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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 99 AND 92 TO

FACILITY OPERATING LICENSE NOS. DPR-42 AND DPR-60

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT NOS. 1 AND 2

DOCKET NOS. 50-282 AND 50-306

1.0 INTRODUCTION

By letter dated October 4, 1991, as supplemented by letter dated December 16, 1991, Northern States Power Company (NSP or the licensee) requested amendments to the Technical Specifications (TS) appended to Facility Operating License Nos. DPR-42 and DPR-60 for the Prairie Island Nuclear Generating Plant, Unit Nos. 1 and 2. The proposed amendments would revise Technical Specification Section 3.8.B and its associated Bases to remove the restriction related to cask handling; add a new Section 4.19 and associated Bases which establish surveillance requirements for the Auxiliary Building crane lifting devices; and revise Section 5.6 to remove references to the spent fuel cask drop analysis and mitigation design features, and incorporate a new paragraph which states that spent fuel casks will be handled by a single-failure-proof handling system.

The amendments also make several changes of an administrative nature in Technical Specification Sections 3.8.B, 5.6 and in Table TS 4.1-2B in order to accommodate placement of spent fuel storage casks in the spent fuel pool, and to discuss the Bases for spent fuel boron requirements to maintain the boron concentration level, provide an action statement if boron concentration falls below required levels, and require a weekly verification of the boron concentration.

The licensee for the Prairie Island Nuclear Generating Plant, Units 1 and 2, intends to construct and operate a Dry Cask Independent Spent Fuel Storage Installation (ISFSI). The licensee submitted a proposal dated August 31, 1990, showing details of the proposed plan and provided further information in submittals dated September 26, and December 12, 1991. In submittals dated October 4, 1991 and February 3, 1992, the licensee provided information relating to upgrading of the auxiliary building crane, which is to be used in moving the cask containing the spent fuel from the spent fuel pool (SFP) to the ISFSI, so as to make the crane single-failure-proof. The licensee is making this change because the height of the TN-40 cask precludes the use of the impact limiter or crash pad, currently in the TS, as the means to limit

This Safety Evaluation (SE) is concerned primarily with the planned modifications of the auxiliary building crane so as to make it single-failure-proof together with those other portions of the heavy load handling system required to constitute a single-failure-proof system for movement of the TN-40 cask within the confines of the auxiliary building. It also addresses the administrative requirements necessary to maintain spent fuel pool boron concentration levels.

2.0 EVALUATION

2.1. AUXILIARY BUILDING CRANE

The licensee committed to upgrade the auxiliary building crane so as to have it comply with the criteria of Section 5.1.6, "Single-Failure-Proof Handling Systems," and Appendix C, "Modification of Existing Cranes" of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." The licensee has contracted with Ederer Inc., to modify this crane in accordance with the provisions of Topical Report EDR-1(P)-A, "Ederer Nuclear Safety-Related Extra Safety and Monitoring (X-SAM) Cranes." Details of the design were forwarded in a submittal dated February 3, 1992. As noted in the Ederer report, X-SAM hoists use three types of safety systems to protect against equipment malfunctions and operator error:

(1) Conventional Hoist Safety Systems, including upper and lower travel limits, overload sensing devices, hoist control protective features, and holding brake on the high speed shafting.

(2) The Hoist Integrated Protective System (HIPS) is used as a second line of defense. HIPS includes a special Emergency Drum Brake System, which acts on the wire rope drum; a Failure Detection System (FDS); and an Energy Absorbing Torque Limiter (EATL) in the drive train. The Failure Detection System actuates the Emergency Drum Brake System, which stops the wire rope drum in the event of a drive train discontinuity or component failure.

The EATL acts to retain the load in the event of two-blocking, overloading or load hangup by converting the hoist's kinetic energy to heat. The EATL to be built for the Prairie Island licensee will consist of 14 friction surfaces with a specified torque setting of approximately 130% of the main hoist design rated load. The capacity of the emergency drum brake to be designed for the Prairie Island Plant will be 130% of that required to hold the design rated load.

(3) The Balanced Dual Reeving System is the defense employed for X-SAM cranes against load sway and loss of load in the event of a single cable failure.

Other design details include:

(1) A maximum load motion of 1.5 feet, vertically, in the event of a drive train failure. Because of the features incorporated in the X-SAM crane design, the maximum kinetic energy to be absorbed from that motion would be that corresponding to a load free-fall of less than one inch. The licensee examined certain plant structures whose location would lie within 1.5 feet of the load during movement and ascertained either that damage to such structures would not prevent safe plant shutdown or that the structures could withstand the potential one inch free fall.

(2) No reverse bends in the wire rope except that between the wire rope drum and the first sheave in the load block. This is consistent with the guidelines in NUREG-0554 "Single-Failure-Proof Cranes for Nuclear Power Plants."

(3) Maximum fleet angle of 3.5 degrees in conformance with the criterion specified in NUREG-0554.

(4) The main hook does not have two independent paths. However, the single load path has an ultimate strength safety factor of 10:1 when lifting the maximum critical load of 125 tons. This is consistent with the guideline in Appendix C of NUREG-0612 for operating plants.

(5) Seismic Design - the licensee reported following the guidance of Section 2.5 "Seismic Design" of NUREG-0554, in qualifying the modified auxiliary building crane for seismic events.

The staff, in an SE dated August 26, 1983, found the Topical Report EDR-1(P), Revision 3, "Ederer Nuclear Safety-Related Extra Safety and Monitoring (X-SAM) Cranes" to be suitable for reference in licensing applications. The SE required that Ederer publish, thereafter, accepted versions of the report and to append an -A, designating it be accepted as EDR-1(P)-A. The licensee cited this accepted version in its submittal. The licensee provided details specific to the modified design of the Prairie Island auxiliary building crane, as required by EDR-1(P)-A, some of which are discussed above. In addition, the licensee committed to modify the crane in accordance with the single-failure-proof criteria of NUREG-0612.

Based upon the licensee's commitments and the foregoing discussion, the staff finds the modified design of the Prairie Island auxiliary building crane to be in accordance with the guidelines of NUREG-0612 for single-failure-proof cranes.

2.2 Lifting System for Cask

In the February 4, 1992 submittal, the licensee reported a conceptual design for a lifting device, "Lift Beam Concept," together with the design criteria to be used for the lifting system. The design contains a crane hook adapter consisting of two parallel columns. The design also contains two cross beams and two lifting arms. The crane hook adapter attaches to the cross beams at one end and to the crane at the other end with 6-7/8 inch diameter pins. The cross beams are horizontal, parallel, and attached to lift arms through 6-7/8 inch diameter pins. The pins are used to swivel the lift arms into "in" and "out" positions so as to engage and disengage the bosses on the TN-40 cask by way of cutouts in the plates constituting the lift arms. Manual disengagement and locking devices just above the cross beams are used to move the arms and to lock them in place so as to hold the cask.

The licensee intends to use the stress design guidance factor of ANSI 14.6, "Special, Lifting Devices for Shipping Containers Weighing 10000 pounds (4500 kg) or More" in the design of the lifting system. The design is not truly single-failure-proof because a loss of one of the lift arms would permit the load to rotate about the other arm or to drop (the two cross beams and two crane hook adapter columns could be designed so that one beam or column could support the load in the event of a beam or column failure). However, the licensee intends to utilize the alternate method of providing stress design safety factors of 6 (i.e., 6 times the Maximum Critical Load) to be equal to or less than the material yield stress and 10 (i.e., 10 times the Maximum Critical Load) to be equal to or less than the material ultimate stress, as permitted by Section 5.1.6, "Single-Failure-Proof Handling Systems," of NUREG-0612. This criterion will apply to tensile, bearing, and shear stresses in the lift beam. In addition, the licensee is adding an additional factor of 5% (changing the factor 6 to 6.3 and 10 to 10.5) to account for dynamic loads. The licensee committed to justify use of the 5% factor for dynamic loads, prior to initial use.

There are additional safety features to prevent dropping the TN-40 casks. The lift arms, in engaging the TN-40 cask bosses, fit into notches in the bosses so that the TN-40 cask has to be jolted sufficiently while being carried to lift the cask from the notches. Even then, manual locking devices in the lift beam keep the arms from moving and prevent them from separating in such a way as to permit dropping the TN-40 cask. The lift beam may also be used to lift the TN-40 cask lid by means of slings attached to three eyes on both the lift beam and cask lid.

Prior to initial use of the lift beam, the licensee committed to provide an acceptable plan for its periodic testing to assure compliance with section 5.3, "Testing to Verify Continuing Compliance," of ANSI 14.6.

Based on the above, the licensee complies with the requirements of Paragraph (1)(a) "Special Lifting Devices" of Section 5.1.6, of NUREG-0612.

The staff finds the concept of the lift beam, together with the licensee's commitment to have the lifting system single-failure-proof and to have the design conform to the criteria of NUREG-0612 (which includes the criteria of ANSI-14.6), acceptable.

The staff finds the modification of the auxiliary building crane to be acceptable as a single-failure-proof crane capable of carrying maximum critical loads not exceeding 125 tons as discussed in Section 2.1 above. The lift beam conceptual design, as proposed by the licensee in attachment 3 of the submittal of February 3, 1992, is found to be acceptable as a single failure proof special lifting device only for handling the TN-40 cask in accordance with the discussion in Section 2.2 above and as noted in the test and drawing of attachment 3 to the February 3, 1992 submittal.

The licensee has committed to submit an acceptable plan for surveillance testing of the special lifting device (lift beam) to comply with section 5.3 of ANSI 14.6 prior to initial use. The licensee has also committed to justify use of the 5% factor for dynamic loads, also prior to initial use of the lift beam.

By letter dated November 1, 1991, the staff requested additional information related to the criticality aspects of the single-failure-proof crane modifications. The questions concerned the frequency of the fuel pool boron surveillance, and assumptions made in the criti ality analysis. By letter dated December 16, 1991, the licensee provided the clarifying information. The licensee stated that, based on alarm setpoints, a weekly boron concentration surveillance is sufficient to ensure the 0.95 k_{eff} requirement during an inadvertent dilution event because the pool monitoring instrumentation would detect any spent fuel pool dilution event before significant dilution of the boron concentration would occur. The licensee also stated that the criticality analysis for the TN-40 spent fuel storage cask did not take credit for the burnup of the spent fuel stored in the cask.

Several changes are required to the TS in order to accommodate placement of the spent fuel storage casks in the spent fuel pool. These changes are administrative in nature or constitute additional restrictions not presently in the TS. Based on a review of the information provided by the licensee in the December 16, 1991 letter, the staff finds these changes acceptable.

3.0 STATE CONSULTATION

In accordance with the Commission's regulation, the Minnesota State Official was notified of the proposed issuance of the amendments. The State Official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendments change requirements with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and a change to the surveillance requirements. The NRC staff has determined that the amendments involve 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 amendments involve no significant hazards consideration and there has been no public comment on such finding (56 FR 50118). The supplementary information provided in a letter of December 16, 1991, was merely clarifying and did not change the scope of the action or the proposed finding of no significant hazards consideration. Accordingly, the amendments meet 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 amendments.

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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

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