UNITED STATES
NUCLEAR REGULATORY COMMISSION
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ENVIRONMENTAL ASSESSMENT

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO MODIFICATION OF THE SPENT FUEL POOL

NORTHEAST NUCLEAR ENERGY COMPANY

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

DOCKET NO. 50-336

1.0 INTRODUCTION

1.1 Description of Proposed Amendment

By letter dated May 14, 1993, and supplemented by letters dated June 10, July 16, November 30, December 1, 1993, and January 27, 1994, the Northeast Nuclear Energy Company (NNECO or the licensee) requested an amendment to change the Technical Specifications (TS) for the Millstone Nuclear Power Station, Unit No. 2. The change would modify the spent fuel pool (SFP) by introducing neutron absorbing (poison) rodlets (pins) into the stored fuel and increase the required burnup in Region C to permit removal of the cell blockers, thus increasing by 234 fuel assemblies the storage capacity of the SFP.

1.2 Need for Increased Storage Capacity

Amendment No. 158 reduced the storage capability of the SFP by adding cell blocking devices to 40 spent fuel storage locations in Region B, thus decreasing the total capacity of the SFP and thus limiting the time to 1994 at which the full off-load capability would be reached without further fuel consolidation. Therefore, to preclude this situation, and to ensure that sufficient spent fuel storage capacity continues to exist without fuel consolidation, NNECO plans to introduce neutron absorbing rodlets into the stored fuel and increase the required burnup in Region C to permit removal of cell blockers, thus reclaiming 234 blocked spent fuel storage locations. The proposed modification would increase the SFP storage capacity to 1306 storage locations which would carry the unit through 2000 with full off-load capability without fuel consolidation.

2.0 ALTERNATIVES

Commercial reprocessing of spent fuel has not developed as had been originally anticipated. In 1975, the Commission directed the staff to prepare a Generic Environmental Impact Statement (GEIS, the Statement) on spent fuel storage. The Commission directed the staff to analyze alternatives for the handling and storage of spent light water power reactor fuel with particular

emphasis on developing long range policy. The Statement was to consider alternative methods of spent fuel storage as well as the possible restriction or termination of the generation of spent fuel through nuclear power plant shutdown.

A Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel (NUREG-0575), Volumes 1-3 (the FGEIS) was issued by the NRC in August 1979. In the FGEIS, consistent with long range policy, the storage of spent fuel is considered to be interim storage to be used until the issue of permanent disposal is resolved and implemented.

One SFP storage alternative considered in detail in the FGEIS is the expansion of onsite fuel storage capacity by modification of the existing SFPs. Many applications of SFP capacity increases have been received and approved. The finding in each case has been that the environmental impact of such increased storage capacity is negligible. However, since there are variations in storage designs and limitations caused by the spent fuel already stored in some of the pools, the FGEIS recommends that licensing reviews be done on a case-by-case basis to resolve plant-specific concerns.

One variation in storage design could be the application of new poison racks. This would require the removal of existing racks and the disposal as radioactive waste. Such an alternative would be much more expensive than the proposed method which offers a more benign solution without as large an environmental cost.

Additional storage capacity could be developed by building a New Independent Spent Fuel Storage Installation (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. Dry storage facilities have been built and used at a few facilities, and staff reviews have indicated that they do not have a significant impact on the environment. While these alternatives are economically acceptable, such a new storage facility, either at Millstone or off site, would require new site-specific engineering and design, including equipment for the transfer of spent fuel. It is not likely that this entire effort would be completed in time to meet the need for additional capacity. Furthermore, such additional construction would not be nearly as practical as the proposed method and thus would waste resources.

The shipment of fuel from the Millstone Unit 2 to the storage facility of another utility would provide short-term relief from the storage problem. The NWPA and 10 CFR Part 50, 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 a viable alternative since NNECO's other facilities - Haddam Neck, Millstone Unit 1,

Millstone Unit 3 and Seabrook - are neither designed nor equipped to receive highly irradiated fuel from offsite. In addition, these sites are expected to have fuel storage problems of their own before the issue is resolved.

Another alternative to the expansion of the SFP would be the implementation of the fuel consolidation program as allowed by the TS. Although this alternative has been demonstrated by the storage of 6 fuel assemblies into 3 consolidation boxes, it would severely impact the licensee's next refueling schedule and, possibly the acceptability by the Department of Energy for ultimate disposal. Thus, the licensee chose the proposed method as the method of extending the date at which full core off loading would no longer be possible.

The proposed method of increasing the storage capacity of the spent fuel pool was found to be the most attractive option when compared with other alternatives considering the overall capital and operating and maintenance cost, refueling schedules and environmental impacts.

3.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

3.1 Radiation Exposure

3.1.1 Occupational Exposure

The licensee stated in its application that all work required to remove the existing cell blockers will be performed using remote handling tools. The licensee further stated (and subsequently committed via teleconference and in its response to request for additional information dated December 1, 1993) that it does not intend to use divers for this SFP modification. In the unforeseen circumstance that divers would be needed during this modification, the licensee has committed to stop SFP modification operations and submit to NRC a proposal addressing the radiological safety precautions to be utilized during diving operations. This submittal shall address the "Procedures for Diving Operations in High and Very High Radiation Areas" as stated in Appendix A of Regulatory Guide 8.38, "Control of Access to High and Very High Radiation Areas in Nuclear Power Plants."

The licensee stated in a teleconference held on December 10, 1993, that all phases of the SFP modification will result in a total of less than one person-rem of exposure.

The licensee will prepare and follow specific procedures that are consistent with as low as is reasonably achievable (ALARA) principles and practices. The modification will be worked under specific radiological work permits that will require appropriate levels of protective clothing and dosimetry to keep employee exposures ALARA. The licensee further stated that all cell blockers will be decontaminated and monitored under water prior to the removal from the SFP to minimize the potential of any hot particle exposure.

The licensee stated that external radiation fields in the area near the pool surface range between 1 and 3 mrem per hour, and are not expected to increase during the SFP modification. During all evaluations, when radioactive material is removed from the pool, there will be continuous health physics job coverage. Further, the licensee will perform air grab samples during the modification and will provide continuous air sampling of the work area when radioactive material is removed from the pool.

Based on the staff's review of the licensee's application, the staff finds the proposed radiation protection aspects of the SFP modification acceptable.

3.1.2 Public Exposure

In its application, the licensee evaluated the possible consequences of postulated accidents, included means for their avoidance in the design and operation of the facility, and provided means for mitigation of their consequences should they occur. The licensee has evaluated the effect of the changes on the calculated consequences of a spectrum of postulated design basis accidents (i.e., Fuel Handling accidents and Spent Fuel Cask Drop accidents) and concludes that the effect of the proposed TS change is small and that the calculated consequences are within regulatory requirements and staff guideline dose values. The addition of poison pins or removal of blocking devices will not have any effect on the probability of occurrence of either of these two accidents. Since the licensee proposes to utilize extended burnup fuel, the staff reevaluated the fuel handling accident for Millstone Unit 2 to consider the effects of increased burnup.

In its evaluation for Millstone Unit 2, issued on May 10, 1974, the staff conservatively estimated offsite doses due to radionuclide released to the atmosphere from a fuel handling accident. The staff concluded that the plant mitigative features would reduce the doses for this design basis accident (DBA) to below the doses specified in Standard Review Plan (SRP) Section 15.7.4.

Since the licensee intends to utilize extended burnup fuel, the staff reanalyzed the fuel handling DBA for this case. According to NUREG/CR-5009 (February 1989), increasing fuel enrichment to 5.0 weight percent U-235 with a maximum burnup of 60,000 MWD/T increases the doses for a fuel handling accident by a factor of 1.2. Therefore, the 1.2 factor increase in dose, displayed in Table 1 below, bounds the dose consequences of the licensee's proposal. In Table 1, the new and old DBA doses are presented and compared to the guidelines doses in SRP Section 15.7.4 (established based on 10 CFR Part 100).

Table 1
Radiological Consequences for Fuel
Handling Design Basis Accident (rem)

	Exclusion Area	Low Population Zone
	Thyroid	Thyroid
Staff Evaluation May 10, 1974	2.8	< 1
Bounding Estimates for Extended Burnup Fuel	3.4	1.2
Regulatory Requirement (NUREG-0800) Chapter 15.7.4)	75	75

[1]Factor of 1.2 greater than original estimate for iodine.

The staff concludes that the only potential increased dose resulting from the fuel handling accidents with extended burnup fuel is the thyroid doses; these doses remain well within the dose limits set forth in NUREG-0800 and are, therefore, acceptable.

3.2 Radioactive Wastes

The plant contains radioactive 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 June 1973. There will be no change in the waste treatment systems described in Section 3.4.2 of the FES because of the proposed SFP modifications.

3.2.1 Radioactive Material Released to the Atmosphere

With respect to releases of gaseous materials to the atmosphere, the only radioactive gas of significance which could be attributable to storing additional spent fuel assemblies for a longer period of time would be the noble gas 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, the staff assumes that all of the Kr-85 released from any defective

fuel discharged to the SFP will be released prior to the next refueling. Enlarging the storage capacity of a SFP has no effect on the calculated average annual quantities of Kr-85 released to the atmosphere each year.

Iodine-131 releases from spent fuel assemblies to the SFP water will not be significantly increased because of the expansion of the fuel storage capacity since the Iodine-131 inventory in the fuel 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 change. A relatively small amount of tritium is contributed during reactor operation by fissioning of reactor fuel and subsequent diffusion of tritium through the fuel and the fuel cladding. Tritium release from the fuel essentially occurs while the fuel is hot, that is, during operations and, to a limited extent, shortly after shutdown. Thus, expanding the SFP capacity will not significantly increase the tritium activity in the SFP.

Storing additional spent fuel assemblies is not expected to increase the bulk water temperature during normal refuelings 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 concentrations than the SFP. Therefore, even if there were a higher evaporation rate from the SFP, the increase in tritium and iodine released from the plant, as a result of the increase in stored spent fuel, would be small compared to the amount normally released from the plant and that which was previously 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 stored in the SFP and either fuel is being moved or other loads are being carried over the SFP (TS 3.9.12). In addition, the station Radiological Effluent Technical Specifications, which are not being changed by this action, limit the total releases of gaseous activity.

3.2.2 Solid Radioactive Wastes

The concentration of radionuclides in the pool water is controlled by the SFP cleanup system and by decay of short-lived isotopes. The activity is highest during refueling operations when reactor coolant water is introduced into the pool and decreases as the pool water is processed through the SFP cleanup system. The increase of radioactivity, if any, due to the proposed modification should be minor because of the capability of the cleanup system to continuously remove radioactivity in the SFP water to acceptable levels.

The only solid waste to be removed from the SFP would be the cell blockers for the 234 cells that were blocked off from accepting spent fuel. The cell blockers will be decontaminated and stored under water prior to removal. Averaged over the lifetime of the station, this would provide an insignificant

increase to the total waste volume shipped from the station and would not have any significant additional environmental impact.

3.2.3 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 proposed modifications. Since the SFP cooling and cleanup systems operate as a closed system, only water originating from cleanup of SFP floors and resin sluice water need be considered as potential sources of radioactivity.

It is expected that neither the flow rate nor the radionuclide concentration of the floor cleanup water will change as a result of these modifications. The SFP demineralizer resin removes soluble radioactive materials from the SFP water. These resins are periodically sluiced with water to the spent resin storage tank. The amount of radioactivity on the SFP demineralizer resin may increase slightly due to the additional spent fuel in the pool, but the soluble radioactive material should be retained on the resins. Radioactive material that might be transferred from the spent resin to the sluice water will be effectively removed by the liquid radwaste system. After processing in the liquid radwaste system, the amount of radioactivity released to the environment as a result of the proposed modification would be negligible.

4.0 NONRADIOLOGICAL IMPACT

The only nonradiological discharge altered by the SFP modification is the waste-heat. The fuel cooling scenarios of normal, abnormal, single-active failure, and loss of forced cooling are unaffected by the increase in intact fuel storage resulting from the removal of the cell blockers and introducing rodlets because License Amendment No. 128, dated March 31, 1988, accounted for an intact spent fuel inventory decay heat history to a maximum of 1965 fuel assemblies. The fuel cooling scenarios are bounded by previous licensed analyses. No impact on aquatic life is expected.

The licensee has not proposed any change in the use or discharge of chemicals in conjunction with the spent fuel pool modification.

5.0 ALTERNATIVE USE OF RESOURCES

This action does not involve the use of resources not previously considered in connection with the Nuclear Regulatory Commission's Final Environmental Statement dated June 1973 related to this facility.

6.0 AGENCIES AND PERSONS CONSULTED:

The NRC staff consulted with the Connecticut State official regarding the environmental impact of the proposed action. The State official had no comments.

7.0 BASIS AND CONCLUSION FOR NOT PREPARING AN ENVIRONMENTAL IMPACT STATEMENT

The staff has reviewed the proposed facility modification relative to the requirements set forth in 10 CFR Part 51. Based on this assessment, the staff concludes that there are no significant radiological or nonradiological impacts associated with the proposed action and that the issuance of the proposed license amendment will have no significant impact on the quality of the human environment. Therefore, pursuant to 10 CFR 51.31, an environmental impact statement need not be prepared for this action.

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