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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 200 TO FACILITY OPERATING LICENSE NO. NPF-1

PORTLAND GENERAL ELECTRIC

EUGENE WATER AND ELECTRIC BOARD

PACIFIC POWER AND LIGHT

TROJAN NUCLEAR PLANT

DOCKET NO. 50-344

1.0 INTRODUCTION

By two letters each dated January 16, 1997, the Portland General Electric Company (PGE or the licensee), submitted license amendment requests to allow pre-operational testing and handling of spent fuel transfer casks in the Trojan fuel building and to allow loading of spent fuel assemblies into spent fuel casks in the fuel building and associated cask handling. License amendment 196 issued on May 19, 1997, approved these actions. On January 27, 1999, PGE submitted a license amendment request, designated License Change Application (LCA) 246, to allow unloading of spent fuel casks in the Trojan fuel building.

PGE intends to transfer spent fuel from the spent fuel pool (SFP) in the Trojan Fuel Building to a separately licensed independently sited fuel storage installation (ISFSI) on the Trojan plant site. The first license amendment above allowed PGE to make equipment and procedural preparations for the fuel transfer. The second allowed for cask loading and movement to the ISFSI. The current request (LCA 246) allows for contingency unloading of a cask if needed.

The existing Technical Specification 3.1.4, Spent Fuel Pool Load Restrictions, Surveillance Requirements (SRs), and Bases are unaffected by this amendment request and will remain in effect to preclude movement of spent fuel casks over the SFP.

2.0 BACKGROUND

NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," dated July 1980, provides guidelines and recommendations for licensees to assure safe handling of heavy loads by prohibiting, to the extent practicable, heavy load travel over spent fuel assemblies, over the core, and over safety-related equipment. The NUREG defines a heavy load as any load carried in a given area during the operation of the plant that weighs more than the combined weight of a single spent fuel assembly and its associated handling tool.

Phase I of NUREG-0612 provides guidelines for reducing the likelihood of dropping heavy loads and limiting the resulting potential consequences of a drop. The guidelines are focused on establishing safe load paths, procedures for load handling operations, training of crane operators, the design of lifting devices and the design, testing, inspection, and maintenance of cranes. Phase II of NUREG-0612 provides guidelines for mitigating the consequences of dropped loads, including the use of a single failure proof crane, use of electrical interlocks and mechanical stops to restrict crane travel, and performance of load drop and consequence analyses to assess the impact of dropped loads on plant safety. Generic Letter GL 85-11, "Completion of Phase II of Control of Heavy Loads at Nuclear Power Plants " dated June 28, 1985, dismissed the need for licensees to implement the requirements of NUREG-0612, Phase II. However, via GL 85-11, licensees are encouraged to implement actions they perceive to be appropriate to maintain safety.

PGE plans to use the TranStor Storage System to move spent fuel and other waste material from the TNP fuel building to the ISFSI. The storage system consists of seal-welded baskets for storing the spent fuel and associated waste, ventilated concrete casks, an ISFSI storage pad, and associated transfer equipment necessary for dry storage of spent fuel assemblies, fuel debris, and associated waste. Structural support, shielding, and natural circulation cooling for the seal-welded basket is provided by the ventilated concrete cask. TNP estimates that 34 baskets and concrete casks will be needed. Each basket is designed to store 24 PWR spent fuel assemblies and fuel debris.

Loading the seal-welded baskets into the transfer cask and then into the concrete casks is done within the fuel building under the 10 CFR Part 50 license. After examination and any needed cleaning, the fuel building overhead crane and a special lifting yoke are used to move the transfer cask to the cask wash pit. The empty basket is moved using the same crane and placed in the transfer cask. After installation of shielding and the cask lid assembly, the transfer cask with the empty basket is then moved over the cask loading pit. The transfer cask and basket are lowered onto an impact limiter at the bottom of the cask loading pit where it is loaded with spent fuel using the fuel handling bridge crane. The gate between the SFP and the cask loading pit has to be opened to allow loading of the basket. After being loaded, the transfer cask is moved from the cask loading pit in the fuel building to the top of the concrete casks at the fuel building cargo handling bay. The sealed basket is lowered from the transfer cask into the concrete cask. Subsequently, each concrete cask and loaded basket is transported from the cargo handling bay to a reinforced concrete ISFSI storage pad. An air pad system is used to lift and float each concrete cask to the ISFSI.

Cask unloading is a contingency operation and is not expected to occur. However, during the loading of a basket, welding of a basket lid, helium leak testing, vacuum drying, transfer cask movement, or basket transfer a condition may occur which requires remedial action. The basket loading and cask transfer process would be reversed and spent fuel in the basket returned to the SFP. Reflooding of the cask if required would occur at the Decontamination and Assembly Station (DAS) on the operating floor of the Trojan fuel building.

3.0 EVALUATION

3.1 Handling of Transfer/Storage Casks and Spent Fuel Assemblies

The cask movement operation proposed by the licensee involves considerations regarding NUREG-0612. Specifically, the cask movement operation involves handling and control of heavy loads, including the design and operation of the fuel building hoisting system (cranes and lifting devices), movement of the seal-welded baskets and transfer casks, loading spent fuel assemblies into the sealed baskets, safe load paths, the use of procedures, crane operator and rigger training, and analyses of potential load drop accidents and consequences.

The requirements of TNP's license condition, technical specifications (TS), and administrative control procedures implement guidelines in NUREG-0612. These requirements include, among other things, prohibiting the loading of spent fuel into casks in the fuel building, and restricting the movement of casks over the spent fuel pool and safety-related equipment.

The proposed change in the TNP license condition will allow unloading of spent fuel assemblies and other associated materials from transfer casks back to the SFP in the fuel building. The plant license conditions and TS will continue to restrict TNP from transporting the casks in proximity to and over spent fuel in the spent fuel pool.

3.2 Hoisting System

As stated by the licensee, the maximum load to be lifted by the fuel building crane during the transfer of spent fuel assemblies and associated wastes is approximately 108 tons. This includes the weight of the transfer cask, a loaded PWR basket, and the lifting yoke. The fuel building 125 ton overhead crane and the transfer cask lifting yoke will be used to lift and move the transfer cask and loaded baskets from the cask loading pit to the concrete cask in the fuel building crane bay. The loads and equipment used to lift and move them will remain the same if the transfer process needs to be reversed to unload fuel.

As stated in the staff's Safety Evaluation Report, dated July 18, 1983, the fuel building crane is in compliance with the requirements of CMAA No. 70, "Specifications for Electric Overhead Traveling Cranes," Crane Manufacturers Association of America, Inc., 1975, and ANSI B30.2-1976, "Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)." The crane was manufactured by the Crane Manufacturing Service Corporation (CMSC) and installed in 1973 during plant construction. The crane has a rated load of 125 tons in the main hoist and 25 tons in the auxiliary hoist. NUREG-0612 requires the crane to be inspected, tested, and maintained according to Chapter 2-2 of ANSI B30.2-1976. Therefore, the test loads are not to exceed 125 percent of the rated load and should be applied with the crane in all its functional travel modes. The licensee stated that the crane was load tested at 156 tons (125 percent of the rated capacity) before initial use. To load test the crane in the transport mode, the licensee used a 125-ton load and performed the test following the original manufacturer's load test procedures. Although ANSI B30.2 only requires a rated load test prior to initial use for all new, extensively repaired, and altered cranes, the licensee states that they will perform another rated load test prior to moving the transfer casks. This load test will help to

assure that the hoisting system components are not degraded and functioning properly. The licensee indicated that the rated load tests would be performed at multiple loading conditions, including with no load, at 50 percent of the rated load if the wire rope is replaced, at the rated load, and at 125 percent of the rated load.

TNP's ISFSI Safety Analysis Report (SAR), dated December 1997, specifies that the transfer cask and trunnions, and the transfer cask lifting yoke are special lifting devices that are designed, fabricated, and tested in accordance with NUREG-0612 and ANSI N14.6-1978, "Standard for Special Lifting Devices for Shipping Containers." The lifting yoke and slings will be interposed between the crane hook and the cask and other storage system components during the cask handling operation. The lifting yoke is used to lift and move the transfer cask using the trunnions for support. Slings are used to lift and move the sealed basket, the basket radiation shield and structural lids, the transfer cask lid assembly, and the concrete cask shield ring and cover plate. The licensee stated that the transfer cask and trunnions are tested at 300 percent of their maximum capacity and the lifting yoke is tested at 150 percent of its maximum design load in accordance with NUREG-0612 and the Code. The licensee stated that the design safety factors (load rating) of the slings, and hoist rings are consistent with criteria in NUREG-0612, Section 5.1.6(b)(ii) and 5.1.1(5) that recommends using twice the safety factors specified in ANSI B30.9-1971, "Slings."

In addition, the licensee stated that they plan to contract CMSC to prepare a crane inspection and load testing procedure and to provide technical representatives to perform crane inspections and direct load testing activities under PGE's supervision. The crane inspections will involve inspection of the crane, the crane rail and rail supports, a review of the load test procedures, rigging, safe load paths, and coordination and communication among crane operators, riggers, and program managers. Various functions of the crane operation will also be inspected including the reeving, brake operation, limit switches, speed controls, and upper and lower limit settings. A post load test inspection will also be performed to evaluate the integrity of the components of the lifting system prior to doing the actual cask movement.

The staff agrees with the licensee's conclusion that the crane coupled with the procedural and administrative measures used to preclude a heavy load drop on irradiated fuel in the SFP will assure the safety of the cask handling operation.

3.3 Load Movements

To reduce the potential consequences of a dropped cask, the licensee plans to move the casks using high density foam impact limiters, as needed, along previously identified safe load paths. Impact limiters will also be installed in the bottom of the cask loading pit, and at the 45 foot elevation of the fuel building hoist way over the crane bay area. In addition, the licensee will use mechanical stops and electrical interlocks to limit and control crane travel to preclude cask travel over the SFP. The safe load paths, impact limiters, mechanical stops and interlocks will remain the same for cask return and fuel unloading as they were for fuel transfer to the ISFSI. The staff agrees that these measures coupled with procedural controls will help to prevent movement of the cask over the spent fuel pool and outside the safe load paths where a load drop could result in hazard to the operation.

3.4 Analysis of Postulated Load Drop Accidents

The licensee performed analyses of postulated accidents for the cask loading and handling process, including load drops, cask tipovers, failure of components of the lifting and storage system, and mishandling and operational events. The analyses are focused on the potential consequences of these accidents when they involve criticality and radiological release. Based on the analyses, the licensee states that the potential consequences of a postulated drop and tipover of the transfer cask into the cask loading pit, the cask wash pit, the fuel building hoist way, and onto the floor in the fuel building would not result in any increases to the K_{eff} to more than 0.95. Damage to plant equipment important to safe storage of spent fuel would not occur due, in part, to the impact limiters and steel load distribution assemblies, the physical layout of the facilities, and established safe load paths. While the transfer cask is moved over the fuel building floor at the 93 ft. elevation, the lift height is kept at 15 in. or less, and the cask is moved over floor slabs supported by rigid sheer walls and steel beams. Furthermore, impact limiters are placed at the bottom of the transfer cask as needed along the safe load path. The safe load path for the cask coupled with electrical interlocks and mechanical stops keep cask travel away from the spent fuel pool. The equipment used and safe load paths followed remain the same for cask return and unloading as for cask loading and transfer. The staff agrees with the licensee that a dropped component would not significantly affect the safety of the operation and that the design safety factors, load testing requirements, and administrative controls for the crane and lifting devices minimize the possibility of a cask drop or tipover occurring.

3.5 Reflood of a Transfer Cask

If the need to unload a cask is determined after the cask has been dewatered, the cask reflooding will occur at the DAS. PGE has identified an upper limit of 8 gallons per minute (gpm) for the reflood rate to preclude warpage of the basket and damage to the vacuum drying system. The 8 gpm limit will be administratively controlled. Basket warpage and damage to the vacuum drying system do not result in the release of radionuclides but would be an inconvenience and additional cost of time and money to PGE. The licensee's analysis of thermal stress to the fuel clad during reflood assumed instantaneous cooling of the cladding exterior and this conservative analysis resulted in no cladding failure. Without cladding failure there will be no release of the radionuclide inventory in the clad gap.

Based on the above discussions, the staff finds that the proposed change to TNP's license condition to allow unloading of spent fuel transfer casks is acceptable. The staff agrees with the licensee that the design safety factors, load testing requirements, and administrative controls of the lifting system are in accordance with the guidelines of NUREG-0612. The staff also agrees that cask reflooding will not result in the loss of fuel clad integrity.

4.0 STATE CONSULTATION

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

5.0 ENVIRONMENTAL CONSIDERATIONS

The amendment changes a requirement with respect to installation and use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant changes 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 (64 FR 9198). 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.

6.0 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.

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