UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

ENVIRONMENTAL ASSESSMENT

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO THE INCREASE IN THE ALLOWED FUEL ASSEMBLY STORAGE OF

FACILITY OPERATING LICENSE NO. DPR-35

BOSTON EDISON COMPANY

FOR THE

PILGRIM NUCLEAR POWER STATION

DOCKET NO. 50-293

1.0 INTRODUCTION

1.1 Description of Proposed Amendment

By letter dated February 11, 1993, as supplemented December 2, 1993, January 5, February 22, March 1, April 15, and May 16, 1994, Boston Edison Company (BECo or the licensee) requested an amendment to the Technical Specifications (TSs) appended to Facility Operating License No. DPR-35 for the Pilgrim Nuclear Power Station. This amendment increases the allowed fuel assembly storage cells from 2320 to 3859, and changes the maximum loads allowed to travel over the spent fuel assemblies from 1000 to 2000 lbs., and changes the limiting characteristics of assemblies to be stored in the spent fuel from a maximum $K_{INIFITY} \leq 1.35$ to a maximum $K_{INIFITY} \leq 1.32$ and a maximum lattice average uranium enrichment of ≤4.6% by weight. The increase in spent fuel pool (SPF) capacity would be accomplished by installing six additional stainless steel storage racks with Boral as the neutron absorbing material.

1.2 Need for Increased Storage Capacity

Pilgrim's SFP currently has a fuel assembly storage capacity of 2320. Because all spent fuel generated so far from operation of the facility has been stored onsite in this pool, the SFP is approaching its maximum storage capacity. After 1995, the SFP will no longer have full-core (580 fuel assemblies) offload storage capability. Therefore, to preclude this situation, the licensee will install additional storage racks.

1.3 Alternatives

Commercial reprocessing of spent fuel has not developed as originally anticipated. In 1975, the Commission directed the staff to perform a Generic Environmental Impact Statement (GEIS) on spent fuel storage. The Commission directed the staff to evaluate alternatives for the handling and storage of

spent light water power reactor fuel with particular emphasis on developing long-range policy. The GEIS was to consider alternative methods of spent fuel storage as well as the possible restrictions on termination of the generation of spent fuel through reactor shutdown.

A "Final Generic Environmental Impact Statement (FGEIS) on Handling and Storage of Spent Light Water Power Reactor Fuel" (NUREG-0575, Volumes 1-3) was issued by the Commission in August 1979. The finding of the FGEIS is that the environmental costs of interim storage are essentially negligible, regardless of where such spent fuel is stored. A comparison of the impact costs of various alternatives reflects the advantage of continued generation of nuclear power versus its replacement by coal-fired power generation. Continued generation of nuclear power versus its replacement by oil-fired generation provides an even greater economic advantage. In the bounding case considered in the FGEIS, that of shutting down the reactor when the existing spent fuel storage capacity is filled, the cost of replacing nuclear stations before the end of their normal lifetime makes this alternative uneconomical. The storage of spent fuel as evaluated in NUREG-0575 is considered to be an interim action, not a final solution to permanent disposal.

One spent fuel storage alternative considered in detail in the FGEIS is the expansion of the onsite fuel storage capacity by modification of the existing SFPs. Over 100 applications for SFP expansion have either been approved or are under consideration by the Commission. The finding in each has been that the environmental impact of such increased storage capacity is negligible. Since there are variations in storage design and limitations caused by spent fuel already in storage, however, the FGEIS recommends that licensing reviews be done on a case-by-case basis, so as to resolve plant-specific concerns.

The continuing validity and site-specific applicability of the conclusions in NUREG-0575 have been confirmed in the environmental assessments for the Surry, H.B. Robinson, Oconee and other plants' independent spent fuel storage installations.

The licensee has considered several alternatives to the proposed action of the SFP expansion, including fuel consolidation and dry cask storage. The staff has evaluated these and certain other alternatives. The following alternatives were considered by the staff:

(1) Shipment of fuel to a permanent Federal fuel storage/disposal facility.

(2) Shipment of fuel to a reprocessing facility.

(3) Shipment of fuel to another utility or site for storage.

(4) Reduction of spent fuel generation.

(5) Construction of a new independent spent fuel storage installation.

(6) No action taken.

Each of these alternatives is discussed below.

(1) Shipment of Fuel to a Permanent Federal Fuel Storage/Disposal Facility

Shipment of fuel to a permanent Federal fuel storage disposal facility is an alternative to increasing the onsite spent fuel storage capacity. The U.S. Department of Energy (DOE) is developing a repository under the Nuclear Waste Policy Act of 1982 (NWPA). The facility, however, is not likely to be able to receive spent fuel until approximately 2010, at the earliest. The existing Pilgrim spent fuel storage pool will lose full core offload capability in 1995. Therefore, spent fuel acceptance and disposal by DOE is not an alternative to increased onsite pool storage capacity.

As an interim measure, shipment to a monitored retrievable storage (MRS) facility is another alternative to increasing the onsite spent fuel storage capacity. However, because Congress has not authorized an MRS, and because the data on the availability of this facility is uncertain, this alternative does not meet the near-term storage needs of Pilgrim. A number of utilities, including BECo, are pursuing the possibility of a private interim-storage facility on the lands of the Mescalero Apache Tribe in New Mexico. However, if this possibility is realized, it will not be available by the time BECo requires the storage provided for in the current application.

Under the NWPA, the Federal Government has the responsibility to provide not more than 1900 metric tons capacity for the interim storage of spent fuel. The impacts of storing spent fuel at a Federal Interim Storage (FIS) facility fall within those already assessed by the Commission in NUREG-0575. In enacting NWPA, Congress found that the owners and operators of nuclear power stations have the primary responsibility for providing interim storage for spent nuclear fuel. In accordance with the NWPA and 10 CFR Part 53, shipping of spent fuel to an FIS facility is considered a last resort alternative. At this time, the licensee cannot take advantage of FIS because existing storage capacity is not maximized.

(2) Shipment of Fuel to a Reprocessing Facility

Reprocessing of spent fuel from Pilgrim is not viable because there is no operating commercial reprocessing facility in the United States, nor is there the prospect of one in the foreseeable future.

(3) Shipment of Fuel to Another Utility or Site for Storage

The shipment of fuel from Pilgrim to the storage facility of another utility would provide short-term relief from the storage problem. The NWPA and 10 CFR Part 53, however, clearly place the responsibility for the interim storage of spent nuclear fuel with each owner or operator of

a nuclear power plant. The shipment of the fuel to another site is not an acceptable alternative because of increased fuel handling risks and additional occupational radiation exposure, as well as the fact that no additional storage capacity would be created.

(4) Reduction of Spent Fuel Generation

Improved usage of fuel in the reactor and/or operation at a reduced power level would extend the life of the fuel in the reactor. In the case of extended burnup of fuel assemblies, the fuel cycle would be extended, and fewer offloads would take place. Through increasing the enrichment of the fuel, the licensee is already working toward extended fuel cycles. As discussed in item 1, however, full-core offload capability will be lost in 1995. Operations at reduced power would not make effective use of available resources, and would cause unnecessary economic hardship on the licensee and its customers. Therefore, reduction of the amount of spent nuclear fuel generated is not a practical alternative for Pilgrim.

(5) Construction of a New Independent Spent Fuel Storage Installation (ISFSI)

Additional storage capacity could be developed by building a new ISFSI. This facility could be either a pool, similar to the existing facility, or a dry storage installation. The staff has generically assessed the impacts of the pool alternative and found, as reported in NUREG-0575, that the storage of spent light water reactor fuel in water pools has an insignificant impact on the environment. The staff has not made a generic assessment of the dry storage option; however, assessments for the dry cask ISFSI at the Surry Power Station and the dry modular concrete ISFSI at the H.B. Robinson Steam Electric Plant and the Oconee Nuclear Station, among others, resulted in findings of no significant impact.

While these alternatives are environmentally acceptable, such a new storage facility, either at Pilgrim or offsite, would require new site-specific engineering and design, including equipment for the transfer of spent fuel. It is not likely that this effort would be completed in time to meet the need for additional capacity as discussed in item (1). Furthermore, such construction would not use the existing expansion capacity of the existing pool, and thus would waste resources.

(6) No Action Taken

If no action were taken, the storage capacity would become exhausted in the near future and Pilgrim would have to shut down. This alternative is considered a waste of an available resource, Pilgrim itself, and is not considered viable.

SUMMARY OF ALTERNATIVES

The only viable long-term alternative solution to the licensee's spent fuel storage problem is the construction of an ISFSI; however, it is not likely that the construction of such a facility could be completed in a timely manner. Furthermore, construction of such a facility would be a waste of available resources, in that it would fail to utilize the expansion capacity of the existing SFP.

2.0 RADIOACTIVE WASTES

The Pilgrim design contains waste treatment systems designed to collect and process the gaseous, liquid, and solid waste that might contain radioactive material. The radioactive waste treatment systems are evaluated in the Final Environmental Statement (FES) dated July 1973. The proposed expansion will not involve any change in the waste treatment systems described in the FES.

2.1 Radioactive Material Released to the Atmosphere

With respect to releases of gaseous materials to the atmosphere, the only radioactive gas of significance that could be attributable to storing additional spent fuel assemblies for a longer time is the radionuclide Krypton-85 (Kr-85). Experience has demonstrated that after spent fuel has decayed 4 to 6 months, there is no longer a significant release of fission products, including Kr-85, from stored spent fuel containing cladding defects.

To determine the average annual release of Kr-85, it was assumed that all of the Kr-85 released from any defective fuel discharged to the SFP would be released before the next refueling. Enlarging the storage capacity of the SFP has no effect on the calculated average annual quantities of Kr-85 released to the atmosphere. There may be some small change in the calculated quantities due a change in fuel burnup; however, this is expected to be a small fraction of the calculated annual quantities.

Iodine-131 releases from spent fuel assemblies to the SFP water will not increase significantly since Iodine-131 will decay to negligible levels between refuelings.

Most of the tritium in the SFP water results from activation of boron and lithium in the primary coolant and this will not be affected by the proposed changes. A relatively small amount of tritium is contributed during reactor operation by fissioning of reactor fuel and subsequent diffusion of the tritium through the fuel and cladding. Tritium releases from the fuel assemblies occur mainly during reactor operations and, to a limited extent, shortly after shutdown. Thus, expanding the SFP capacity will not increase the tritium activity in the pool.

Storing additional spent fuel assemblies is not expected to increase the bulk water temperature during normal refueling above the value used in the design analysis. Therefore, it is not expected that there will be any significant change in the annual release of tritium or iodine as a result of the proposed modifications from that previously evaluated in the FES. Most airborne releases of tritium and iodine result from evaporation of reactor coolant, which contains tritium and iodine in higher concentration than the SFP. Therefore, even if there were a higher evaporation rate from the SFP, the resulting tritium and iodine releases would be small in comparison to the amount already evaluated in the FES. The SFP exhaust system must be operating and discharging through both high-efficiency particulate air (HEPA) and charcoal filters whenever spent fuel is being moved, and whenever loads are being carried over the pool.

2.2 Solid Radioactive Wastes

Currently, about 180 cubic feet of solid radioactive waste per year is generated by the SFP cleanup system. No significant increase in volume of solid radioactive wastes is expected as a result of the expansion of the capacity of the SFP.

2.3 Radioactive Material Released to Receiving Waters

There should not be a significant increase in the liquid release of radionuclides from the plant as a result of the modifications. The SFP cooling and cleanup systems operate as a closed system. The SFP demineralizer resin removes soluble radioactive materials from the SFP water. These resins are periodically replaced (i.e., annually) and disposed of as solid radioactive waste. The amount of activity in the resin may increase slightly due to the increased amount of spent fuel in the pool; however, the amount of radioactivity released to the environment as a result of the proposed change would be negligible.

3.0 RADIOLOGICAL IMPACT ASSESSMENT

Operating experience shows dose rates of 1.0 to 2.0 mrem/hour, with a few areas such as the pool bridge showing dose rates of 2.0 to 4.0 mrem/hr, regardless of the quantity of fuel stored. This is not expected to change with the proposed modification because radiation levels above the pool are due primarily to activity in the water, which experience shows will return to an equilibrium value. Stored spent fuel is so well shielded by the water in the pool that dose rates at the top of the pool from this source are negligible. Additionally, there has been no crud built up along the sides of the pool. Should crud buildup ever be detected, it could easily be washed down. Furthermore, the water level in the SFP will be kept as high as possible in order to maintain exposure levels as low as is reasonably achievable. Therefore, increased exposure due to this source is considered negligible. There is no noticeable concentration of airborne activity in the area of the

SFP. The proposed modification is not expected to increase this activity. Area monitors for airborne activities are available in the immediate vicinity of the SFP. Therefore, the staff concludes that the proposed SFP expansion will not result in any significant long-term increases in doses received by workers.

The total occupational exposure to plant workers as a result of the modification is estimated to be between 2 and 4 person-rem, assuming dose rates between 2.5 mrem/hr to 5 mrem/hr for most of the operation. The modification will utilize detailed procedures prepared with full consideration of ALARA principles. Similar operations have been performed at a number of other facilities in the past and there is every reason to believe that the proposed expansion can be safely and efficiently accomplished at Pilgrim with minimum radiation exposure to personnel.

4.0 NONRADIOLOGICAL IMPACT

The only nonradiological effluent affected by the SFP expansion is the additional spent fuel waste heat rejected from the plant. The total increase in heat load rejected to the environment will be small in comparison to the amount of total heat currently being released. No impact on aquatic life is expected. Thus, the increase in rejected heat will have a negligible effect on the environment.

The licensee has not proposed any change in the use or discharge of chemicals in conjunction with the expansion of the SFP. The proposed expansion will not require any change to the National Pollution Discharge Elimination System permit. Therefore, the staff concludes that the nonradiological environmental impacts of expanding the SFP will be insignificant.

5.0 ACCIDENT CONSIDERATIONS

The staff, in its related Safety Evaluation to be issued at a later date, has addressed both the safety and environmental aspects of a fuel handling accident. A fuel handling accident bounds the potential consequences of an accident attributable to operation of a SFP with high density racks. A fuel handling accident may be viewed as a "reasonably foreseeable" design basis event which the pool and its associated structures systems and components (including the racks) are designed and constructed to prevent. The environmental impacts of the accident were found not to be significant.

6.0 SUMMARY

The FGEIS on Handling and Storage of Spent Light Water Reactor Fuel concluded that the cost of the various alternatives reflects the advantage of continued generation of nuclear power with the accompanying spent fuel storage. Because of the differences in SFP designs, the FGEIS recommended environmental evaluation of SFP expansions on a case-by-case basis.

The occupational radiation dose for the proposed operation of the expanded SFP is extremely small compared to the annual occupational exposure for a facility of this type. The small increase in radiation dose should not affect the licensee's ability to maintain individual occupational doses at Pilgrim within the limits of 10 CFR Part 20, and as low as reasonably achievable. Furthermore, the nonradiological impacts of expanding the SFP will be insignificant, and none of the alternatives are practical or reasonable.

6.1 Alternative Use of Resources

This action does not involve the use of resources not previously considered in connection with the Commission's Final Environmental Statement, dated July 1, 1973, in connection with Pilgrim.

6.2 Agencies and Persons Consulted

The staff reviewed the licensee's request. The staff also consulted with the State of Massachusetts regarding the environmental impact of the proposed action.

7.0 BASIS AND CONCLUSIONS FOR NOT PREPARING AN ENVIRONMENTAL IMPACT STATEMENT

The staff has reviewed the proposed SFP modification to Pilgrim relative to the requirements set forth in 10 CFR Part 51. Based upon the environmental assessment, the staff has concluded that there are no significant radiological or nonradiological impacts associated with the proposed action and that the proposed license amendment will not have a significant effect on the quality of the human environment. Therefore, the Commission has determined, pursuant to 10 CFR 51.31, not to prepare an environmental impact statement for the proposed amendment.

Principal Contributor: J. Harold

Date: June 15, 1994