Mr. John H. Mueller
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Lycoming, NY 13093

July 29, 1

SUBJECT: CORRECTION TO SAFETY EVALUATION FOR AMENDMENT NO. 167 FOR NINE MILE POINT NUCLEAR STATION, UNIT NO. 1 (TAC NO. MA1945)

Dear Mr. Mueller:

On June 17, 1999, the Commission issued Amendment No. 167 to Facility Operating License No. DPR-63 for the Nine Mile Point Nuclear Station, Unit No. 1 (NMP1) in response to your application dated May 15, 1998, as supplemented September 25, October 13, December 9 (two letters), 1998; January 11, April 1, and April 22, 1999. The amendment changed Technical Specification 5.5, "Storage of Unirradiated and Spent Fuel," to reflect a planned increase in the storage capacity of the spent fuel pool and to delete an inappropriate statement and reference.

The amendment also enclosed a copy of the related Safety Evaluation (SE). Please substitute the enclosed pages 4, 5, and 11 for the corresponding pages of that SE. The new pages correct the SE to be consistent with the application for amendment. These corrections do not affect the NRC staff's conclusions or associated bases.

Sincerely,

ORIGINAL SIGNED BY:

Darl S. Hood, Sr. Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-220

Enclosures: Replacement pages
number 4, 5, and 11

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

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Calculations were also made for storage rack reactivities of fuel enriched to 4.25 and 4.6 w/o U-235, including the GE-11 (9x9 array) fuel enriched to 4.6 w/o U-235, as a function of the fuel assembly k-infinity (k_{inf}) in the standard NMP1 core geometry at 20 °C, defined as an infinite array of fuel assemblies on a 6-inch lattice spacing without any control absorber or voids. The results indicate that a k_{inf} of 1.31 for both the 8x8 and 9x9 fuel designs in the standard core geometry results in a rack reactivity less than 0.95, including all appropriate 95/95 uncertainties, for enrichments up to 4.6 w/o U-235. The 4.6 w/o GE-11 fuel was found to be lower in reactivity than the 4.6 w/o 8x8 fuel type.

Based on these results, a BWR fuel assembly appropriate for use in the NMP1 reactor is acceptable for storage in the NMP1 storage racks if it has a peak lattice enrichment of 4.6 w/o U-235 and if its k_{inf} in the standard NMP1 core geometry, calculated at the maximum over burnup, is less than or equal to 1.31. These requirements are incorporated into the proposed changes to NMP1 TS 5.5. NMPC has also shown that any fuel with a peak lattice U-235 enrichment of 3.1 w/o or less is acceptable regardless of the gadolinium content or the k_{inf} in the standard core geometry.

Most abnormal storage conditions will not result in an increase in the k_{eff} of the racks. However, it is possible to postulate events, such as the accidental insertion of an assembly outside and adjacent to the fuel storage rack or dropping an assembly on top of the rack, which could lead to an increase in reactivity. However, such events were found to have a negligible effect and the resulting reactivity would remain below the 0.95 design basis.

NMP1 TS 5.5 currently states, in part, that "Calculations for k_{eff} values have been based on methods approved by the Nuclear Regulatory Commission covering special arrays (10CFR70.55)." The specified reference is inappropriate because 10 CFR 70.55 addresses inspections for special nuclear material, not calculational methods. The existing TS statement does not address a required design feature of the facility, which is the purpose of TS Section 5.0. The statement also does not represent any Commission requirement. Therefore, the NRC staff concludes the existing statement is inappropriate and should be deleted.

The following TS changes to TS 5.5 have been proposed as a result of the requested spent fuel pool reracking. The NRC staff finds these changes acceptable.

(1) The number of fuel assemblies which can be stored in the spent fuel pool when all the new Boral racks are installed has been increased from 2776 to 4086.

(2) The spent fuel stored in the Boral racks must have a peak lattice enrichment of 4.6 w/o U-235 or less and the k_{inf} in the standard cold core geometry must be less than or equal to 1.31.

(3) The inappropriate statement involving approved calculational methods covering special arrays, including its reference to 10CFR70.55, is deleted.

Based on the review described above, the NRC staff finds the criticality aspects of the proposed modifications to the NMP1 spent fuel pool storage racks are acceptable and meet the requirements of Appendix A to 10 CFR Part 50,General Design Criterion 62, "Prevention of Criticality in Fuel Storage and Handling."

3.2 Spent Fuel Pool Cooling Evaluation

The SFP cooling system (SFPCS) at NMP1 is a Seismic Category 1 system consisting of two cooling trains, each primarily equipped with one pump, one filter and one heat exchanger. The SFPCS is designed with both cooling trains operable and only one cooling train is required to be operating to maintain the SFP water temperature at or below 140 °F during normal (planned) refueling outages (i.e., during a normal (planned) refueling outage at NMP1, an entire core is offloaded). Heat is removed from the SFPCS heat exchangers by the reactor building closed loop cooling system (RBCLCS). The RBCLCS water temperature is maintained between 40 °F and 95 °F depending upon the water temperature of Lake Ontario (the ultimate heat sink).

As a result of the increase in SFAs to be stored in the SFP, the decay heat generated in the SFP will increase. To maintain the SFP water at or below the temperature limit of 140 °F, SFAs must be held in the reactor for a minimum period of time after shutdown before being transferred to the SFP. In any event, based upon radiological exposure requirements, SFAs may not be off-loaded from the reactor prior to a minimum shutdown time of 72 hours. Since the heat removal capability of the SFPCS is a function of RBCLCS water temperature, NMPC performed analyses to determine the reactor shutdown time required before discharging SFAs from the reactor in order to maintain the SFP water temperature at or below 140 °F with RBCLCS water temperatures at 40 °F, 60 °F, 80 °F, and 95 °F. In the analyses, one SFPCS train is assumed to be operating, with both SFPCS trains operable. The following summarizes the results of these analyses:

RBCLCS Water Temp. (°F)	Reactor Shutdown Time Required (hours)	Coincident Time[1] After Reactor Shutdown (hours)	Coincident Net Heat Load (Mbtu/hr)	Time-to-Boil (hours)	Max. Boil-off Rate (gpm)
40	72[2]	177	20.72	8.97	43.72
60	141	250	18.39	8.87	39.05
80	458	573	13.80	11.79	29.41
95	1008	1129	10.35	15.70	22.09

As indicated in the above table, maintaining the SFP temperature limit of 140 °F is based on two primary parameters. The first is the RBCLCS water temperature which, in turn, is a function of the water temperature of Lake Ontario. The second is the SFAs in reactor decay time following reactor shutdown. Therefore, NMPC established the following constraints which are applicable to all full-core discharge operations:

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1 The time after reactor shutdown at which the SFP water reaches its temperature limit of 140 °F.

2 The calculated peak SFP temperature for this case is 130.1 °F.

The results of the analysis of the deep drop scenario show that the load transmitted to the liner through the rack structure is properly distributed through the bearing pads located near the fuel handling area. Therefore, the liner would not be ruptured by the impact as a result of the fuel assembly drop through the rack structure. The results of the analysis of the shallow drop scenario show that damage would be restricted to a depth of 7.3 inches below the top of the rack, which is above the active fuel region. The NRC staff reviewed NMPC's analysis results in NMPC's letter dated May 15, 1998. The NRC staff finds that NMPC's structural integrity conclusions are appropriately supported by the parametric studies, and the NRC staff, therefore, concurs with NMPC's findings.

3.4.4 Conclusion

Based on its review and evaluation of NMPC's submittal dated May 15, 1998, and additional information regarding structural evaluations provided by NMPC in letters dated December 9, 1998, and April 22, 1999, the NRC staff concludes that NMPC's structural analysis and design of the spent fuel rack modules and the SFP structures are adequate to withstand the effects of the applicable loads, including that of the SSE. The analysis and design are in compliance with the current licensing basis set forth in the FSAR and applicable provisions of the SRP, and are, therefore, acceptable.

3.5 Occupational Radiation Exposure

The NRC staff has reviewed NMPC's plan for the modification of the NMP1 SFP storage racks with respect to occupational radiation exposure. As previously noted, for this modification NMPC plans to ultimately install a total of 16 new fuel rack modules in the SFP. A number of nuclear power facilities have performed similar operations in the past. With the benefit of the lessons learned from these previous operations, NMPC estimates that the proposed fuel rack installation can be implemented while maintaining occupational radiation exposure between 6 and 12 person-rem.

All of the operations involved in the fuel rack installation will utilize detailed procedures prepared with full consideration of as-low-as-is-reasonably-achievable (ALARA) principles. NMPC's Radiation Protection department will prepare Radiation Work Permits for the various jobs associated with the reracking operation. Each member of the project team will receive radiation protection training on the reracking operation. Personnel will wear protective clothing and will be required to wear personnel monitoring equipment consisting, at a minimum, of thermoluminescent dosimeters (TLDs) and self-reading dosimeters.

NMPC may also use divers for the removal of the existing SFP rack modules and installation of the replacement high-density racks. These divers may also be needed to remove certain underwater appurtenances in the SFP. Each diver will be equipped with whole body and extremity dosimetry with remote, above surface, readouts that will be continuously monitored by NMPC's Radiation Protection personnel. Divers will also be equipped with underwater survey instrumentation with remote readout capabilities. NMPC will utilize underwater cameras to permit remote monitoring of the diver's location at all times. Divers will also be in continuous communication with the Radiation Protection personnel. NMPC will conduct radiation surveys of the diving area before each diving operation and following the movement of any irradiated hardware in the SFP. NMPC will use either visual or physical barriers to ensure that divers