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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 81 TO FACILITY OPERATING LICENSE NO. NPF-69

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION, UNIT 2

DOCKET NO. 50-410

1.0 INTRODUCTION

By letter dated October 7, 1997, Niagara Mohawk Power Corporation (the licensee) submitted an application to amend the operating license (NFP-69) for Nine Mile Point Nuclear Station Unit 2 (NMP2). The proposed amendment would revise Technical Specifications (TS) by changing the setpoints of Surveillance Requirements (SRs) 4.9.6.a, 4.9.6.f, and 4.9.6.g for the refueling platform main hoist. Specifically, each refueling platform crane or hoist used for handling control rods or fuel assemblies within the reactor pressure vessel would be demonstrated operable by:

a. Demonstrating operation of the overload cutoff on the main hoist when the load exceeds 1600 +100/-0 pounds (rather than 1200 +50/-50 pounds).

f. Demonstrating operation of the loaded interlock on the main hoist when the load exceeds 700 +50/-0 pounds (rather than 485 +50/-50 pounds).

g. Demonstrating operation of the redundant loaded interlock on the main hoist when the load exceeds 700 +50/-0 pounds (rather than 550 +50/-50 pounds).

The proposed amendment, in effect, would authorize replacement of the existing triangular refueling platform mast with a round, heavier mast (General Electric Model NF-500) which includes an installed television camera and monitor system.

2.0 DESCRIPTION

The licensee plans to install and utilize General Electric Company's Model NF-500 mast as the refueling platform fuel grappler hoist during the next NMP2 refueling outage (currently scheduled to begin in early May 1998).

The current fuel grapple hoist uses a four segment, open frame, triangular mast. As described in Section 9.1.4 of the NMP2 Updated Safety Analysis Report (USAR), the fuel grapple is used for lifting and transporting fuel assemblies. It is designed as a telescoping grapple that can extend to the proper work level and, in its fully retracted state, still maintains adequate water shielding over the fuel. The main telescoping fuel grapple has redundant hooks and an indicator that confirms positive grapple engagement. In addition to redundant electrical interlocks to preclude the possibility of raising radioactive material out of the water, cables on the auxiliary hoists on the refueling platform incorporate an adjustable, removable stop that prevents hoisting when the free end of the cable is at a preset distance below water level.

The replacement, Model NF-500, is a four segment, solid, cylindrical telescoping mast and includes a new grapple head equipped with a television camera and monitor system. The licensee finds the cylindrical mast to be structurally stronger than the triangular mast and less susceptible to damage during fuel moves. The television camera and monitor system will enhance visibility for fuel handling activities and provide additional assurance that the grapple is oriented over the correct fuel assembly. The licensee states that Model NF-500 with its television camera and monitor system is a direct replacement for the existing mast, although it is heavier by approximately 400 pounds. Because the replacement is heavier, certain overload and interlock load limits (setpoints) must be revised since weight is a factor in the establishment of these limits. The licensee also states that all applicable standards, codes and design criteria will continue to be met. The basis for the fuel handling requirements remain unchanged, the new mast will function like the existing one, and the required functions will still be tested.

3.0 EVALUATION

Setpoint Changes

The proposed changes to the TS surveillance requirements reflect new setpoints that must be increased to compensate for the additional weight of the new mast. The affected setpoints are all related to the main hoist and are (1) the overload cutoff, (2) the loaded interlock, and (3) the redundant loaded interlock.

The hoist overload cutoff limits the hoist lifting force to a value that avoids damage to a stuck fuel assembly, and also protects other core and vessel components that could be inadvertently engaged during lifting operations. The most limiting component is a fuel assembly, which is designed to withstand an upward handling load equivalent to 3 times the weight of the fuel assembly (3g). This load is defined as 2g lift, plus 1g of fuel assembly weight, or approximately 2,000 lbs. The new proposed hoist overload setpoint is 1600 +100/-0 lbs., which is substantially below the 2,000 lbs. limiting force for the fuel assemblies.

The hoist loaded and redundant loaded interlocks are actuated when the main hoist is loaded with a fuel assembly. The hoist loaded interlock initiates a control rod block to prohibit control rod withdrawal when the main hoist is loaded and located over the reactor vessel. It also prevents lifting a load when the main hoist is over the reactor vessel and a control rod is withdrawn. The redundant loaded interlock initiates a bridge reverse block to prevent movement of the refueling platform toward the core when the main hoist is loaded and a control rod is withdrawn. The minimum submerged cable weight of the replacement mast is approximately 160 lbs. The submerged weight of a channeled fuel assembly is approximately 650 lbs. The proposed hoist loaded and redundant loaded interlock setpoints of 700 +50/-0 lbs. will ensure that the associated interlocks will initiate when the weight of a channeled fuel assembly is applied to the grapple. The maximum cable weight of the replacement mast fully retracted or at the overhoist position is approximately 570 lbs. The proposed setpoint of 700 +50/-0 is sufficiently above this weight to ensure that a false hoist loaded signal does not hamper refueling activities.

To be consistent with vendor recommendations, the setpoints for both the hoist loaded and redundant loaded interlocks will be set at the same value. Moving the redundant loaded interlock

setpoint to 700 lbs. is conservative with respect to the increased weight of the replacement mast and minimizes any possible confusion with having two separate setpoints.

Accordingly, the NRC staff concludes that the new setpoints are conservative and appropriately compensate for the increased weight of the new mast. Therefore, the NRC staff finds the proposed TS changes to be acceptable.

Conformance with Standards and Regulations

As stated in Section 9.1.4.1.1 of the USAR, the "working loads of the refueling platform structures are in accordance with the AISC Manual of Steel Construction. All parts of the hoist systems are designed to have a minimum safety factor of 5 based on the ultimate strength of the material. A redundant load path is incorporated in the fuel hoists so that no single component failure could result in a fuel assembly drop." The licensee's submittal states that the replacement mast and television camera and monitor system were constructed to the same standards and specifications as the triangular mast; therefore, these existing requirements will be met.

The licensee reanalyzed the seismic analysis of the refueling platform to determine if the Safe Shutdown Earthquake criteria of the USAR were met. The licensee's re-analysis confirmed the refueling platform, modified as proposed, met the Safe Shutdown Earthquake criteria.

In 10 CFR Part 50 Appendix A, General Design Criteria (GDC), Criterion 2 states that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The licensee states that the replacement mast satisfies the requirements of GDC 2 as it relates to the protection of safety-related equipment and spent fuel from the effects of earthquakes. GDC 61 and 62 address requirements regarding the prevention of unacceptable radioactivity releases and criticality accidents. The licensee states that the existing triangular mast was determined to meet the requirements of GDC 61 and 62. The NRC staff agrees that, because the new mast is essentially a direct replacement for the triangular mast, has been constructed to the same standards, meets the same design criteria, and functions the same as the triangular mast, it will also meet the requirements of GDC 61 and 62.

Effects upon a Postulated Fuel Handling Accident

Section 15.7.4 of the USAR presents an analysis of a postulated fuel handling accident resulting from a failure of the fuel assembly lifting mechanism which drops a raised spent fuel assembly onto the reactor core after the reactor vessel head has been removed. The licensee has revised this analysis to recognize the changes associated with the proposed modification to the refueling platform main hoist. In particular, because part of the mast is assumed to drop along with the attached fuel assembly, the increased weight of the new mast by 400 pounds was analyzed regarding the potential to increase the number of breached fuel rods, and the potential that this might result in an increase in the magnitude of radioactivity released.

The licensee's analysis was patterned after a similar analysis provided in General Electric document NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel", referred to as GESTAE-II. The USAR accident is based upon GE 8 x 8 fuel, the original refueling platform mast, and the assumptions and methods of Safety Guide 1.25. That analysis concluded that no more than 124 fuel rods would fail as the result of the fuel handling accident. The licensee estimated that, using the GESTAE II methods for GE 9 x 9 fuel and the new refueling platform mast, no more than 140 rods would fail. This represents an increase of 16 rods from the previously analyzed case. The licensee stated that, since the core inventory used in the 8 x 8 analysis is spread over a larger number of fuel rods in the 9 x 9 assemblies, there is less radioactivity to be released by each fuel rod. The licensee found that, even with 16 additional damaged rods, the activity released to the environment remained bounded by the original USAR analysis. The licensee concluded that there would be no increase in the radiological consequences stated in the USAR.

The NRC staff reviewed the licensee's analysis and the recent history of amendments that might have had an impact on the postulated consequences of a fuel handling accident. The licensee updated from 8 x 8 fuel to 9 x 9 fuel under a 10 CFR 50.59 evaluation based on the NRC staff approved GESTAE-II topical report which had concluded that there would be no increase in radiological consequences of such a change. The fuel rod damage threshold for the 9 x 9 fuel was assumed to be 200 ft-lbs, which is lower than the 250 ft-lbs assumed for the 8 x 8 fuel. However, the 9 x 9 fuel assembly weighs less than a 8 x 8 assembly and contains a larger number of fuel rods, resulting in less energy exerted on each fuel rod.

The original 8 x 8 core consisted of 764 assemblies and 62 rods per assembly, for a total of 47,368 fuel rods. In the current 9 x 9 core, there are 764 assemblies and 74 rods per assembly, for a total of 56,536 fuel rods. In accordance with the NRC staff's assumptions in Safety Guide 25, the radioactivity released during a fuel handling accident is based on the postulated core inventory that follows an extended period of operation at rated power. Credit is taken for radioactive decay between the time of reactor shutdown and the start of refueling activities. The analysis assumes that the core inventory is equally distributed in all fuel assemblies in the core. To account for unequal fuel burn up in the various regions of the core, a peaking factor is conservatively applied to all fuel assemblies. Since the core inventory is a function of thermal rated power and is unaffected by the number of fuel assemblies, the activity per assembly in the 8 x 8 and 9 x 9 fuel is assumed to be identical. However, the radioactivity per fuel rod in the 9 x 9 fuel will be less than that for the 8 x 8 fuel.

The licensee's analysis indicates that, with the proposed refueling platform mast, the postulated damage to the 9 x 9 fuel will be 140 rods, an increase of 16 rods over that assumed originally in the USAR. The fraction of the overall core damaged in the original 8 x 8 fuel case is:

$$\frac{124\ rods}{47368\frac{rods}{core}} = 0.00262\ of\ core\ inventory$$

For the 9 x 9 case with the proposed refueling platform mast:

$$\frac{140\ rods}{56536\frac{rods}{core}} = 0.00248\ of\ core\ inventory$$

Since the fraction of core inventory released is bounded by the original case, there is no increase in the quantity of radioactivity released.

The NRC staff considered the potential impact of a fuel handling accident upon an existing 8 x 8 fuel assembly stored in the spent fuel pool. There are no 8 x 8 fuel assemblies in the current reactor core. However, there are 8 x 8 fuel assemblies in the pool that were removed from the core in earlier refuelings. The licensee's analysis only considered the 9 x 9 fuel with the new refueling platform mast. The licensee has stated that this is the limiting case. The NRC staff agrees with the licensee's position in that (1) the activity in the 8 x 8 assemblies would have decayed at least one refueling cycle, and (2) the assumed damage threshold for the 8 x 8 fuel is greater than that for the 9 x 9 fuel.

In summary, the NRC staff concludes that the proposed change to the refueling platform mast will not increase the postulated radiological consequences of the fuel handling accident as currently analyzed in the NMP2 USAR. Therefore, doses to persons at or beyond the site exclusion area boundary will continue to be well within the guidelines of 10 CFR Part 100, while doses to control room operators will continue to be less than the criteria of GDC-19 of Appendix A to10 CFR Part 50, and the NRC's Standard Review Plan for the Review of Safety Analysis Reports (NUREG-0800).

Accordingly, the NRC staff concludes that the proposed TS changes and construction modifications regarding the refueling platform are acceptable.

4.0 STATE CONSULTATION

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

5.0 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 and changes surveillance requirements. 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 (62 FR 68309). 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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