



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 72 TO FACILITY OPERATING LICENSE NO. NPF-57

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION, UNIT 1

DOCKET NO. 50-352

1.0 INTRODUCTION

By letter dated May 6, 1994, as supplemented by letter dated June 3, 1994, the Philadelphia Electric Company (PECo, or the licensee) submitted a request for changes to the Limerick Generating Station (LGS), Unit 1, Technical Specifications (TS). The requested changes would revise TS Section 5.5.3, "Capacity," to allow an interim increase in the Unit 1 Spent Fuel Pool (SFP) from 2040 fuel assemblies to 2500 fuel assemblies (including 560 low exposure fuel assemblies received from the Shoreham facility). PECo has indicated that the SFPs had been designed for a storage capacity of 2862 fuel assemblies (LGS Updated Final Safety Analysis Report (UFSAR), Section 9.1), and that the staff analysis (NUREG-0991, Section 9.1.3) supported a storage capacity of 2484 fuel assemblies. The revision is necessary to support another proposed TS amendment request, dated January 14, 1994, that would authorize the reracking of Units 1 and 2 SFPs at LGS. The supplemental letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 EVALUATION

Currently, each unit at LGS has its own SFP, which provides storage for 2040 new and spent fuel assemblies. The two SFPs are located on a common refueling floor and are provided with interconnection for fuel transfer between the two pools.

The SFPs are seismic Category I reinforced concrete structures with post-tensioned girders and a 72-inch thick reinforced concrete slab (Section 3.2 of the LGS UFSAR). They are lined with stainless steel plates and are provided with a drainage system, and leakage detection and collection system (Section 9.1 of the LGS UFSAR). Loss of any nonseismic Category I components would not affect the ability to maintain spent fuel cooling or to maintain adequate submergence of the fuel. Also, accidental dropping of movable heavy objects into the SFP is precluded by administrative procedures, electrical interlocks, use of guardrails, curbs and reactor wells around the pool to prevent fuel handling and servicing equipment from falling into the pool. The licensee is committed to follow the guidance in NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," which would preclude the likelihood of a heavy load drop.

The spent fuel storage racks are modular, freestanding, top entry racks designed to maintain the spent and new fuel in a space geometry whereby each fuel assembly has a neutron poisoning material between it and any adjoining

fuel assemblies. Currently, three sizes of rack modules are approved to use at LGS: 10 feet x 11 feet, 10 feet x 12 feet, and 11 feet x 12 feet. The 10 x 11 modules have 55 poison cans, the 10 x 12 modules have 60 poison cans, and the 11 x 12 modules have 66 poison cans. The poison cans consist of two concentric square aluminum tubes with four plates of Boral in the annular gap. The outer concentric tube is folded into the inner tube at both ends and totally seal-welded. Each poison can is pressure and vacuum leak tested, plug-welded to isolate the Boral from the pool water, and then anodized. The storage racks are installed in such a manner so that there is a Boral plate between each adjoining fuel storage position. Each storage module is level with each other module at the top. There are 7.25 inches of clearance from the bottom of the module to the SFP floor. This clearance ensures each fuel assembly will stay cool with cooling water entering each fuel cell and by natural convection. The only point of contact between the spent fuel rack and the SFP structure is with the bottom liner plate. The design of the existing SFP storage racks is discussed in Section 9.1 of the LGS UFSAR.

The licensee has indicated that the rack materials have no significant degradation from the total radiation dose expected in the SFP over the design life. Furthermore, the racks are designed to withstand various loading conditions such as dead and live loads, loads experienced by a jammed fuel assembly or dropped fuel assembly, and loads experienced during seismic events.

The spent fuel storage racks maintain fresh and spent fuel with a nominal center-to-center spacing of 6.625 inches between fuel assemblies. The racks are designed with a boral plate between each adjoining fuel storage position. This separation distance, in conjunction with the high neutron absorbing boral material, ensures that the rack k_{eff} does not exceed the NRC acceptance criterion of 0.95 when completely flooded with unborated water, even for the proposed interim increase in the storage capacity. Therefore, the staff finds the criticality aspects of this interim change acceptable.

The LGS Unit 1 SFP has been designed by the licensee and evaluated by the staff for a storage capacity of up to 2862 spent fuel assemblies (UFSAR Section 9.1, and NUREG-0991 Section 9.1). Therefore, the staff finds the structural aspects of the proposed change to limit the spent fuel pool capacity up to 2500 fuel assemblies for the LGS Unit 1 spent fuel pool acceptable.

The Fuel Pool Cooling and Cleanup (FPCC) system is designed to remove the decay heat generated by the spent fuel assemblies in the SFP and to maintain the quality of pool water suitable for underwater operations and for personnel protection in the refueling area. The FPCC system is designed to maintain the bulk water temperature in the SFP at or below 140 degrees F under normal operating conditions with a normal decay heat load of 1.632×10^7 Btu/hr, two FPCC pumps, and two FPCC heat exchangers in operation. Two of the three installed SFP cooling pumps per each unit are powered from Class 1E power sources. Section 9.1 of the UFSAR contains the description for the normal heat load discharge history. The licensee's evaluation assuming the actual

discharge schedules for the proposed storage of the 2500 spent fuel assemblies in the Unit 1 SFP results in a decay heat load to be 1.05×10^7 Btu/hr which is below the currently analyzed condition. The RHR system is available as a backup SFP cooling system, following installation of an open spool piece, in the event of a loss of the spent fuel pool cooling system. Furthermore, the SFP is provided with redundant seismic Category 1 makeup capability from the ESW system, using valves located outside the control structure, to ensure an adequate supply of water under various conditions.

Based on NUREG-0991, "Safety Evaluation Report Related to the Operation of Limerick Generating Station, Units 1 and 2," Supplement 2, Section 9.1.3, "Spent Fuel Pool Cooling and Cleanup System", the heat removal capability of the FPCC system could support up to the storage of 2484 spent fuel assemblies. The licensee is requesting to increase the spent fuel storage capacity in the Unit 1 SFP from 2040 fuel assemblies to 2500 assemblies. They consist of 1940 spent fuel assemblies discharged from LGS, Units 1 and 2, including contingency, and 560 low exposure fuel assemblies shipped to LGS from the Shoreham Nuclear Power Station. In March 1994, the licensee completed an evaluation of the fuel recently discharged from LGS Unit 1 during the fifth refueling outage, and discovered that the present decay heat generation rate is approximately 6400 W/bundle. In comparison, the decay heat generation rate for Shoreham fuel is approximately 0.47 W/bundle. The heat load to the Unit 1 SFP from all the Shoreham fuel is considered negligible. The heat load for the Unit 1 SFP would still be well below the current TS limit for 2040 fuel assemblies, after the proposed increase in storage capacity to 2500 fuel assemblies. The staff finds the information on the spent fuel pool cooling and cleanup system acceptable.

The staff is currently evaluating certain specific potential loss of spent fuel pool cooling issues that were raised in a report filed pursuant to 10 CFR Part 21, on November 27, 1992. Should the staff determine that additional action regarding spent fuel cooling systems is warranted on a generic basis, the staff will take appropriate action.

The spent fuel transfer operation will involve the movement of 6 empty SFP racks from the Unit 2 SFP to the Unit 1 SFP. The removal and transfer of these racks will be performed using remote handling tools. Diving operations are not anticipated. However, if diving becomes necessary, the licensee has committed to follow existing plant procedures that incorporate the guidance stated in NRC Regulatory Guide 8.38, "Control Access of High and Very High Radiation Areas in Nuclear Power Plants," for the protection of the divers.

The empty SFP racks will be surveyed and rinsed with demineralized water prior to being transferred to the Unit 1 SFP. If the survey identifies any rack as having a radiation level higher than 1 R/hr, it will be hydrolized under water to reduce the radiation level to less than 1 R/hr. The transfer will require that the racks be lifted out of the SFP. However, the time that the racks are out of the SFP is expected to be minimal (i.e., estimated as 5 minutes per rack), with minimal impact on airborne radioactivity levels. Further, the licensee has committed to ensure that the racks should not be allowed to dry out during the transfer.

The licensee is committed to maintain personnel exposure to as low as reasonably achievable and estimates that transfer of the 6 racks will result in less than one person-rem of occupational dose. In addition, PECO has committed to provide continuous health physics coverage along with continuous air sampling during this transfer operation. Further, as a result of the operational controls, no personnel respiratory protection devices are being considered for this operation. The staff finds the proposed radiation protection aspects of this SFP rack transfer from the Unit 2 SFP to the Unit 1 SFP acceptable.

Based on the above, the staff concludes that the proposed change to the Limerick Generating Station, Units 1 and 2, revising TS Section 5.5.3, "Capacity," to facilitate an interim increase in the Unit 1 SFP from 2040 fuel assemblies to 2500 fuel assemblies, is acceptable.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendment. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (59 FR 27063). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: F. Rinaldi
T. Liu

Date: June 30, 1994