1998 ANNUAL REPORT

FEDERAL PROGRAMS FOR THE MANAGEMENT OF HIGH-LEVEL RADIOACTIVE WASTE

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Environmental Quality Board
Minnesota Office of Strategic and Long Range Planning

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1998 Report to the Legislature

Federal High-Level Radioactive Waste Activities

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Acronyms

CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
LWR	Light Water Reactor
MPC	Multipurpose Canister
MRS	Monitored Retrievable Storage
MTU	Metric tons uranium
PFS	Private Fuel Storage, Inc.
NSP	Northern States Power Company
NRC	U.S. Nuclear Regulatory Commission
NWPA	Nuclear Waste Policy Act
OCRWM	U.S. DOE Office of Civilian Radioactive Waste Management
WIPP	Waste Isolation Pilot Plant

Principal Resources

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International Energy Outlook 1998:Nuclear Power, U.S. Energy Info. Administration, U.S. DOE, 1998
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Executive Summary

Implementation of congressional policy on nuclear waste by the U.S. Department of Energy (DOE) remains in turmoil as pressure mounts to show progress on the national repository and to remove utility spent fuel from civilian reactor sites. Federal policy continues to rely on storage at reactor sites until a national repository is constructed. Because the contractual acceptance date lapsed in 1998, the DOE is considering payments to utilities to continue storage at reactors.

Debate continued through 1998 at the federal level over the nation=s nuclear waste management policy. Argued both in Congress and in court, a fundamental dispute between the administration and the nuclear utility industry has focused on when the federal government will remove waste from commercial reactor sites, which are running out of storage room.

As in 1996 and again in 1997 legislation mandating a temporary storage facility near Yucca Mountain, Nevada narrowly failed. Similar legislation has again been proposed, but will require veto-proof support to become law. President Clinton has promised to veto the legislation, believing it imperative to first conclude that Yucca Mountain is an acceptable site.

On February 2, 1998, the DOE officially defaulted on its directive to begin accepting spent fuel from electric utilities. This date and obligation had been the focus of legal challenges by states and utilities for several years. The utilities have begun to pursue breach of contract suits against DOE to at least recover costs of extended storage at reactor sites.

Meanwhile, DOE studies of Yucca Mountain have continued amid controversy. The DOE completed a viability assessment, which it considers a major milestone. The DOE still hopes to receive approvals in time to allow waste disposal in the repository to begin in 2010.

Though the fate of renewed legislation to build a federal interim storage facility is uncertain at best, a private initiative led by Northern States Power is seeking certification by the Nuclear Regulatory Commission (NRC) that would permit construction on a tribal reservation site in Utah, and hopefully allow movement of at-reactor stored wastes in 2002. Spent fuel could be transported by individual utilities under existing regulations.

In anticipation that the federal government will accept and move wastes at some point on a large scale, planning for an expanded transportation infrastructure remains active, though a federal transportation system to move commercial spent fuel is still years from being implemented. States have begun legislating transportation management provisions to prepare for emergency response capabilities. Major issues in the transportation debate are the extent of the risks posed by a national shipping campaign for spent fuel, the adequacy of federal regulation of transportation safety, and the possible concentration of shipments along certain major east-west transportation routes.

I. Minnesota=s Nuclear Waste Monitoring Program

The state High-level Radioactive Waste program was developed to ensure that Minnesota is prepared to respond to federal high-level nuclear waste storage, transportation, and disposal policy issues. At the time the legislation was enacted, the U.S. Department of Energy (DOE) was looking at Minnesota as a potential host state for a geologic high-level waste repository. The statute specified that the State Planning Agency (now Office of Strategic and Long Range Planning) was responsible for monitoring federal activities, and that it also provide staff to the Minnesota Governor=s Nuclear Waste Council.

In 1987, Congress acted to remove Minnesota from consideration as a host state for a permanent repository and selected Yucca Mountain, Nevada as the single candidate site. As provided in the Minnesota law, the state=s Nuclear Waste Council was terminated at that point.

Because Minnesota was no longer being formally considered as a federal repository host state, the Council=s duty to monitor the federal high-level radioactive waste program was assigned to Office of Strategic and Long-Range Planning (Minnesota Planning). As an administrative unit within Minnesota Planning, the Minnesota Environmental Quality Board provides staff for the high-level waste program.

The state's high-level waste monitoring program is funded through an assessment on state nuclear utilities. Currently, the only high-level radioactive waste produced in Minnesota is spent fuel from Northern States Power Company=s dual Prairie Island reactors and single Monticello reactor. Since NSP is the only nuclear utility in the state, it has been responsible for all payments into the program. This assessment terminates when the Department of Energy begins construction of a high-level waste disposal site in another state. The annual assessment has been capped at $42,000 by appropriation for the past six years.

Low-level radioactive waste is, by definition, any waste which is not high-level. Though low-level waste is produced at Minnesota=s nuclear power plants, it is regulated and managed separately from spent fuel. It is not monitored by this program. The Minnesota Pollution Control Agency manages the state=s low-level radioactive waste program.

This annual report has been provided to the legislature for the past ten years. Previous editions are available at the Minnesota Legislative Reference Library.

II. Federal High-Level Waste Program

Viewed in a broad federal policy perspective, no major changes of concern to Minnesota occurred in 1998. There continues to be much federal activity and intense debate on many fronts related to nuclear wastes, but agreement on substantive change in fundamental policy has not been achieved. The DOE, with the President=s support, has steadfastly tried to maintain momentum toward development of the Yucca Mountain national waste repository, while leaving electric utilities and the states to struggle with how to manage the buildup of

spent fuel at reactors. Congress is again being asked to order development of an interim storage facility. There is also an active NRC licensing review for a private storage facility which, if approved and developed according to schedule, could result in movement of waste in several years, though it is uncertain what, if any, role DOE would have in that transportation. Design and modal planning for transportation of commercial spent fuel by the DOE, and alternatively by utilities themselves, is ramping up to prepare for these contingencies.

While the DOE has responsibilities for both nuclear defense wastes and commercial spent fuel, the focus of this report is on federal programs for the disposal of commercial spent fuel generated by the nation=s nuclear utilities. However, it is important to recognize that the two responsibilities are interrelated technically, politically, and administratively. Thus while the generators of commercial spent fuel, i.e., the nuclear utility industry, may appear to be the central players in the nuclear waste debate, the nation=s defense infrastructure and its attendant industry are also central players, and have significant influence on many aspects of nuclear waste policy. (DOE has much less spent fuel than civilian nuclear utilities, about 2,600 tons, stored in four locations: Hanford in Washington, Idaho National Engineering Laboratory, Savannah River in South Carolina, and West Valley Site in New York.)

Nuclear utilities, which pay for most of the high-level waste disposal program through a fee on nuclear power, have grown increasingly concerned about the program's slow progress. Although some of the delays have been blamed on poor program management, DOE contends that tight funding has been a major barrier. DOE cannot spend the nuclear industry's nuclear waste fees without congressional approval, and until FY1995 the President had requested and Congress has appropriated only about half the fees collected. After a funding increase in FY1995, funding was sharply reduced in FY1996 and has remained at the lower level through FY1999.

On February 2, 1998, the DOE officially defaulted on its directive to begin accepting spent fuel from electric utilities. This date and obligation had been the focus of legal challenges by states and utilities for several years, and the driving basis for legislative efforts to develop an interim storage facility. The default set off a new round of lawsuits and calls for legislative solutions. The DOE’s overall strategy did not flinch in response to criticisms. Rather, the agency reacted principally to the likelihood of the forced compensation to utilities, beginning its defense by downplaying the significance of costs to utilities which continue to store spent fuel.

Administration changes at the DOE in 1998 included the resignation of Energy Secretary Fedrico Peña on June 30. Bill Richardson, U.S. Ambassador to the U.N. and former Democratic congressman from New Mexico, was named Secretary to replace Peña. In confirmation hearings, Republicans again pressed Richardson, as they had Peña earlier, on a commitment to support legislation for an interim storage facility.

The major issues surrounding high-level nuclear waste continue to be (1) the status of

repository development at Yucca Mountain, Nevada, (2) interim storage facilities, and (3) transportation planning. Each of these major issues are addressed in the following subsections of this report.

A. Permanent Repository

Background

Under the Nuclear Waste Policy Act of 1982 (NWPA) and 1987 amendments, the Department of Energy (DOE) is studying the suitability of Yucca Mountain, Nevada, for housing a deep underground repository for spent nuclear fuel and other highly radioactive waste. The state of Nevada has fought DOE's efforts on the grounds that the site is unsafe, pointing to potential volcanic activity, earthquakes, underground flooding, nuclear chain reactions, and fossil fuel and mineral deposits could be mined in the future. DOE contends that the evidence so far indicates that Yucca Mountain is likely to prove suitable and that studies of the site should continue. The planned Yucca Mountain repository is not scheduled to open until 2010 at the earliest, more than a decade later than the 1998 goal specified by NWPA.

The safety of geologic disposal of highly radioactive waste, as planned in the United States, depends primarily on the characteristics of the rock formations from which a repository would be excavated. Because many geologic formations are believed to have remained undisturbed for millions of years, it appeared technically feasible to isolate radioactive materials from the environment until they decayed to safe levels. "There is no scientific or technical reason to think that a satisfactory geological repository cannot be built," according to the National Research Council.

But, as the Yucca Mountain situation indicates, scientific confidence about the concept of deep geologic disposal has turned out to be difficult to apply to specific sites. Every high-level waste site that has been proposed by DOE and its predecessor agencies has faced allegations or discovery of unacceptable flaws, such as groundwater flow or earthquake vulnerability, that could release radioactivity into the environment. Much of the problem results from the inherent uncertainty involved in predicting geologic behavior for the 10,000-year period (or even longer) that nuclear waste is to be isolated. Opponents of geologic disposal have urged greater emphasis on new or alternative technologies that might allow entirely different approaches to high-level radioactive waste management.

Status

Given the current budget restraints, which are expected to continue, DOE's revised waste program is aimed at opening the repository no sooner than 2010. Under the latest revised program plan, DOE was to have completed a "viability assessment" of Yucca Mountain by fall 1998, followed by an environmental impact statement in 2000. If the site appears acceptable, DOE would recommend approval by the President in 2001 and, with Presidential approval, submit a license application to NRC in 2002. DOE then hopes to receive the necessary NRC construction permit and operating license in time to allow waste disposal in the repository to begin in 2010. The repository is to be permanently

closed in 2071, by which time the program's total cost (in 1994 dollars) will have reached $33 billion, according to a September 1995 DOE estimate.

DOE did complete and release its Viability Assessment for Yucca Mountain in December 1998. This represents a major milestone. The report is intended to provide the President, Congress and the public with information on progress of the scientific analysis of the Yucca Mountain site, and identify critical issues that remain to be resolved before the Energy Secretary can make a decision in 2001 on whether to recommend the site to the president for development as a repository. Among the issues that remain to be resolved are how key natural processes at Yucca Mountain, such as ground water movement, would affect the long-term performance of the repository and waste package design. As expected, the industry and its supporters in Congress hailed the report as a positive achievement and called for approval of an interim storage facility adjacent to Yucca Mountain since it was certain to be found acceptable. Opponents cited many aspects of the report which should disqualify the site. The Viability Assessment's Overview has been included in this report as Appendix 1.

If authorized, the repository will be developed at the Yucca Mountain site, about 100 miles northwest of Las Vegas in Nevada. The site is currently undergoing characterization to determine its suitability for hosting the repository, in accordance with 10 CFR Part 960, General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories. Because they were originally written to be generally applicable to multiple sites, DOE is proposing to revise relevant portions of the guidelines to be specifically applicable to the Yucca Mountain site.

A large-scale test to determine how the underground environment will respond to heating and cooling of high-level waste packages began in December 1997. A cross-drift tunnel that plays a critical role in determining whether the site will become the nation's permanent storage site for high-level waste was started. The 2,820-meter long tunnel will provide information about fracture patterns, potential faults, distinct rock layers and hydrologic characteristics of the repository. Related research, called the drift scale heater test, also began in late 1997, and will last for 10 years, with a four-year heating phase followed by a four-year cooling phase. Other studies looking at radionuclide release, hydrology, and geochemistry were also begun in 1998.

Although the statutory capacity of the repository is 70,000 metric tons uranium (MTU) or equivalent of spent fuel and high-level waste, the repository may be physically capable of accommodating a larger capacity. Of the initial statutory capacity, 63,000 MTU will be utility waste and 7000 MTU will be government/military waste. A single repository that is capable of holding all of the nation's nuclear waste is assumed at this time to be a cost-effective alternative to a second repository, the need for which is to be recommended by the Secretary of Energy to the President between 2007 and 2010. DOE records show that through 1994, 30,000 MTU of commercial spent fuel had been generated by utilities. Projections to 2035 show that 87,000 MTU will have been generated by utility reactors. These projections assume no new reactors and operation of 40 years.

B. Central Interim Storage

The DOE Plan

The 1987 NWPA amendments authorized construction of a monitored retrievable storage (MRS) facility to store spent fuel and prepare it for delivery to the repository. The facility was intended to allow utilities to ship spent fuel from full reactor pools and to store it temporarily while the permanent repository was being built. But because of fears that the MRS would reduce the need to open the permanent repository and become a de facto repository itself, the law forbids DOE from building an interim facility until it was certain that the repository would be built.

Other Remedies

Delays in the repository program have prompted renewed interest in an interim storage facility that would be available earlier than the MRS. Without such interim storage, large amounts of additional storage space must be constructed at nuclear power plant sites. But current law sharply limits the usefulness of the MRS facility as an interim storage site, because the longer the repository is delayed, the longer the MRS must be delayed as well. Responses to the perceived need for interim storage as soon as possible have been in the forms of a major legislative campaign to amend the NWPA to require federal interim storage immediately and utility initiatives to develop a private interim storage facility.

Consideration has also been given to storage of commercial spent fuel at various nuclear-related DOE installations other than Yucca Mountain, such as the Savannah River Site in South Carolina and the Hanford Site in Washington. The presumption is that it would be easier to expand these established sites than to create a new site near Yucca Mountain. But the existing sites have on-going, substantial disposal issues related to military production. Controversy is expected to be a limitation and "temporary" is not clearly defined.

A private storage facility is not a new idea. Two private central storage facilities already exist -- at former reprocessing plants in New York and Illinois. Both are pool storage facilities, and neither is currently accepting additional spent fuel. They were developed by two reactor vendors, Westinghouse and General Electric. When the NSP's Monticello plant was built, NSP and General Electric entered into an agreement that made possible the shipment to Illinois of 1,058 spent fuel assemblies between 1984 and 1987. There were 30 dedicated rail shipments which generated controversy in Minnesota and Wisconsin. The shipments created space in the Monticello storage pool. This will allow operation of the reactor through its current license (2010) without storage expansion.

More recent initiatives have been discussed in several contexts, but the most prominent has been that proposed by a consortium of eight nuclear utilities, led by NSP. The group, Private Fuel Storage, Inc., applied to the NRC in 1997 for a license to build a commercial spent fuel storage facility on the Utah reservation of the Skull Valley Band of Goshutes.

Privately owned central storage facilities would require NRC licensing under the same regulations that would apply to a DOE-owned MRS facility.

The utility group is essentially the same entity that had negotiated with the Mescalero Apaches to build a private interim storage facility on the tribe=s New Mexico reservation. Negotiations with the Tribe were not successful, and the project was abandoned in 1996.

The Utah site is in a desert valley about 40 miles west of Salt Lake City. The license application describes a design that would allow the storage of up to 40,000 metric tons in about 4,000 sealed canisters. The storage facility, which would begin receiving spent fuel beginning in 2002, would cost about $130 million to license and construct. A dual purpose cask system would be certified separately, and deployed to transport spent fuel from reactor storage sites to the Utah facility, where it would remain until federal acceptance. The NRC conducted public environmental impact statement (EIS) scoping meetings on the proposed facility in Skull Valley, Utah in June 1998, and issued a Scoping Report in September 1998. The EIS is being prepared by the NRC

In the State of Utah, the plan faces major opposition from Governor Mike Leavitt and other Utah leaders who vehemently oppose such a facility in the state, but the Goshutes= sovereignty over their reservation appears to preclude state authority to regulate or block the proposed project. The governor sought to have the road accessing the proposed site redesignated a state road so shipments could be blocked by the state. A similar effort is underway to redesignate lands around the reservation so that a proposed new rail line could also be blocked. The local Tooele County government, which has expressed an interest in discussing the proposal, is unhappy with the state=s tactics. Tooele County, Utah already is the site of one of the nation's largest commercial landfills for low-level radioactive waste. Bills are being heard in the current session of the Utah legislature that are designed to block the proposal.

Formal NRC hearings on a draft EIS are expected in 1999. The proposers are hopeful that the facility could be operating by 2002.

A January 1999 annual staff report to the NRC noted that “This lengthy and complex proceeding currently involves 5 admitted parties, including Native American groups who oppose the Skull Valley Band's agreement with Private Fuel Storage, and the state of Utah, which is vigorously contesting the facility. Contested issues include financial qualifications, environmental justice, NEPA (National Environmental Policy Act) matters, the security plan, and numerous technical questions.”

Previous proposals for private storage facilities have required nuclear utilities to retain ownership of any spent fuel that they shipped to such sites. As a result, utilities would risk being required to take back their spent fuel if DOE were unable to begin accepting it before a storage facility closed. Although such private storage facilities would not necessarily solve nuclear utilities= long-term waste problems, they could provide an alternative for power plants that were facing state and local obstacles to the expansion of on-site storage.

A privately developed nuclear waste storage facility at the Yucca Mountain site was proposed by Senator Rod Grams during the 104th Congress (S. 1478). Under that plan, a consortium of nuclear utilities and other firms would receive money from the Nuclear Waste Fund to build a storage facility on DOE land at Yucca Mountain for at least 40,000 metric tons of commercial spent fuel. Once the facility authorized by S. 1478 was licensed by NRC, it would receive spent fuel taken by DOE from reactor sites, allowing DOE to fulfill its responsibilities under its contracts with nuclear utilities. Unlike the situation at other proposed private storage facilities, spent fuel sent to the private facility under S. 1478 would have been owned by DOE and no longer the responsibility of the utilities that generated it. DOE also would assume ownership of the storage facility before decommissioning, with costs to be paid from the Nuclear Waste Fund. Senator Grams' proposal was not enacted.

Though little information is available, a private interim spent fuel storage project, named Owl Creek Energy Project, may still be planned at a site in central Wyoming.

The Mescalero Tribe of New Mexico had indicated, when its planning with the NSP consortium failed, that it intended to pursue a private storage facility on its own, but no current information on this intent is available.

C. Transportation Planning

More than 80,000 metric tons of spent nuclear fuel are expected to be discharged from today's nuclear power plants during their scheduled operating lives. Unless spent fuel is to be kept permanently at reactor sites, it will have to be transported elsewhere for long-term storage and disposal X a prospect that continues to generate considerable controversy along potential transportation routes.

<u>The DOE Plan</u>
The DOE continues to plan on use of private contracts to provide the necessary services and equipment required to accept and transport commercial spent fuel to a DOE facility. These services and equipment will be procured by awarding one or more contracts, with each contract covering utility reactor sites in four regions in the continental United States. Each contractor will be responsible for all activities and services in its region, including the provision of transportation and storage cask/canister systems, storage modules, and ancillary equipment, as required, to accept commercial spent fuel and transport it to a designated federal facility for storage or disposal. Specific performance requirements for each contractor will be set forth in detail in the procurement documents.

Transportation will be carried out using commercially available equipment and approved routes in compliance with Nuclear Regulatory Commission and Department of Transportation regulations. Cask/canister systems to be used for transportation and storage will not be specified by DOE. They will be developed by industry, certified by the Nuclear Regulatory Commission, and deployed to meet the waste delivery schedules.

Interface requirements will be specified by DOE to ensure that the casks and canisters will be compatible with handling facilities at the federal facility.

Cask/canister systems differ in whether they employ casks or canisters; whether their functions include transportation, storage, and/or disposal; and how they are transported. In canister systems, spent fuel is sealed inside a canister and the sealed canister is placed into an overpack for transportation, storage, or disposal. The use of canisters may reduce the number of times individual fuel assemblies have to be handled during transport, storage and disposal. Casks/canisters designed and certified for a single use only, such as for transportation or storage, are known as single purpose systems. Casks/canisters designed and certified for both storage and transportation are referred to as dual purpose canisters or transportable storage casks. Canisters designed and certified for transportation, storage, and disposal are known as multi-purpose canisters (MPCs).

The mix of cask/canisters to be deployed is largely unknown at this time. It will depend on the availability of technologies that are certified by the Nuclear Regulatory Commission prior to the start of DOE transportation operations.

In December 1997, the DOE issued a newly revised draft request for proposals for commercial spent nuclear fuel acceptance and transportation services, including provision of storage equipment. Comments were solicited on the draft through February 1998, and another draft was issued in September 1998. Continued review has been deferred and no further comment is sought. The final Request for Proposals is planned for issuance in FY 2001.

In addition to commercial waste from utilities, DOE plans to make 4,169 high-level radioactive waste cask shipments by 2035. This represents waste generated by various federal programs. Of those, 1,008 casks will be from research reactors, and will be shipped through the Charleston and Concord naval weapons stations and from Canada and Mexico under the Foreign Research Reactor program. The Navy will have 580 shipments of spent fuel from nuclear submarines and surface ships. Segregation of aluminum-clad fuel from non-aluminum-clad fuel at DOE's Savannah River and Idaho facilities will require 235 shipments. Non-weapons waste transfers from Hanford and Oak Ridge to both Savannah River and Idaho will involve 524 shipments. Up to 300 shipments are planned from New York's West Valley Demonstration Project (reprocessing) to Savannah River. DOE also plans 600 tritium production shipments to Savannah River, related to tritium production in commercial reactors. The remaining 800 shipments will be composed of spent fuel from non-governmental university and research reactors across the country. DOE plans to ship an average of 110 highly radioactive casks per year during the next 35 years.

The transportation of radioactive materials is regulated jointly by the Nuclear Regulatory Commission (NRC) and the Department of Transportation (DOT). The responsibilities of the two agencies are generally divided as follows:

DOT - Regulates carriers of radioactive material and the conditions of transport (such as routing, tie-downs, vehicle requirements, handling and storage).

NRC - Regulates users of radioactive material and the design, construction, use and maintenance of shipping containers.

Safety standards for spent fuel casks are set forth in NRC regulations. Casks must be designed to withstand a series of impact, puncture, and fire environments, thereby providing reasonable assurance that packages will withstand serious transportation accidents. The cask design is initially reviewed by the NRC staff to verify its resistance to accidents. An approval certificate must be issued by the NRC before a cask can be used to transport spent fuel.

The standards established in the regulations provide that casks shall prevent the loss or dispersion of radioactive contents, provide adequate shielding and heat dissipation, and prevent nuclear criticality under both normal and accident conditions of transportation.

The normal conditions of transportation which must be considered are specified in the regulations in terms of hot and cold environments, pressure differential, vibration, water spray, impact, puncture, and compression tests. The accident conditions that must be considered are specified in terms of impact, puncture and fire conditions.

The NRC recently completed a reevaluation of its regulations concerning radioactive materials. In the course of that reevaluation, the NRC concluded that the regulations provide a reasonable degree of safety and that no immediate changes are needed to improve safety. This conclusion was based on:

1. an assessment of the probability and severity of transportation accidents;
2. the extent of potential consequences that could result if a radioactive material shipment were involved in a transportation accident; and
3. the excellent safety record developed over more than 30 years during which millions of radioactive material shipments have been made without identifiable injury or death attributable to radiological causes.

The safety of spent fuel shipping casks was further demonstrated in a series of controlled tests conducted by the Department of Energy. In one test, a truck carrying a cask was deliberately placed in the path of a speeding locomotive. The 120-ton locomotive struck the cask at a speed of 80 miles per hour. In another test, a cask aboard a truck moving at about 80 miles per hour was deliberately crashed into an immovable concrete structure. Subsequent examination in both tests confirmed that no radioactive material would have been released if the casks had been loaded with spent fuel.

If an accident occurs, state and local governments are primarily responsible for overseeing the response of the carrier, shipper and others and for taking any actions deemed necessary to protect the public health and safety.

To assist state and local governments, the federal government has established an Interagency Radiological Assistance Plan under the coordination of the Department of Energy, which charges eight regional coordinating offices with the responsibility and authority for convening radiological assistance teams. Upon requests, immediate action will be taken to respond to the emergency, including providing assistance at the scene.

Current Issues

The risk of transporting highly radioactive spent fuel from nuclear power plants to a central storage site or permanent underground repository is a major factor in the current nuclear waste debate. Controversy over the transportation of spent fuel and other highly radioactive nuclear waste has focused on the adequacy of NRC standards for shipping casks, the potential consequences of transportation accidents, and the routes that nuclear waste shipments are likely to follow.

NRC requires that spent fuel shipping casks be able to survive a sequential series of tests that are intended to represent severe accident stresses. The tests are a 30-foot drop onto an unyielding flat surface, a shorter drop onto a vertical steel bar, engulfment by fire for 30 minutes, and, finally, immersion in three feet of water. A undamaged sample of the cask design must be able to survive submersion in the equivalent pressure of 50 feet and 200 meters of water.

Studies for NRC and other federal agencies have found that casks meeting NRC's standards would survive nearly all transportation accidents without releasing large amounts of radioactive material. The safety record of more than 1,000 past shipments of spent fuel in the United States is consistent with those findings. Four accidents occurred during those previous U.S. shipments, and none released radioactive material, according to a federal database.

NRC's cask standards and the federal safety studies have been criticized by the State of Nevada and others who contend that severe accidents could release hazardous levels of radioactivity. They argue that NRC's cask tests do not adequately represent a number of credible accident scenarios, and that individual casks may be fatally compromised by manufacturing flaws and by loading and handling errors.

Because nuclear power plants and DOE waste storage sites are located throughout the nation, almost all states are expected to be traversed by nuclear waste shipments. Major east-west highway and rail lines in the central United States are likely to be the most heavily used, but numerous options are available under current regulations. The Department of Transportation (DOT) requires that highway shipments of spent fuel follow the quickest route on the interstate highway system, although states are allowed to designate alternative routes if they follow certain procedures.

More than 80,000 metric tons of spent nuclear fuel, highly radioactive fuel rods that can no longer efficiently generate power, are expected to be discharged from today's nuclear power plants during their scheduled operating lives. Considered a waste material in the United States, spent fuel will remain dangerously radioactive for thousands of years.

Unless spent fuel is to be kept permanently at reactor sites, it will have to be transported elsewhere for long-term storage and disposal, a prospect that has generated considerable controversy along potential transportation routes.

Efforts to mandate interim storage near Yucca Mountain are vehemently opposed by the State of Nevada, environmental groups, and other organizations that cite transportation hazards as one of their primary concerns. The opponents of central storage contend that, because NRC has determined on-site storage to be adequately safe, any risk posed by transporting spent fuel from reactor sites in the near term is unnecessary. Nuclear utilities, noting that NRC also has found transportation to be adequately safe, respond that the benefits of central storage of spent fuel far outweigh any transportation risks involved.

Although it is generally expected that spent fuel will be transported from nuclear power plants eventually, opponents of the Yucca Mountain interim storage plan point out that extended on-site storage would allow for radioactive decay in spent fuel before it was shipped. After 100 years, radioactivity in spent fuel would drop by more than 99 percent, although it still would contain more than 10,000 curies per metric ton, and long-lived radioactive elements such as plutonium would not have decayed significantly.

Major issues in the transportation debate are the extent of the risks posed by a national shipping campaign for spent fuel, the adequacy of federal regulation of transportation safety, and the possible concentration of shipments along certain major east-west transportation routes.

Preliminary plans indicate that spent fuel transportation through Minnesota to a Nevada facility will involve only waste from Minnesota=s and Wisconsin=s reactor sites.

The states' interest in route selection for radioactive materials shipments derives from their responsibility to protect public health and welfare, as well as property, from the possibility and effects of accidents. This responsibility exists regardless of whether there are few or many shipments, and regardless of the mode. Therefore, states have an interest on behalf of their citizens to become involved in route selection for all types and modes of radioactive materials shipments.

Route designations that have occurred have required lengthy and often contentious public hearings, highly complex (and occasionally diversionary) technical debates over allocating weight to various risk factors, and considerable use of staff time for evaluation and analysis. Industry opposition to additional regulation, combined with conflicts between state, local, and tribal governments, further complicate the task of alternate route designation. Moreover, alternate route designation in one state can seriously impact (or even eliminate) routing options in adjacent states, and may influence routing options as far as three or four corridor states away.

State legislation

In a flurry of legislative activity not seen since 1991, 20 state legislatures attempted to assert greater state regulatory control over the transportation of radioactive materials through their states. Most of the emphasis was on spent nuclear fuel and high-level radioactive waste. States dealt with shipments of foreign reactor fuel repossessed by the U.S. and prepared for the possibility that Congress would authorize interim storage of spent fuel at the Nevada Test Site, which would mean waste shipments could begin within two to three years.

Interim storage legislation failed to pass Congress, however, which removed some of the urgency from state efforts. Some of the legislation that would more strictly regulate spent fuel and radioactive waste failed due to concerns about federal preemption. But bills passed in Illinois and New Hampshire, and a significant bill was vetoed by the governor in California.

Major Report Issued

In late April 1998 the US Department of Transportation published the long-awaited mode and route study mandated by Congress in 1990. The study was directed by Congress as part of the Hazardous Materials Transportation Uniform Safety Act of 1990 (HMTUSA) to address concerns over what factors should be considered by shippers and carriers in selecting transportation routes and modes for the shipment of high-level radioactive waste and spent nuclear fuel. (Modes refer to the transport options of highway, rail, water and intermodal.) Entitled Identification of Factors for Selecting Modes and Routes for Shipping High-level Radioactive Waste and Spent Nuclear Fuel, the study was prepared by the John A. Volpe National Transportation Systems Center for the Research and Special Programs Administration of DOT.

The study examined three scenarios for assessing safety factors: incident-free radiological exposure—the exposure to low levels of radiation that normally occur as a result of the transport of radioactive materials; accident-related radiological exposure—the radiation exposure attributable to accidents that result in the release of radioactive materials; and non-radiological consequences of accidents—the fatalities, property damage and other non-radiological consequences that result from accidents involving the transport of nuclear materials.

The study found that overall radiation risk is low under all three scenarios. Using a case study analysis, risks were estimated for 65 mode/route combinations between eight generic origin/destination pairs. Under all scenarios, exposure levels to radiation were well below regulatory limits.

The study also concluded, however, that there is a sizable variation in the values of primary safety factors across different mode and route combinations, indicating that mode and route choices made by shippers and carriers can affect shipment risks. This conclusion should bolster the long stated contention of affected state, local and tribal governments that the US Department of Energy should develop standards for choosing

routes and modes rather than leaving those choices to the companies transporting the material. The study states that under current practices, safety is not usually given as a reason for choosing a particular mode. Other factors such as availability, service attributes and minimizing transit time are more important selection factors. Likewise routing choices are currently made for reasons primarily of operational efficiency.

The most significant safety factor in determining risk for any given shipment option was shipment duration. The total time it takes to move a shipment from origin to destination affects non-incident radiation exposure levels; the group most affected by this factor is transport personnel. Basically, the longer the material is in transit, the longer the exposure of the crew and general public.

A second factor that substantially affects mode choice, number of trips and total risk is the amount of material to be shipped. The larger capacity of rail and barge casks along with the ability to carry multiple casks on a single train or barge means that such shipping campaigns require fewer trips than moving the same amount by truck. Fewer trips reduces total risk under all three scenarios.

Safety factors were narrowed to eight from 82 using a hierarchical analysis and risk models. The eight safety factors are general population exposed, occupational population exposed, sensitive environment exposed, trip length, shipment duration, accident rate, emergency response and quantity of material shipped.

Emergency response to a radiological accident is probably the biggest concern of state and local officials. The study concluded that it is indeed an important risk factor, but that it is difficult to measure in comparing route/mode choices. One observation is that routes with lower general radiation risk are often farther from emergency response due to the remoteness of the routes. The study failed to address this factor adequately due to the problem of measurement of emergency response capability along routes and thus, it will continue to be a concern of public safety officials. It did suggest that the measure for this factor ought to be the amount of time for a specially trained radiological responder to arrive at any point along the potential route of travel. And it suggested that remote routes selected by shippers should be reassessed or examined for improvements in emergency response coverage.

III. Federal Legislation

Background

Because of the delays in the repository program, the nuclear industry and its supporters want Congress to require DOE to build an interim storage facility that could begin receiving spent fuel from nuclear power plants as soon as possible. Many states in which nuclear generation plants are located are also concerned about potential problems with electrical supply and socioeconomic issues. Such a facility could reduce spent fuel storage costs, increase safety, and fulfill the federal government's legal obligations, supporters contend. But environmental, anti-nuclear power, and other groups warn that interim storage would result in earlier transportation of unprecedented quantities of

nuclear waste; they contend it would be safer to leave the waste in place until a permanent solution can be found.

Legislation to rewrite NWPA and require construction of an interim storage facility near Yucca Mountain was passed by the Senate in 1997 (S. 104). A similar bill, H.R. 1270, was approved by the House. The two measures are similar to legislation (S. 1936, H.R. 1020) that was considered in 1996 but not enacted. A conference committee was expected to begin negotiations in January 1998. In addition to mandating interim storage, the bills would modify the licensing standards for a permanent underground repository, revise the program's funding mechanism, and make other program modifications. The House vote was more than sufficient to override a veto,
but backers of the legislation would have needed two more votes in the Senate to achieve a two-thirds majority. Because the legislation included revenue provisions, and the Constitution requires revenue measures to originate in the House, the House declined to take up the Senate bill and instead sent the House bill to the Senate February 18, 1998. As a result, the Senate would have had to pass the House bill -- overcoming filibusters from the Nevada delegation -- before a formal conference could be held on the legislation. After the Senate rejected a cloture motion on H.R. 1270 on June 2, 1998, by a vote of 56-39, no further action on the legislation was taken.

As the 106th Congress convened, legislation has again been introduced establishing an integrated waste management system featuring centralized interim storage. H.R. 45 is essentially the same as the bill passed in 1998. Positions on the bill are expected to be similar as on last years effort.

IV. Federal Budget

DOE cannot spend the nuclear industry's nuclear waste fees without congressional approval, and until FY1995 the President had requested and Congress has appropriated only about half the fees collected. After a funding increase in 1995, funding was sharply reduced in FY1996 and remained about the same through FY1999.

Through the end of FY1996, utility nuclear waste fees and interest totaled about $10 billion, of which about $5 billion had been appropriated to the waste disposal program, according to DOE. Another $2 billion was owed by utilities for spent fuel generated before 1983.

In September 1998, Congress appropriated $169 million ($165 million from the Nuclear Waste Fund) to the DOE for continued work on nuclear waste disposal. It was believed that this amount would keep DOE on track for opening of Yucca Mountain in 2010 and assumed that the viability assessment on Yucca Mountain would be completed by the end of 1998.

V. Federal Lawsuit

Background

In addition to legislative efforts to require the DOE to begin removing spent fuel from reactor sites, nuclear utilities and state officials began seeking legal remedies in 1994.

The U.S. Court of Appeals for the District of Columbia Circuit decided in favor of the utilities in 1996, reversing DOE's determination that the 1998 deadline would not be binding if facilities were not available (*Indiana Michigan Power Company, et al., v. Department of Energy and United States of America*). However, the court called it "premature to determine the appropriate remedy" for DOE's anticipated failure to meet the 1998 statutory deadline. Despite this court decision, DOE notified utilities in 1996 that it could not meet the NWPA deadline for the start of waste disposal operations.

In response, utilities and states filed additional lawsuits in 1997, seeking a remedy from the same appeals court for DOE's anticipated noncompliance. Potential remedies included payments to utilities for extended waste storage at reactor sites and suspension of waste fee payments to the federal government. The State of Minnesota enacted legislation in May 1997 allowing nuclear waste fees collected in the state to be placed in escrow until DOE began taking waste from reactor sites, if authorized by a federal court. Several other states have been considering similar action.

In late 1997, a U.S. Appeals Court ruled that the Energy Department must take radioactive waste from nuclear power producers, but denied an industry call for a court order to force the government to start removing the waste. Instead, the court said that utilities should enforce their contracts with the Energy Department by seeking compensation from DOE or get the government to take the waste. Presumably, DOE compensation to utilities would come from the Nuclear Waste Fund, which would have to be appropriated by the Congress. The court also chided the Energy Department for claiming that "unavoidable delays" had prevented it from building a central storage site for the waste, which originally was to have been opened by January 1998.

Current

When the DOE defaulted on February 2, 1998, on its obligation to take the waste from utility sites around the country, a coalition of 35 states immediately filed a motion in federal court to take action to:

- bar DOE from using the Nuclear Waste Fund to pay damage claims by utilities or states that have to store and safeguard high-level waste;
- direct utilities to pay future fees into an escrow account;
- order DOE to submit a plan to accept and dispose of spent fuel as soon as possible; and
- appoint a court master to oversee DOE and ensure court-ordered remedies are followed.

The DOE again emphasized that a temporary fix would divert resources away from efforts to get a repository developed, and that the waste was safe at reactor sites until a repository was ready.

The separate group of 41 utilities followed with their suit on February 19, 1998, demanding DOE compliance in a manner similar to that argued by the states. In a related suit, the Yankee Atomic Electric Co., one of the 41 utilities, sought $70 million in damages for its cost to store wastes at its Yankee Rowe plant in Massachusetts.

In May 1998 a federal appeals court denied the states' petition to require DOE to begin to dispose of spent fuel. The court also denied the state's petition to allow states to set up escrow accounts into which utilities would pay Nuclear Waste Fund fees, and directed injured parties to seek remedies for contract violations. The court also consolidated all the related lawsuits into a single action.

In May 1998 DOE Secretary Peña proposed a settlement of the lawsuits against DOE for failing to pick up spent fuel as required by the Nuclear Waste Policy Act. Applying only to the utility parties, the DOE proposed to partially defer ongoing payments into the Nuclear Waste Fund if utilities would forego all damages and surrender present and future legal remedies. The settlement was rejected by the utilities because it provided no assurance that it would meet DOE's obligation to accept spent fuel. Nor was the amount of money available under the proposal sufficient for utilities to defray the costs of storage at reactor sites.

In August 1998 the states group, the Nuclear Waste Strategy Coalition, petitioned the U.S. Supreme Court to enforce federal law requiring DOE to remove spent fuel from civilian nuclear power plants. The coalition also asked the court to review the May appeals court decision which had denied the coalition's request for relief.

A September letter from the coalition, representing 68 state utility commissioners from 24 states, called on Energy Secretary Richardson to defer $6.5 billion in payments into the Nuclear Waste Fund until DOE provides spent fuel disposal services. Subsequently 28 additional state utility commissioners signed the letter. The group demanded DOE limit payment of fund fees to each utility's share of those funds appropriated by Congress for commercial disposal programs. Utility payment of the non-appropriated portion of the fee (stated as 84 cents on the dollar) would be deferred until DOE removes spent fuel from reactor sites. The effect would be to stop Congress from spending the unappropriated portion on other things. Under the 1982 Nuclear Waste Policy Act, nuclear utilities pay 1 mill per kilowatt hour – more than $600 million per year – into the waste fund. However, Congress only releases about 16 cents on the dollar to fund the federal disposal program. The rest is diverted to other spending. Since 1982, more than $7 billion has been diverted. An additional $6.5 billion, including interest, will be diverted between 1998 and 2010, the earliest date DOE says it can begin waste disposal.

Upon 1998 filings by individual utilities, a U.S. Court of Federal Claims ruled that DOE breached its waste acceptance contract with three utility claimants by not having accepted

their waste by January 31, 1998. However, the claims court found that the failure could not be remedied under the contract terms, and that liabilities would have to be determined by other courts. The three utilities are seeking $289 million in total damages. Seven other utilities, including Northern States Power, have claims pending.

VI. State Activities

Nuclear Waste Strategy Coalition

Through 1998, the Minnesota Department of Public Service continued to lead a group of state utility regulators who mounted a major campaign in 1995 to secure federal acceptance and removal of spent fuel being stored at nuclear reactors throughout the nation. The group, the Nuclear Waste Strategy Coalition, consists of 41 members from 24 states, including, in addition to the Minnesota Department of Public Service, the Minnesota Public Utilities Commission and NSP. The Coalition's mission is to ensure the timely development of a cost-effective, safe and environmentally sound system for the permanent disposal of spent nuclear fuel and high-level radioactive waste.

In addition to supporting legislative change and the lawsuits against DOE, several state members of the coalition have initiated efforts to escrow utility payments that would otherwise be paid into the federal Nuclear Waste Fund because the federal program is unlikely to result in the timely, cost-effective disposal of utilities' nuclear waste. Though the federal Appeals Court did not address the question of withholding payments to the Nuclear Waste Fund, the coalition has stated that if the renewed legislative initiative fails, they will continue to pursue the escrow option.

The coalition released data in August 1997 showing that utility ratepayers and accrued interest had contributed more than $1 billion to the fund in the year between June 1996 and June 1997. However, according to the coalition, only 14 cents on the dollar was used for radioactive waste disposal programs. Payments from ratepayers during this time totaled $614 million and interest on earlier payments was $436 million. During this time, only $151 million was appropriated to the civilian nuclear waste program. The latest figure reported for total payments into the fund since its inception is $14 billion.

In October 1998 the Minnesota Department of Public Service (DPS) recommended that the Minnesota Public Utilities Commission (PUC) require Northern States Power to begin depositing fees paid by NSP electric consumers into an escrow account for nuclear waste storage and disposal. If the recommendations are adopted, Minnesota would become the first state in the nation to withhold funds that now go to the U.S. Department of Energy (DOE) for a federal Nuclear Waste Fund.

The Department cited three major developments that make it imperative that the state move now to protect the interests of Minnesota consumers:

> First is the failure of DOE to meet the January 31, 1998 deadline established by the federal Nuclear Waste Policy Act for beginning removal of nuclear waste from NSP's Prairie Island plant and other nuclear power plants around the nation.

Second, a number of legal actions filed before the United States Supreme Court and other federal courts could result in funds deposited in the Nuclear Waste Fund being used to compensate plaintiffs rather than for safe disposal of nuclear waste.

Third, the PUC action sought was specifically authorized by the 1997 Minnesota legislature. This statute vests a duty in the PUC to direct NSP to pay the nuclear waste disposal fees to the Commissioner of DPS for deposit in an escrow account.

The Department stated that since the federal Nuclear Waste Fund was established in 1982, Minnesota ratepayers have contributed approximately $200 million, not counting interest, and the nation's ratepayers have contributed in excess of $14 billion. If fees paid into this fund end up not being used for their intended purpose, Prairie Island could be forced to shut down prematurely, and it would be Minnesota's electric consumers who would bear the cost of replacing this energy facility.

The nation's ratepayers now contribute $600 million annually to the federal Nuclear Waste Fund. If the PUC adopts the DPS recommendations, future fees paid by Minnesota consumers -- now totaling $16 million annually -- would be placed into an escrow account established under terms and conditions set by the PUC and managed by DPS. The payments would be treated in the same manner as other interest-bearing funds administered by the state.

DPS first looked into the withholding of Minnesota nuclear waste payments in 1995 and submitted a report and recommendations in 1996 calling for establishing of an escrow fund. In response to that report, NSP expressed concern that withholding fees could result in the utility being forced to breach its contract with DOE and losing its nuclear operating license and its ability to recover penalties if DOE failed to meet its obligations. DPS rejected those arguments at the time and stands by its initial conclusions and principal recommendations.

Nevada

The state of Nevada, through its Agency for Nuclear Projects, the governor=s office and its congressional delegation, has continued to object at every opportunity to the federal plans to dispose of nuclear waste at Yucca Mountain. The DOE had been supporting state participation in the repository review, but Congress, finding the state=s role to be obstructive, first eliminated funding for Nevada’s review role in 1997, and in the current budget has provided limited funding with strict prescriptions on how it can be spent.

South Carolina

Over the objections of the state, DOE began shipping over 20 tons of spent foreign research reactor fuel (generated in 41 countries) from Europe and South America to the DOE Savannah River facility. The highly enriched uranium fuel was provided to other nations as part of the AAtoms for Peace≅ program. Shipments will continue over 10 years, traveling first by ship to Charleston, then by rail to the DOE facility. The spent

fuel is being stored in pools, but will be moved to dry storage, and eventually to the national repository. The state sued DOE to halt the shipments but did not prevail. A related DOE plan to develop a West Coast entry point was similarly controversial in California, and that effort is also moving forward.

New Mexico

Intended only to accept processed nuclear defense wastes, the DOE=s Waste Isolation Pilot Plant (WIPP) has been constructed near Carlsbad, New Mexico and, after many years of controversy, was scheduled to open in 1998. The opening date has been pushed into early 1999. The state has opposed development of the facility through several state administrations, but the current governor supports the project. DOE plans to bury up to 6.2 million cubic feet of radioactive clothing, tools, equipment and other defense-related transuranic waste in a salt bed 2,150 feet underground. Over its projected 35-year life span, WIPP is expected to receive some 37,700 waste shipments, which would pass through as many as eight states.

Council of State Governments

The Council of State Government's Midwestern High-Level Radioactive Waste Transportation Project has kept midwestern state officials informed of developments within the federal Civilian Radioactive Waste Management System since 1989. Funded by a cooperative agreement with the U.S. DOE, the project is directed by a committee comprised of midwest state officials. The Minnesota agency representative on the committee is Mr. John Kerr of the Division of Emergency Management, Minnesota Department of Public Safety. He coordinates the indirect participation in committee activities with the Minnesota Departments of Public Service, Health and Transportation. Minnesota's legislative member of the committee is Senator Steve Novak. The CSG also publishes several reports yearly; these are generally helpful to the states.

National Conference of State Legislatures

The NCSL issues an annual Report on State Legislative Developments in Radioactive Materials Transportation. It tracks state legislation regulating radioactive waste transportation.

National Association of Regulatory Utility Commissioners

Comprised of state utility commissioners, NARUC has had a long-standing interest in protecting ratepayers' interests with respect to their financial support of the civil nuclear waste program. After establishing the Nuclear Issues-Waste Disposal Subcommittee in 1984, NARUC has adopted twenty-one resolutions pertaining to the nuclear waste program. Minnesota's PUC has a staff representative on the subcommittee.

NARUC's most recent (1999) resolution reiterates that DOE's failure to store or dispose of high-level nuclear waste and spent nuclear fuel, in accordance with its statutory obligations, continues to impose unnecessary costs on consumers of electricity. It strongly urged the Congress and the Administration to pass legislation that would require DOE to immediately begin site preparation, licensing and transportation activities for a

centralized interim storage facility that would allow DOE to meet its obligations as soon as possible.

VII. Canadian Nuclear Waste Disposal Program

Canada=s nuclear waste disposal program continues to be monitored because of the potential that Canadian disposal sites near Minnesota=s northern border could be considered. This mirrors Canadian interests in the mid-1980's when several sites in northern Minnesota were being considered as potential candidate sites for a US national repository. Principle issues at that time were the potential for transboundary water pollution and application of the Boundary Waters Treaty of 1909.

Background

The Canadian government, through an independent panel appointed by the Canadian Environmental Assessment Agency, has been reviewing Atomic Energy of Canada Limited=s (AECL) proposed nuclear fuel waste management and disposal concept. The focus of the review has been an Environmental Impact Statement issued in 1994. Staff at the Minnesota Environmental Quality Board have monitored the proceedings through comprehensive documentation made available through the independent panel.

Canada=s proposed disposal concept design includes sealing of waste in long-lasting (500 years) containers, placing the containers in a disposal vault excavated to a nominal depth of 500 to 1000 meters in intrusive igneous (plutonic) rock of the Canadian Shield, surrounding the containers with a sealing material, and then eventually sealing all openings. Disposal technologies include a range of options to provide adaptability to physical conditions of the yet-undetermined site location, and to allow for changes in criteria and standards. The concept anticipates a construction and operating schedule of 89 years, including an initial 20 years for identifying a host site.

To date, the public participation in the Canadian review process does not suggest that the Canadian concept is any less controversial than the similar US approach, though a distinctive difference is that the Canadian program is attempting first to gain public acceptance of the disposal concept before focusing on specific sites. Further, the government has firmly established that dry cask storage will be its policy and practice until a repository can be developed. Further, dry cask storage will be developed as needed at existing reactor sites, with no plans for a central interim storage facility.

Minnesota=s interest in Canada=s nuclear waste management program has two aspects. In the near-term we must continue to monitor probable implementation of a repository siting process, and be prepared to inform their siting process of any concerns that may arise regarding potential impacts on Minnesota. Though the Canadian Shield (crystalline rock) search area covers much of Canada, it does extend to Minnesota's border in Manitoba and Ontario, so that sites adjacent to the Minnesota border could conceivably be considered. Much of the research and development on disposal has been conducted at two national laboratories, one of which is the Whiteshell Laboratories southeast of Winnipeg, approximately 45 miles from Minnesota's northern border with Manitoba.

The Whiteshell Laboratories include the Underground Research Laboratory, which was constructed to provide a representative environment in which to conduct large-scale underground tests. The AECL emphasizes that the Whiteshell facility has not been investigated as a potential site. An additional field research area is at Atikokan, Ontario, approximately 35 miles north of Minnesota's northern border and the Boundary Waters Canoe Area.

A second potential, and longer term, consideration is that the crystalline rock being investigated by the Canadian government extends through the northern half of Minnesota. The US DOE has no active program formally evaluating geologic formations for potential use for a repository site in Minnesota, or anywhere else other than Yucca Mountain. It is likely that the U.S. will need a second repository at some point in the future, and the DOE has maintained an active funding and information sharing relationship with the Canadian disposal research and development program. While there is no basis for anticipating that the U.S. government will again look to Minnesota as a potential second repository host, the state should continue to monitor the DOE\AECL relationship and the Canadian waste disposal program. Similarly, there is no basis for anticipating that spent fuel from the US or any other country could be sent to Canada=s repository at any time in the future, or that such a scenario could suggest increased transportation of spent fuel through Minnesota.

Current

In February 1998, the Canadian Environmental Assessment Agency issued its report with recommendations regarding the acceptability of the disposal concept and on the steps that must be taken to ensure the safe long-term management of nuclear fuel wastes in Canada. Subsequently, if the government accepts the concept, presumably the 20 year siting process will begin, possibly within two to five years, followed by construction at a preferred site around 2025. The proposed implementation plan currently provides that a host community must accept the facility and will have the right to negotiate terms of commitments.

The 1998 report included the following key conclusions:

- Broad public support is necessary in Canada to ensure the acceptability of a concept for managing nuclear fuel wastes.
- Safety is a key part, but only one part, of acceptability. Safety must be viewed from two complementary perspectives: technical and social.
- From a technical perspective, safety of the AECL concept has been adequately demonstrated for a conceptual stage of development, but from a social perspective, it has not.
- As it stands, the AECL concept for deep geological disposal has not been demonstrated to have broad public support. The concept in its current form does not have the required level of acceptability to be adopted as Canada’s approach for managing nuclear fuel wastes.

The report recommends further refinements of the government's approach to spent nuclear fuel management, and focuses on the immediate need for a new, more independent, nuclear fuel waste management agency, at arms length from the utilities and the AECL, with the sole purpose of managing and coordinating the full range of activities relating to the long-term management of nuclear fuel wastes. It would have a board of directors representing all stakeholders, and an advisory council also with wide representation. Until the recommendations are implemented, the report emphasized that the search for a specific site should not proceed.

VIII. Related Issues

In the past, this annual monitoring report has elicited inquiries from legislators regarding several issues related to nuclear waste management but which are generally outside the scope of the program. Five of these issues are briefly discussed in this section.

A. Policies in Other Countries

Worldwide, there are currently 439 commercial nuclear power reactors operating in 32 countries, with another 28 power reactors under construction. Nuclear reactors supply 17% of the world=s electricity. Of the world=s total domestic nuclear electric generation, the largest producer is the US at 30%, followed by France at 16%, Japan at 12%, former USSR at 8%, Germany at 7%, Canada at 5%, Sweden at 3%, and all others collectively at 19%. There is uncertainty about the future of new nuclear power generation throughout the international market, but recent media reports of Chinese interest in nuclear power technology and aggressive policies in other Pacific Rim countries suggest that there may be significant development in that region. The growing debate on global warming may also be a factor in the future of nuclear power development, with renewed interest in both current and more advanced technologies.

All of the major countries generating nuclear energy, and therefore nuclear waste, have active waste management programs. A 1994 US General Accounting Office report on the programs in these countries made the following observations:

X A*Governments around the world support the use of geologic repositories as the best method for disposing of highly radioactive waste, but no country has yet built an operational facility. All have encountered difficulties with their waste management programs, and most do not plan to have a repository until 2020 or later.*

X *AProgress on nuclear waste disposal is widely considered a prerequisite for any future growth of nuclear power.*

X *AOpposition to geologic disposal affects all countries=programs.*

X *AOther countries, in contrast to the US, have decided, for the foreseeable future, how they will store their waste until disposal.*

X *AOther countries have less ambitious repository development schedules*

X *AWaste producers in other nations are assigned greater responsibility than in the US.*

X *AOther nations have taken a less detailed regulatory approach ..... allowing flexibility to respond to the conditions discovered as they proceed with their repository programs.*

X *ASome countries are emphasizing engineered barriers ..... i.e., more robust containers, in contrast to the US DOE, which will rely primarily on the natural geology of the Yucca Mountain site to contain radiation.*

X *AThe most significant difference between the approaches of the United States and of the countries (reviewed) is that the other countries appear to have separated the issue of long-term waste disposal from considerations of temporary waste storage.≅*

The report notes that nuclear programs in other countries are much smaller than the US program, and, for various reasons, are not constrained by pressure to begin removing waste from power plants. In stark contrast, DOE=s repository development schedule appears to be based predominantly on the earliest possible acceptance and disposal of utilities= waste - rather than on the technical requirements of constructing a repository.

Reprocessing

The high-level waste from reprocessing United Kingdom, French, Japanese and German spent fuel is largely liquid. It consists of the highly-radioactive fission products and some transuranic elements with long-lived radioactivity. It generates a considerable amount of heat and requires cooling. This is vitrified into borosilicate (Pyrex) glass, encapsulated into heavy stainless steel cylinders about 1.3 meters high and stored for eventual disposal deep underground.

Major commercial reprocessing plants are operating in France and the United Kingdom (U.K.), with a capacity of almost 4700 tons per year and cumulative civilian volume of 55,000 tons over 40 years. These facilities also reprocess spent nuclear fuel for utilities in other countries, notably Japan, which has made over 140 shipments of spent fuel to Europe since 1979. At present most Japanese spent fuel is reprocessed in Europe, with the vitrified waste and the recovered uranium and plutonium being returned to Japan to be recycled as fuel. In future the plutonium will be returned as mixed oxide (MOX) fuel elements.

Germany

Transportation of spent fuel casks within Germany produced controversy in early 1998, when 30,000 police were needed to escort a train shipment.

Uncertainty about whether Germany will continue its contracts to have its spent fuel reprocessed in the U.K. has raised questions about significant cost penalties and possible return to Germany of unreprocessed waste that has been sent to the U.K.'s private THORP reprocessing facility. A German pullout could threaten the viability of the U.K. facility.
A major change in German policy occurred after fall elections, where the non-ruling SPD-Green coalition is aiming to halt reprocessing and restrict the movement of spent fuel. New government policy favors the on-site interim storage of spent fuel at nuclear power plants and final disposal in deep underground repositories. There is also intent to close the country's six oldest reactors in the next four years and to phase out its other 13 reactors.

France
Shipments of spent fuel from Germany for reprocessing in France were halted when trains carrying the waste were reported by French media to be contaminated at levels up to 500 times normal. The situation was criticized by the Environment Ministers in both France and Germany, and a full investigation was ordered. The contamination was limited to the train and cask surfaces, with the focus of concern on workers. All international shipments between France, Germany, Switzerland and the U.K. were suspended. Subsequently the German nuclear power company acknowledged the resultant political crisis and apologized for its lax maintenance. Contamination was removed easily using standard techniques. Domestic shipments were never suspended in the U.K. and Switzerland, and began again in France two months later, but continue to be suspended in Germany, which is partly related to the change in government policies resulting from November national elections in Germany. The suspensions led to formation of a four-nation working group to develop responses.

The Swedish Nuclear Program
Sweden=s nuclear power program has experienced radical political changes. Sweden has twelve nuclear power reactors providing about half its electricity. Up to the late 1960s there was a focus on hydro electricity to power Sweden's industrial growth. In 1965 it was decided to supplement this with nuclear power, to avoid the uncertainties of oil prices and increase the security of supply. The policy was reinforced by the oil shocks of the early 1970s, a time when Sweden depended on oil for about one fifth of its electricity.

In 1994 the government appointed an Energy Commission which reported at the end of 1995 that a complete phase-out of nuclear power by 2010 would be economically and environmentally impossible. However, the commission thought that one unit might be shut down by 1998.

Early in 1997 an agreement was forged between the Social Democrats and two of the other parties to close one small reactor by mid 1998 and its twin by mid 2001. The second reactor, however, would be shut down only if alternatives were demonstrated. This agreement was confirmed in June 1997 by parliamentary decision.

One trade-off of the decision to close the two reactors is that Sweden=s other ten reactors gain a reprieve beyond 2010, and may be able to run for about 40 years (i.e. closing 2012-2025). A phase-out program for these other ten reactors is to be decided before 2002.

Under the agreement, production from the closed nuclear plants is to be replaced by power from wood-fueled, combined heat power plants, some wind power and extensive conservation measures. It is accepted that increased natural gas consumption and some net electricity imports (e.g. from Danish and German coal-fired power stations) will also be needed.

The nuclear power question in Sweden has continued to be controversial throughout 1998. Difficulties with solutions for replacement power has complicated the political resolve for phase out, and various options for extending the phase out period are being debated.

B. Alternatives to Waste Disposal

The range of options available for additional spent fuel storage capacity include continuing the expansion of dry storage at reactor sites, construction of federal or private interim storage facilities, and reprocessing of spent fuel to extract plutonium and uranium. Transmutation is not considered a true alternative, because disposal of residuals would still be necessary. It is however considered to have future potential that could affect how federal programs manage waste. This section will elaborate further on the reprocessing option and transmutation.

Reassessing current U.S. policy and sending spent nuclear fuel to reprocessing plants has been suggested as an alternative to storing the material at reactor sites or a central facility. Possible reprocessing locations include a newly constructed facility in Great Britain and underused defense reprocessing facilities at DOE=S Savannah River Site.

Reprocessing of spent fuel could alleviate near-term storage problems and extract uranium and plutonium for use in new nuclear fuel. However, the highly radioactive waste produced by reprocessing would still require long-term storage and disposal, and the separation of plutonium would probably raise serious concerns about nuclear weapons proliferation.

British Nuclear Fuels Ltd. (BNFL) has urged authorization for DOE to take spent fuel from nuclear power plants with severe on-site storage problems and ship it to BNFL=s new Thermal Oxide Reprocessing Plant (THORP) in northern England. BNFL already is receiving spent fuel shipments from Japan and other countries. Under the BNFL proposal, DOE could send U.S. spent fuel to THORP to be stored for at least a decade and then reprocessed. The storage and reprocessing cost of $1million per metric ton would be paid from the Nuclear Waste Fund. If DOE storage and disposal facilities became available before the U.S. spent fuel was reprocessed, the material could be

returned and the reprocessing contract terminated. DOE would pay a termination fee covering BNFL=s transportation and storage costs.

If the U.S. spent fuel were reprocessed, the plutonium (about 1 percent) and uranium (about 95 percent) would be separated from highly radioactive waste products. The resulting liquid high-level waste would be vitrified --dissolved in molten glass -- and poured into stainless steel canisters at a new facility that adjoins THORP. The uranium, plutonium, and waste canisters would then be returned to DOE, or, for an additional fee, BNFL could produce mixed-oxide (MOX) fuel from the plutonium and some of the uranium. Most U.S. nuclear plants could load at least a third of their reactor cores with MOX fuel.

A report by the operator of the DOE Savannah River Site suggested that the site's reprocessing facilities, which formerly extracted highly enriched uranium and plutonium primarily for defense needs, could economically reprocess spent fuel from commercial reactors. A new vitrification plant at the site could solidify the resulting high-level waste for disposal. However, questions have arisen about the ability of the 40-year-old Savannah River Site reprocessing facilities to meet current safety standards.

Reprocessing costs are intended to be offset at least partly by the value of the uranium and plutonium extracted from spent fuel, a value that depends primarily on the market price of newly mined uranium. Uranium has been relatively inexpensive since the early 1980s, but reprocessing supporters expect prices to rise in the future. The value of reprocessed uranium is difficult to assess. On the downside, reprocessed uranium contains a relatively high percentage of undesirable uranium isotopes and may be slightly contaminated with highly radioactive residues. However, it also usually has a higher percentage of the crucial isotope uranium-235 than found in natural uranium.

Reprocessing proponents maintain that waste disposal costs would be lowered by the reduction in waste volume and by the recycling of plutonium, which poses a long-term radioactive hazard. However, the waste-management benefits of reprocessing remain largely undemonstrated. Most of the near-term radioactivity and heat in spent fuel would remain in the vitrified high-level waste, so the separation between waste canisters in a repository (and therefore total acreage requirements) might not be significantly reduced. Also, because plutonium can be recycled only a few times in today's reactors before becoming unusable, some reprocessed plutonium would eventually require permanent disposal unless advanced reactor technology became commercialized.

Reprocessing of U.S. commercial reactor fuel would require a substantial change in U.S. nuclear nonproliferation policy. Although the Clinton Administration does not attempt to block the United States= economically advanced allies from reprocessing civilian spent fuel, it Adoes not encourage the civil use of plutonium and, accordingly, does not itself engage in plutonium reprocessing for either nuclear power or nuclear explosive purposes.≅ Supporters of the Administration policy contend that any U.S. reprocessing would undermine efforts to prevent non-nuclear-weapons nations from building plutonium stockpiles.

In collaboration with the DOE and the University of Idaho, BNFL is also currently researching a new supercritical fluid reprocessing method in Idaho. It could significantly reduce a variety of waste including that produced in reprocessing spent fuel. Although the method has so far been successful, developers say there is a long way to go before it will be used commercially at a large scale to reprocess spent fuel.

Transmutation converts radioactive isotopes into isotopes of other elements with shorter half-lives or less radioactivity. Laboratories around the world are testing transmutation using reactors, accelerator systems or some combination of both. In an effort to sort out some of the potential applications, Congress gave DOE $4 million in FY99 to study transmutation and determine its technical impact on spent fuel disposal. The DOE emphasizes that development of the technology will not significantly impact nuclear waste disposal for decades and should not influence near-term decisions on a repository. The principal effect may be on whether or not the repository would eventually be entombed or managed as a monitored retrievable storage facility so that waste could be removed and reduced to less dangerous forms in the future. Of the long-lived radioisotopes, 99.995% comprise only one percent of the volume of spent fuel. Actinides and some fission products are the major problems. Concerns include leakage from a repository over thousands of years (some actinides in the waste, such as cesium, have half-lives in excess of a million years) and intentional diversion for military or terrorist purposes.

Transmutation could reduce the period of maximum risk from tens of thousands of years to something closer to 500 to 1,000 years by eliminating the long-lived actinides and highly toxic fission products. Two European labs are proposing to develop demonstration plants, and are seeking international support.

C. The Future of Nuclear Power Generation

The DOE Energy Information Administration's 1998 report, *International Energy Outlook*, made the following observations about nuclear power:

- The prospects for nuclear power to maintain a significant share of worldwide electricity generation are uncertain, despite projected growth of 2.7 percent per year in total electricity demand through 2020. Only developing nations and Japan are projected to have net additions to nuclear power capacity, and countries operating older reactors and have other, more economical options for new generating capacity are expected to let their nuclear capacity fade as current nuclear units are retired.
- The Kyoto Climate Change Protocol could create new incentives for the use of nuclear power, though a continuation of current trends is assumed for the near term, and other key factors must be considered, these being political climates, national energy plans, construction management experience, and financial conditions.
- In the North America region, which includes Canada and Mexico, no growth in nuclear capacity is forecasted. By 2020, U.S. nuclear capacity is projected to be 51 percent lower than the 1996 level.

The report discussed the most significant factors shaping the outlook for nuclear power, which are:

- Changes in electricity industries worldwide, introducing more competition in the generation sector: nuclear power plants require relatively large amounts of capital and more time to build than other technologies. This will make nuclear power less attractive to investors in a competitive environment. Competition may also affect how long current reactors will operate. However, British experience, which has been responding to deregulation longer than in the U.S., suggests that improvements in nuclear performance are possible. In general, U.S. utilities operating nuclear power stations have already begun to reduce costs and improve performance.
- Public acceptance: the perceived risks of nuclear power continue to be an issue in technology choices for new generating capacity.
- Nuclear waste issues: in the U.S., it is unlikely that new nuclear construction will be considered before a solution to the nuclear waste problem is found.
- Operating performance: in 1996, the average capacity factor of the world's nuclear power plants was 73 percent. In recent years, the worldwide average has been improving. In the U.S., there have been permanent shutdowns of reactors (three in the first half of 1997) related to operating competitiveness.

Debate continues in a number of contexts which raise very fundamental questions about the future role of nuclear power generation, both nationally and internationally. Particularly in the U.S., a near-term solution to the waste disposal dilemma is considered to be the pivotal factor influencing perceptions and decisions about nuclear power. Costs, safety and proliferation concerns are important factors as well.

No nuclear plants have been ordered since 1978 and more than 100 reactors have been canceled, including all ordered after 1973. No units are currently under active construction; the Tennessee Valley Authority's Watts Bar 1 reactor, ordered in 1970 and licensed to operate in 1996, was the last U.S. nuclear unit to be completed.

The nuclear power industry's troubles include a slowdown in the rate of growth of electricity demand, high nuclear power plant construction costs, public concern about nuclear safety and waste disposal, and a changing regulatory environment.

High construction costs are perhaps the most serious obstacle to nuclear power expansion. Construction costs for reactors completed within the last decade have ranged from $2-$6 billion, averaging about $3,000 per kilowatt of electric generating capacity (in 1995 dollars). The nuclear industry predicts that new plants could be built for about half that amount, but construction costs would still substantially exceed the projected costs of coal- and gas-fired plants. Some in the industry have expressed optimism that continued growth of nuclear power in Asian countries will have a positive effect on the US market for new construction.

Of more immediate concern to the nuclear power industry is the outlook for existing nuclear reactors in a deregulated electricity market. Electric utility restructuring, which is currently underway in several states, could increase the competition faced by existing nuclear plants. High operating costs and the need for costly improvements and equipment replacements have resulted in the permanent shutdown during the past decade of eight U.S. commercial reactors before completion of their 40-year licensed operating periods. At least four more reactors are currently being considered for early shutdown. (Also see next section.)

Nevertheless, electricity production from U.S. nuclear power plants is greater than that from oil, natural gas, and hydropower, trailing only coal, which accounts for 55% of U.S. electricity generation. Nuclear plants generate more than half the electricity in six states. Average operating costs of U.S. nuclear plants have dropped during the 1990s, and costly downtime has been steadily reduced. Licensed commercial reactors generated electricity at an average of 75% of their total capacity in 1996, slightly below the previous year's record.

Global warming that may be caused by fossil fuels -- the "greenhouse effect" -- is cited by nuclear power supporters as an important reason to develop a new generation of reactors. But the large obstacles noted above must still be overcome before electric utilities will risk ordering new nuclear units. Reactor manufacturers are working on designs for safer, less expensive nuclear plants, and the Nuclear Regulatory Commission (NRC) has approved new regulations intended to speed up the nuclear licensing process, consistent with the Energy Policy Act of 1992 (P.L. 102- 486). Even so, the Energy Information Administration forecasts that no new U.S. reactors will become operational before 2010, if any are ordered at all.

Driven by experience over the past 30 years, the DOE and the nuclear utility industry have cooperated to move toward a new generation of more standardized reactor design, intended to improve safety and reduce costs and construction lead times. Effectively, these are almost Aoff-the-shelf≅ designs which have been preapproved by the NRC.

For the Clinton Administration, "nuclear power is not high priority," according to a FY1995 DOE budget summary, but "the option should be kept open." That ambivalence is reflected in DOE's nuclear R& D budget under the Clinton Administration, which proposes to continue research on existing commercial nuclear plants while terminating development of advanced reactors.

Federally funded nuclear fission energy supply research and development at the Department of Energy has plummeted this decade, reaching zero funding in 1998, while federal funding to all other energy supply research and development categories (fossil, renewables, energy efficiency, fusion) has averaged over $300 million per year over the same period.

Termination of DOE research on advanced reactors began in FY1995, when Congress accepted the Administration's plan to halt development of the Advanced Liquid Metal

reactor (ALMR), also called the Integral Fast Reactor (IFR). For FY1996, Congress agreed to terminate research on the Gas Turbine Modular Helium Reactor (GT-MHR). Congress and the Administration continued funding for improved versions of today's Light Water Reactors (LWRs) through FY1997. But the Administration's FY1998 request declares the program completed and would provide only $5.5 million in termination costs for advanced LWR development.

The US Nuclear Regulatory Commission gave final design certification to two advanced reactor designs in May 1997. These are the first such generic certifications to be issued and will be valid for 15 years. The certification process anticipates that safety issues within the scope of the certified designs have been fully resolved and hence will not be open to legal challenge during licensing for particular plants.

Outside of the US, there are active research and development programs for advanced reactors in Japan, Canada, Germany, France and Russia. Advanced reactors have been built and brought on line in Japan, and are under construction in Russia.

D. Implications of Electric Deregulation

A January 1997 Nuclear Regulatory Commission technical paper, *Effects of Electric Industry Deregulation on Nuclear Power Plants,* concluded that economic deregulation and restructuring in the electric utility industry could potentially have profound impacts on the long-term ability of power reactor licensees to obtain adequate funds to operate and to decommission their plants safely.

The Nuclear Regulatory Commission in late 1997 issued its final policy statement on the Restructuring and Economic Deregulation of The Electric Utility Industry. The NRC initiated the policy effort because of concerns about the possible effects that rate deregulation and disaggregation resulting from various restructuring actions involving power reactor licensees could have on the continued protection of public safety. Such changes may affect the licensing basis under which the NRC originally found a licensee to be financially qualified to construct, operate, or own its power plants, and to accumulate adequate funds to ensure decommissioning at the end of reactor life. Prior to issuance of this new policy statement, licensees had always been obligated to obtain advance approval from the NRC for any changes that would constitute a transfer of the license, and to report any information regarding financial qualification and decommissioning funding assurance that may have a significant implication for public health and safety.

The NRC believes that its regulatory framework is generally sufficient at this time to address the restructurings and reorganizations that will likely arise as a result of electric utility deregulation. Further**,** the NRC recognizes the primary role that state and federal economic regulators have served, and in many cases will continue to serve, in setting rates that include appropriate levels of funding for safe operation and decommissioning. While the NRC intends to continue to defer to economic regulators in these rate related

areas, the NRC reserves the right to take appropriate steps in order to assure a licensee=s adequate accumulation of decommissioning funds.

The NRC=s policy statement does not address any aspect of the management of spent nuclear fuel. Presumably, any general plant or independent storage licensee will have been judged to meet financial and decommissioning fund assurance requirements, and will be required to operate the storage facilities in a safe manner in compliance with the NRC license**.** Questions of who pays the cost of on-site storage are left to the courts and state public utility commissions.

The industry and rate payer groups have expressed concern about Astranded costs≅ in a deregulated environment, which will be particularly challenging where nuclear units are forced to close prematurely, whether the result of rate deregulation or other reasons. The NRC and state public utilities commissions also must deal with insufficient decommissioning funds for a prematurely closed nuclear unit. Relative to the federal nuclear waste program, contributions to the Nuclear Waste Fund are also diminished by plant closures.

The NRC has several actions underway to streamline the hearing process for license transfers and address other considerations in license transfers, such as foreign ownership and technical qualifications. The NRC issued a final Standard Review Plan on antitrust reviews and soon will be issuing a final Standard Review Plan on financial qualifications and decommissioning funding assurance. The NRC also intends to issue an integrated Standard Review Plan on license transfer issues by the end of 1999.

An environmental group, Public Citizen, released a study in January 1999 that concluded utility deregulation will result in significant funding shortfalls for decommissioning nuclear power plants and storing nuclear waste. The study predicts that deregulation will force early closure of as many as 90 of the 103 operating plants in the U.S. It states that because funding under current law assumes plants will run until their licenses expire, these economically driven plant closures would create an unfunded liability for nuclear plant decommissioning, that could reach $15.3 billion. Further, early plant retirements also will create an unfunded liability for long-term storage of high-level waste that could total as much as $46.5 billion.

E. Relicensing of Reactors

No U.S. nuclear power plants have been relicensed. The NRC has been working for several years on developing procedures in anticipation of relicensing applications as plants approach the end of their current 40-year licenses.

Based on the Atomic Energy Act, the Nuclear Regulatory Commission (NRC) issues licenses for commercial power reactors to operate for up to 40 years. These licenses can be renewed for up to 20 additional years. A 40-year license term was selected on the basis of economic and antitrust considerations--not by technical limitations. However, individual plant designs may have been engineered on the basis of an

expected 40-year service life.

The first 40-year operating license will expire in the year 2006, approximately 10 percent of the rest will expire by the end of the year 2010, and more than 40 percent will expire by the year 2015. The decision whether to seek license renewal rests entirely with nuclear power plant owners (i.e., licensees). They must decide whether they are likely to satisfy NRC requirements and whether costs of the venture are worth it.

The NRC has established a timely license renewal process and clear requirements that are needed to assure safe plant operation for extended plant life. Renewal of licenses undoubtedly will impact on whether nuclear power will remain part of the energy supply mix for the nation during the first half of the 21st Century. Currently, nuclear power provides about 20 percent of the electricity in the U.S.

The license renewal process proceeds along two tracks--a technical review of safety issues and an environmental review. The applicant has to provide NRC an evaluation that addresses the technical aspects of plant aging and describes the ways those effects will be managed. It must also prepare an evaluation of the potential impact the plant might have on the surrounding environment if it operates for another 20 years. The NRC reviews the application and verifies the safety evaluations through inspections.

Public participation is an important part of the license renewal process. There are several opportunities for members of the public to raise questions regarding whether effects of aging will be adequately managed for the period of extended operation. Information provided by the licensee is made available to the public. Several public meetings are held and NRC evaluations, findings, and recommendations are published when completed. Concerns may be litigated in a formal adjudicatory hearing if any party that would be adversely affected requests a hearing. In addition, members of the public may petition the Commission for consideration of issues other than the management of the effects of aging during the period of extended operation of the plant.

A nuclear power plant licensee may apply to the NRC to renew its license as early as 20 years or as late as five years before expiration of its current license. License renewal is expected to take less than three years, including the time to conduct an adjudicatory hearing, if necessary.

Baltimore Gas and Electric Company (BGE) submitted the first license renewal application for its two Calvert Cliffs plants in April 1998. The BGE application was based on an integrated plant assessment methodology submitted in August 1995, detailing how BGE intends to address the requirements in Part 54. The NRC plans to issue a draft safety evaluation in March 1999, and a final safety evaluation report in November 1999.

Duke Power Company submitted a license renewal application for their three Oconee plants in July 1998. The technical information on the reactor building was submitted in March 1997. Samples of the other areas were also submitted to NRC for feedback in

preparing their formal renewal application. The NRC plans to issue a draft safety evaluation in June 1999, and a final safety evaluation in February 2000.

Both utilities have submitted to NRC environmental reports required by 10 CFR Part 51. Separate environmental scoping meetings have been held near each of the plants to obtain comments from the public. These comments will be considered in NRC's environmental impact review for each of the plants. Draft and final environmental statements are planned to be issued in the same month as the draft and final safety evaluation reports for both applications.

Several other licensees have expressed an interest in license renewal, and have described their plans for preparing license renewal applications in public meetings with the NRC staff. In particular, the Southern Nuclear Operating Company is developing an integrated plant assessment for their Hatch plant in cooperation with Northern States Power and PECO Energy Company. Presumably NSP's cooperative role is intended to develop experience in the NRC relicensing process. In addition, Florida Power and Light is pursuing renewal for their Turkey Point plant, in cooperation with Virginia Electric Power Company.

F. Nuclear Waste Fund

The DOE Office of Civilian Radioactive Waste Management's most recent estimate of the adequacy of the Nuclear Waste Fund fee was included in a December 1998 report, *Nuclear Waste Fund Fee Adequacy: An Assessment*. The fund is a separate account, established in the Treasury of the United States by the Nuclear Waste Policy Act (NWPA). It consists of receipts, proceeds and recoveries realized by the U.S. Department of Energy (DOE) under the NWPA, any appropriations made by the Congress into the fund, and any unexpended balances that were transferred to the fund on the date of enactment of the NWPA. Fees paid by owners and generators of civilian spent nuclear fuel are deposited directly into the fund. The fee is 1 mill (0.1 ¢) per kilowatt-hour of electricity generated and sold.

The NWF Fee Adequacy report only considers the costs associated with disposal of commercial spent nuclear fuel. Costs for the disposal of government-managed nuclear materials, including DOE and naval spent fuel, vitrified high-level radioactive waste glass, and immobilized plutonium, are not paid for with the fees assessed to commercial nuclear utilities.

The assessment identifies key uncertainties in projecting fund balances, including variability in DOE program costs, fund revenues, and economic conditions. The results indicate that the fee charged to utilities is adequate under the assumptions used. Even with the uncertainties described in the assessment, the report concludes that there is no need at this time to adjust the fee.

The executive summary of the fund assessment report is attached as Appendix 2.