge, or air carriers of radioactive materials to maintain liability coverage. Private insurance policies often exclude coverage of nuclear accidents [DOE, 2002, p. M-26].

Price-Anderson and latent illnesses. In the event of a nuclear incident and a release of radioactivity, one concern is liability for latent illness, such as cancer, which may take years to develop. (For more information on latent illness, see the discussion of Three Mile Island and the related science on pp. 14 - 16.)

Congress addressed the problem of latent illness claims from extraordinary nuclear occurrences (ENOs), by requiring the waiver of defenses relating to statutes of limitations [PCCNA, undated, p. 2; ed.]--a person affected by an ENO may make a personal injury claim up to three years after discovering an injury, such as cancer, regardless of how long it has been since the incident. (Normally, State statutes of limitations would apply.) Since it is difficult to prove causation of latent illness, Congress has funded biomedical research to learn more about cancer induction [PCCNA, p. 2].

The Act contemplates the need to cover latent illness claims in case a very large accident causes a significant drain on available funds from insurance or, in the case of DOE contractors, from the government's indemnity [PCCNA, p. 1]. If a court finds that funds to cover all claims will probably be insufficient, the President must submit to Congress a compensation plan, including recommendations for money to be set aside for payment of claims that may arise as a result of latent injuries [Subsection 170(i)(2), in PCCNA, pp. 2, 3].

Also, no payment from the government's indemnity in excess of 15 percent of available funds may be made, if a court with jurisdiction has determined that claims will likely exceed the total fund, unless the court has found that such payment would be in accordance with a court-approved plan of distribution [Section 170(o), in PCCNA, p. 1, 2]. The NRC or the DOE, as appropriate, must submit plans of distribution, and other interested persons may also submit them. They must include an allocation of money for latent injury claims that may not be discovered until a later time [PCCNA, p. 2].

"Congress has long recognized that no allocation formula can be legislated in advance, and has chosen instead to vest considerable discretion in the court that has jurisdiction over claims arising out of the nuclear incident to adopt a plan that would provide for latent illness claims [S. Rep. 650, 89th Cong., 1st sess., pp. 16-17, in PCCNA, pp. 1, 2].

IV. LEGISLATIVE HISTORY OF THE PRICE-ANDERSON ACT

Overview. The Congress enacted the original Price-Anderson Act in 1957, and renewed and amended the Act in 1966, 1969, 1975, and 1988 [DOE, 1999, p. 5; DOE, 2002, p. M-23]. The Act also received a limited short-term extension in 2003 [H.J. Res. 2, 2003]. The relevant current legal citations are:

- Atomic Energy Act (AEA) of 1954, as amended, 42 USC 2210 et seq. (1994);
- Section 2014 (AEA section 11), definitions;
- Section 2210 (AEA section 170), indemnification and limitation of liability; and
- Section 2282a (AEA section 234A), civil monetary penalties for violations of DOE regulations [DOE, 2000].

Price-Anderson Act, 1957. Congress enacted the PAA in 1957 as an amendment to the Atomic Energy Act (AEA) of 1946 [P.L. 79-585, 60 Stat. 755, in Court of Appeals, p. 9]. Congress had enacted the AEA to establish an industry to generate inexpensive electrical power [Court of Appeals, 1999, p. 9]. The AEA created the Atomic Energy Commission and authorized the licensing of commercial nuclear power plants.

The AEA envisioned the nuclear industry as a government monopoly. But Congress later decided to permit the entry of the private sector, based on a belief that development of atomic energy for peaceful purposes, under a federal program of licensing and regulation, was in the national interest. The purpose of the Price-Anderson Act was to protect the public, by assuring money would be available to compensate victims for damages and injuries, and to encourage development of the atomic energy industry by providing financial protection in the event of a nuclear incident. Industry representatives said they would be forced to withdraw from the field without legislative limits on their liability, and it became apparent that nuclear power would not exist without such limits [Court of Appeals, 1999, p. 10; DOE, 1999, pp. 3, 4; Brownstein, 1984]. The 1957 Act limited the aggregate liability to \$500 million plus the amount of private insurance, which--in 1957--was \$60 million [Brownstein, 1984].

The record of the hearings on the original Act contains this statement: "[T]he question of protecting the public was raised where some unusual incident, such as negligence in maintaining an airplane motor, should cause an airplane to crash into a reactor and thereby cause damage to the public. Under this bill, the public is protected and the airplane company can also take advantage of the indemnification and other proceedings [DOE, 1999, p. 12]." A 1957 Senate report said the PAA would only be needed for 10 years, until the problem of reactor safety was solved and the insurance industry had experience on which to base a sound program [Public Citizen, 2001].

Price-Anderson Act, 1966. Although the original PAA was to expire on August 1, 1967, the availability of private insurance for nuclear reactors had not improved by 1965. In 1966, Congress extended the PAA to 1977, and capped aggregate liability at \$560 million [Brownstein, 1984].

The 1966 amendments introduced the waivers of certain defenses, discussed earlier in this report (page 3). The waiver of defense applied only to an extraordinary nuclear occurrence (ENO), defined as "any event causing a discharge or dispersal of source, special nuclear or by-product material from its intended place of confinement in amounts offsite or causing radiation levels offsite which the Commission determines to be substantial [Brownstein, 1984]." Because of concerns regarding latency periods, Congress adopted a waiver of statutes of limitations shorter than three years from discovery or ten years from the event. The report of the Joint Committee on Atomic Energy said that the Act would not cure problems of proof of causation--for ENOs or otherwise--and that proof was exceedingly difficult, if not impossible. But the Joint Committee supported continued study of the biological effects of radiation, and continued funding for biomedical research [PCCNA, undated, p. 4].

During consideration of the 1966 amendments, the Joint Committee on Atomic Energy expressed concern that a catastrophic accident would exhaust the total fund prior to emergence of possible latent injuries in some victims. Thus, the amendments granted discretion to the judicial branch to make sure funds were distributed in accordance with a court-approved plan [PCCNA, undated, p. 3].

Price-Anderson Act, 1975. Congress amended the PAA in 1975, and extended its expiration date to August 1, 1987. The amount of private insurance available to nuclear power plants had grown to \$125 million by 1975. Representatives of the nuclear industry said the Act should be extended in advance of its 1977 expiration date, to provide sufficient time for planning. The main changes were to phase out the government indemnity and to allow the liability ceiling of \$560 million to grow. These changes were accomplished through the imposition of retroactive premiums not to exceed \$5 million, levied on each nuclear power plant in case of an accident [Brownstein, 1984, p. 3].

In 1978, the U.S. Supreme Court overturned a lower court ruling that the PAA was unconstitutional. In the matter of *Duke Power vs. Carolina Environmental Study Group, Inc.*, the Supreme Court ruled that the PAA did not violate the equal protection provisions of the Constitution, since the importance of nuclear power must be balanced against the burden of those potentially harmed. The Study Group had challenged the PAA on two grounds: that it violated the Fifth Amendment because it failed to ensure adequate compensation for the victims of an accident, and that it violated the 14th Amendment by treating nuclear accidents differently than other accidents [Brownstein, 1984, p. 4].

Price-Anderson Amendments Act (PAAA) of 1988. In 1988, the Congress extended the PAA for 14 years to August 1, 2002 [P.L. 100-408, 102 Stat. 1066, in DOE 2002, p. M-23]. The 1988 amendments raised the primary insurance requirements to \$200 million and increased the aggregate liability to \$9.43 billion [SECC, undated; ed.]. The amendments also created a federal cause of action for public liability actions and provided that all such suits arise under the PAA [Court of Appeals, 1999, p. 11].

Prior to the 1988 amendments, the DOE had discretion under the Act to enter into indemnification agreements for contractors whose activities involved risk of public liability for a substantial nuclear incident. The 1988 amendments required the DOE to enter into such indemnification agreements, and removed the "substantial nuclear incident" limitation. [DOE, 1999, p. 17]. The amendments increased the amount of the DOE indemnification to \$9.43 billion [DOE, 1999, p. 5].

Further, the 1988 amendments gave DOE the authority to impose civil penalties on its indemnified contractors for violations of nuclear safety requirements (as discussed earlier in this report on page 6) and directed the DOE and the NRC to file reports with Congress for repeal, continuation, or modification of the PAA [DOE, 1999, pp. 3, 21].

The Price-Anderson Reauthorization Act of 2001. In December, 1997, the DOE published a notice of inquiry in the *Federal Register* (Vol. 62, pp. 68272 through 68278), seeking comments from the public on whether the provisions of the PAA should be continued, modified, or eliminated [DOE, 2000]. A number of persons, including Eureka County, responded. One can view their comments at the DOE's website. After considering the comments, the DOE recommended that Congress extend the PAA from its expiration date of August 1, 2002 [DOE, 2002, p. M-23].

On October 2, 2001, Representative Heather Wilson (R-NM) introduced H.R. 2983, the Price-Anderson Reauthorization Act of 2001. The House of Representatives passed the measure by voice vote on November 27, 2001 [U.S. Congress, 2002]. As of the date of this report, the Senate had not acted on the measure. (Senator Harry Reid [D-NV] introduced alternative legislation that would require power plant owners to find private insurance [Grove, 2002].)

The Reauthorization Act would:

- Reauthorize the PAA for 15 years, to August 1, 2017;
- Through retrospective premium increases, raise the industry's indemnity for nuclear power plants and related facilities to \$10.2 billion, plus a potential five percent surcharge;
- Raise the aggregate indemnity for DOE contractors from \$9.43 billion to \$10 billion, and require an inflation adjustment to the indemnification limit at least once every five years;
- Require the Secretary of Energy to issue industrial health and safety regulations applicable to contractors at DOE facilities, providing worker protection and establishing civil penalties equivalent to the regulations of the Occupational Safety and Health Administration; and
- Authorize the Attorney General to bring a federal action to recover amounts paid by the federal government under an indemnification agreement for public liability resulting from the intentional misconduct of any corporate officer, manager, or superintendent of a DOE contractor, subcontractor, or supplier.

The PAA expired on August 1, 2002, but in the Consolidated Appropriations Resolution of 2003, Congress extended its provisions, only as they apply to NRC licensees, until December 31, 2003 [Division O, H.J. Res. 2, 2003]. The indemnification under a DOE contract in effect on August 1, 2002, remains in place until the normal term of the contract is completed, but there is currently no indemnification under contracts entered into after that date [DOE, 1999, p. 5].

On September 29, 1997, the United States signed the Convention on Supplementary Compensation for Nuclear Damage, which is intended to "establish a global regime for dealing with legal liability and compensation in the event of a nuclear incident." Ratification of the Convention would require conforming amendments to the PAA, but would not result in significant changes [DOE, 1999, pp. 2, 24, 25].

V. ACTUAL APPLICATIONS OF THE PRICE-ANDERSON ACT

The literature on PAA contains a number of very different estimates of the total claims and payments made under the Price-Anderson Act. This subject would benefit from additional research beyond the scope of this report. Nevertheless, the references cited in the bibliography contain these summaries of actual PAA applications:

The Fernald, Ohio, cases. Since 1988, two cases in the U.S. District Court for the southern district of Ohio addressed alleged damages from activities occurring between 1950 and 1980 at the DOE's Feed Material Production Center (FMPC) in Fernald, Ohio [DOE, 1999, p. 13].

In the case known as *In re Fernald Litigation* [No. C-1-85-149 (S.D. Ohio Sept. 29, 1989)], property owners and residents living near the FMPC, local businesses, and employees--but not employees of the DOE contractor--alleged negligence, strict liability, public nuisance, willful and wanton misconduct, violation of the parent corporation's contractual guarantee, and violation of the PAA. The plaintiffs claimed damages for emotional distress and diminution of property values. A jury returned a verdict in favor of the plaintiffs of \$136 million, including \$1 million for diminution of property value, \$80 million for a medical monitoring fund, and \$55 million in punitive damages. The parties settled, and the DOE paid \$78 million. The DOE indemnity under the PAA was cited as the authority for the payment of the settlement [DOE, 1999, p. 13].

In 1990, workers and frequent visitors at the FMPC facilities filed the matter of *Day vs. NLO, Inc.* [No. C-1-90-67 (S.D. Ohio Dec. 22, 1994)]. The court dismissed the claims of some plaintiffs, since they were employees of indemnified persons and covered under state or federal workers' compensation acts. The court concluded that jurisdiction in this matter stemmed from the PAA, which was the source of the plaintiffs' claims. The DOE paid a \$20 million settlement in this case.

The Three Mile Island Accident. The TMI accident, described as the United States' worst nuclear accident, occurred on March 28, 1979 [Court of Appeals, 1999, p. 67]. It provides the main example of actual application of the Price-Anderson Act.

The Three Mile Island accident started when a pressure relief valve did not close, and as much as 5 million gallons of reactor coolant water was lost, discharged directly into the reactor building and auxiliary building, over several days. The reactor core became uncovered and began to heat up. Core temperatures reached 3500 to 4000 degrees F or more. Some of the fuel rods cracked, releasing radioactive material into the coolant water. About 10 hours into the incident, there was an explosion of hydrogen gas in the reactor building, and operators feared another explosion. They struggled for weeks to regain control and contain the radioactive releases caused by the accident, and the reactor was not stabilized until a month later, on April 27, 1989. The major pathway for the release of radiation to the environment was through the escape of coolant into the auxiliary building and through its ventilation system [Court of Appeals, 1999, p. 66 - 70].

In response to the TMI accident, representatives of the plant's insurance pool traveled to Harrisburg. They established an office on March 31, and placed advertisements in local

newspapers to publicize their presence in the area. The plant's insurance paid for the living expenses of families that decided to evacuate, although no evacuation was ordered. The insurance representatives made payments of about \$12,000 on their first day of operations, and paid \$1.2 million in evacuation claims to 3,170 claimants. Insurance also paid more than \$92,000 in lost wage claims to 636 persons [ANS, 2001].

The accident generated a large number of lawsuits against the defendants: General Public Utilities, Inc.; Metropolitan Edison Company; Jersey Central Power and Light Company; Pennsylvania Electric Company; Babcock and Wilcox Company; McDermott, Inc.; Raytheon Constructors, Inc.; and Burns and Roe Enterprises, Inc.--the owners or operators of the facilities, companies that had provided design, engineering, and maintenance services, and vendors of equipment and system [Court of Appeals, p. 9]. A number of TMI-related lawsuits not involving personal injury were settled, including a class action lawsuit for property loss, evacuation losses, and expenses for individuals, corporations, and municipalities. Some health claims were also settled. More lawsuits are pending, including actions filed by a group of veterinarians and by the tourism industry [TMI Alert, 1999].

The defendants settled non-personal injury claims brought by individuals, businesses, and non-profit organizations within a 25-mile radius of the TMI facility [*Stibitz v. General Public Utility Corp.*, 746 F.2d.933, 995 n.1 (3d Cir. 1984) in Court of Appeals, p. 9]. The plaintiffs in the class action were businesses that suffered economic loss; individuals who suffered economic loss; and individuals who sought medical detection services allegedly needed because of the accident. Under the 1981 settlement, a \$25 million fund was established, with \$20 million available to pay claims of businesses and individuals, and \$5 million set aside for the Three Mile Island Public Health Fund, one purpose of which was to finance studies of long-term health effects of the TMI accident [ANS, 2001; Court of Appeals, 1999, p. 76].

In 1982, after the federal district court dismissed two suits seeking reimbursement for the costs of emergency services provided during the accident, the U.S. Circuit Court of Appeals reinstated the cases, resulting in settlements of \$250,000 to the Commonwealth of Pennsylvania and \$225,000 to municipalities [TMI Alert, 1999].

The TMI personal injury cases. In 1985, Metropolitan Edison's insurance paid over \$3.9 million for settlements of personal injury lawsuits, some involving children. The largest settlement, over \$1 million, was for a child born with Down's syndrome. Stipulations incorporated into the settlement agreements prohibited plaintiffs from discussing their settlements [TMI Alert, 1999]. Although no health damages from the TMI accident were substantiated, payments through 1997 totaled more than \$70 million, including \$42 million in indemnity settlements and \$28 million in expenses. The payments were all from the plant's primary insurance coverage; funds from secondary protection were not needed [ANS, 2001; Barton, 2001].

However, a very large number of personal injury claims stemming from the TMI accident are still pending in the courts. More than 2,600 plaintiffs filed claims for personal injuries purportedly caused by exposure to radioactive materials released during the accident. Some claims were originally filed in the early 1980s in state and federal district courts in Pennsylvania, New Jersey, and Mississippi. The plaintiffs removed the state court actions to federal district

courts in Pennsylvania and New Jersey, under the authority of the PAA [Court of Appeals, p. 9]. But the federal appeals court ruled that "the Price-Anderson Act did not create a cause of action as a federal tort and was not intended to confer jurisdiction on federal district courts," remanded the state court personal injury actions, and transferred the federal court actions to the appropriate state courts [Court of Appeals, pp. 10, 11]. In 1985 and 1986, after the remands and transfers, the bulk of the TMI personal injury cases were filed in state courts [Court of Appeals, p. 10].

The personal injury cases eventually came back to the federal courts, however. After enactment of the 1988 amendments to the PAA, which created a federal cause of action [Court of Appeals, p. 11], the defendants removed all of the pending state actions to the U.S. District Court for the Middle District of Pennsylvania. The Third Circuit Court of Appeals subsequently upheld the constitutionality of the retroactive application of federal jurisdiction [Court of Appeals, 1999, p. 12]. The District Court dismissed 42 claims as time barred, applying Pennsylvania's two-year statute of limitations; the Third Circuit Court affirmed this ruling [Court of Appeals, 1999, pp. 13, 14]. (If the incident had been declared an ENO, the defendants would have been required to waive the more-stringent statute of limitations defense [ed.])

The cases were consolidated into several class action lawsuits before District Court Judge Sylvia Rambo. The plaintiffs proposed, and the court adopted, a case management program calling for an initial "mini-trial" of the claims of twelve typical defendants, half selected by the plaintiffs and half selected by the defendants [Court of Appeals, p. 15]. After conducting hearings, the Judge ruled that much of the plaintiffs' expert testimony was inadmissible, and dismissed the lawsuits on summary judgment. Although she was convinced that the majority of the plaintiffs' experts were well qualified, Judge Rambo found many of their opinions to be based on scientifically unreliable methods and upon data on which a reasonable expert in the field would not rely [Court of Appeals, 1999, p. 15].

The plaintiffs then appealed to the Third Circuit Court of Appeals, which issued a lengthy decision: (1) affirming the district court's grant of summary judgment in favor of the defendants and against the trial plaintiffs, (2) holding that the district court's extension of the summary judgment to "non-trial" plaintiffs (i.e., those plaintiffs not directly represented by counsel in the mini-trial) was error, (3) reversing the grant of summary judgment to the defendants on the non-trial plaintiffs' claims, and remanded those claims to the district court for further proceedings, and (4) making other rulings on legal matters including sanctions and reassignment [Court of Appeals, 1999, pp. 190-203]. Thus, although the Court of Appeals upheld Judge Rambo's grant of summary judgment against the small number of plaintiffs who had been chosen for the mini-trial, the cases of the non-trial plaintiffs are still pending at the federal district court level, over 20 years after the accident [ed.].

To gain a more complete perspective on the outcome of the lawsuits generated by the TMI accident, it is important to understand some of the scientific and legal issues involved. The following sections summarize information on the scientific background and the rules of evidence from the Third Circuit's decision.

Scientific background information related to the TMI lawsuits. The Third Circuit Court's decision on the personal injury cases of the TMI plaintiffs includes a fairly complete summary of the principles of nuclear physics, nuclear engineering, the TMI-2 accident, ionizing radiation, and the health effects of radiation on the human body. The court says these principles "are at the center of the damage that plaintiffs claim they suffered as a result of the TMI accident . . . [Court of Appeals, 1999, p. 18]." The personal injury plaintiffs allege that they have developed radiation-induced neoplasms (i.e., cancer) because of their exposure to ionizing radiation resulting from the TMI accident [Court of Appeals, 1999, p. 9].

When cell tissue is irradiated, the scientific evidence indicates that DNA is the principal target and the most critical site for lethal damage. Scientists believe that DNA is the critical cellular component injured at low doses of radiation. Ionizing radiation can damage cells directly, by setting electrons in motion, or indirectly, by chemical production of free radicals [Court of Appeals, 1999, p. 37]. "Ionizing radiation" means a stream of particles--electrons, neutrons, protons, alpha particles, photons, or a combination--that creates charged particles that excite and ionize atoms in their path [ed.].

Not all damage to DNA from radiation is harmful. Cells have repair systems and can quickly repair breaks in DNA, with no long-term cellular consequence. Alternatively, the repair may not return the DNA to its original form, but may retain its integrity. If cellular damage is not repaired, it may prevent the cell from surviving or reproducing, or it may result in a viable but modified cell. These two outcomes have different results, leading either to deterministic or stochastic effects [Court of Appeals, 1999, pp. 37, 38].

Deterministic effects of radiation are totally predictable. Their severity is a direct consequence of the radiation dose. They occur when an organism cannot compensate for the loss of dead cells by making viable cells. Cell death normally becomes apparent within a few hours or days of irradiation. After a tissue or organ absorbs a threshold dose, its function is harmed. In severe cases, the organism dies. Deterministic effects include erythema (reddening of the skin), bone marrow depression, radiation cataracts, sterility, and acute radiation syndrome. Above a certain whole body dose (about 600 rad), death is almost certain. About half that dose (300 rad) would be lethal to half of an irradiated population that received no medical care. This is the "median lethal dose [Court of Appeals, 1999, pp. 37 - 40]."

In contrast, stochastic effects occur at random, and their probability of occurrence (not their severity) is determined by the dose [Court of Appeals, 1999, p. 38]. They occur when an irradiated cell is modified but not killed. Since there is a finite possibility of a stochastic effect, even at very small doses, scientists assume there is no threshold for the initiation of a stochastic effect. The possibility of a stochastic event must be taken into account at all doses; the probability of a resulting cancer increases proportionately with dose [Court of Appeals, 1999, p. 41]. The severity of the cancer does not depend on the level of the dose that triggered it [Court of Appeals, 1999, p. 43].

In general, there are two types of stochastic effects: those inducing cancer in the exposed person, and those resulting in hereditary disorders in their descendants. However, science has not yet clearly demonstrated hereditary effects in humans. Hereditary effects are presumed to exist

based on research on mice [Court of Appeals, 1999, p. 41]. Therefore, in the TMI personal injury cases, the type of stochastic effect resulting in induction of cancer was the main issue [Court of Appeals, 1999, p. 42].

The intervening time between exposure to radiation and the detection of a resulting cancer is the "latency period." Depending on the type of cancer, the minimum latency period is between two and ten years [Court of Appeals, 1999, p. 43].

"Although there is a scientific consensus that ionizing radiation can cause cancer, [it] is not currently known to leave a tell-tale marker in those cells which subsequently become malignant [Court of Appeals, 1999, p. 43]." Medical examination alone cannot prove, or disprove, that a specific radiation exposure caused a specific cancer. Causation can be established--if at all--only from epidemiological studies of exposed persons. Further, the establishment of causation is complicated by the fact that, even without exposure to radiation, about a third of the population in industrialized countries will develop cancer and about 20 percent will die of cancer. Determination of causation is also complicated by the presence of both natural and man-made radiation in the environment [Court of Appeals, 1999, pp. 43, 44].

Evidentiary requirements imposed on the TMI plaintiffs. As the previous paragraphs explain, the crux of the personal injury claims of the TMI plaintiffs is cancer induction, a stochastic (i.e., random) effect of radiation exposure, for which proof of causation is extremely difficult. The trial judge refused to admit into evidence most of the expert testimony proposed by the plaintiffs, despite a finding that the experts themselves were, for the most part, well qualified. The primary issue, upon appeal to the Third Circuit, was the whether the trial judge had erred in refusing to admit that evidence [ed.].

In its decision, the Third Circuit said that the plaintiffs must establish four facts: (1) the defendants released radiation into the environment in excess of the levels permitted by federal regulations in effect at the time of the accident, (2) the plaintiffs were exposed to that radiation, although not necessarily at the levels prohibited by the regulations, (3) the plaintiffs have injuries, and (4) the radiation was the cause of those injuries [Court of Appeals, 1999, p. 14].

To meet the evidentiary standards imposed by the courts, the plaintiffs employed expert scientific witnesses. The admissibility of scientific evidence is governed by the federal rules of evidence, as well as case law. One case that established much of the precedent for consideration of the testimony of expert witnesses in these types of lawsuits is known as "Daubert," or *Daubert vs. Merrell Dow Pharmaceuticals, Inc.* (509 U.S. 579 (1993)) [Court of Appeals, 1999, p. 15]. Another such case is known as "Paoli II [Court of Appeals, 1999, p. 82]."

In the Daubert case, the court said that "an inference or assertion must be derived by the scientific method. Proposed testimony must be supported by appropriate validation--i.e., 'good grounds' In short the requirement that an expert's testimony pertaining to 'scientific knowledge' establishes a standard of evidentiary reliability [Court of Appeals, 1999, p. 79]."

In the Paoli II matter, the Third Circuit identified eight tests to help determine whether a scientific methodology is reliable: (1) does it consist of a testable hypothesis, (2) has it been

subjected to peer review, (3) what is the known or potential rate of error, (4) do standards controlling the technique's operation exist, and were they maintained, (5) is the technique generally accepted, (6) what is the relationship of the technique to other techniques established as reliable, (7) what are the qualifications of the expert, and (8) what are the non-judicial uses of the method? The Daubert decision also referred to the first, second, third, and fifth tests in this list [Court of Appeals, 1999, pp. 81, 82].

Finally, when a court considers the admissibility of scientific evidence, the court's inquiry focuses on principles and methodology, not on the conclusions generated. However, the conclusions must reliably flow from the facts known to the expert and from the methodology employed. The gap between the data and the expert's opinion must not be too great [Court of Appeals, 1999, p. 84].

Thus, a plaintiff's expert witness in a personal injury case involving a nuclear incident, who is asked to establish that a plaintiff's cancer was caused by the radiation released in the incident, faces a daunting task. It may be extremely difficult, if not impossible, to prove causation. According to the scientific background provided earlier in this report, such proof would depend on epidemiological studies. And, in the absence of an ENO declaration, an injury might not be discovered until after the state statute of limitations has been exceeded [ed.].

Further, in the context of the proposed transportation of SNF and HLW through rural areas, such as Eureka County, it may also be difficult to meet two other requirements imposed by the Third Circuit in the TMI matter: (1) showing that the defendants released radiation into the environment in excess of the levels permitted by federal regulations in effect at the time of the accident and (2) showing that the plaintiffs were exposed to that radiation, although not necessarily at the levels prohibited by the regulations. In the case of a nuclear reactor, such as the one at Three Mile Island, a radiation monitoring network would likely be in place around the reactor site. Whether an effective monitoring network could be, or would be, installed along a spur rail line through a rural area is unknown at this time [ed.].

VI. SUGGESTIONS FOR ADDITIONAL RESEARCH

Eureka County and others interested in the Price-Anderson Act and its applications may benefit from additional research and study of the following subjects, among others:

- How, and under whose authority, would the PAA apply to the DOE's proposed geologic repository at Yucca Mountain? The repository would be a DOE facility licensed by the NRC.
- The applicability of the PAA to transport of high-level radioactive waste (HLW) from Department of Defense facilities needs to be confirmed.
- How broad is the exclusion of coverage for workers' compensation claims, especially with respect to transportation of SNF and HLW, DOE contractors and subcontractors, and third parties?

- Since, in the absence of an extraordinary nuclear event or ENO, Nevada's laws would cover the determination of whether someone is liable for damages, what exactly do those laws say?
- What other information is available on actual applications of the PAA? Specifically, what sorts of claims have been denied, based on procedural considerations or substantive exclusions from the PAA indemnification?
- How will future Price-Anderson reauthorization legislation affect the existing provisions of the Act?

David S. Ziegler, AICP, doing business in Carson City, NV, as **Ziegler Technical**, researched and wrote this report. The report was prepared for Abigail C. Johnson Consulting, Carson City, NV, and the Board of Eureka County Commissioners.

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