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SEP 9 1977

MEMORANDUM FOR: K. R. Goller, Assistant Director for Operating Reactors, DOR

FROM: L. C. Shao, Chief, Engineering Branch, DOR

SUBJECT: NIAGARA MOHAWK POWER CORPORATION - SPENT FUEL POOL MODIFICATION (TAC 6417)

Plant Name: Nine Mile Point Unit 1
Docket Number: 50-220
Requested Completion Date: August 31, 1977
Operating Reactors Branch and Project Manager: ORB3, S. Nowicki
Operational Technology Branches Involved: Engineering Branch, Plant Systems Branch, Environmental Evaluation Branch
Description of Task: Review of Spent Fuel Pool Modification Submittals dated 12/3/76, 4/13/77 and 7/27/77
Review Status: Complete

The Engineering Branch, Division of Operating Reactors, has reviewed the structural, mechanical and materials aspects of the information submitted by Niagara Mohawk Power Corporation in their change request to Section 5.5 of the Technical Specifications, including Attachment "A" entitled "Proposed Changes to Facility Operating License," and Attachment "B" entitled "Nine Mile Point Unit 1 - Spent Fuel Pool Modification," dated December 3, 1976; the document entitled "Response to February 11, 1977 Nuclear Regulatory Commission Questions," dated April 13, 1977; and the document entitled "Responses to June 30, 1977 Nuclear Regulatory Commission Questions," dated July 27, 1977. Our Safety Evaluation is contained in the enclosure.

L. C. Shao, Chief
Engineering Branch
Division of Operating Reactors

Enclosure: As stated

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

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Enclosure: As stated

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NINE MILE POINT UNIT 1

PROPOSED MODIFICATIONS TO SPENT FUEL POOL

SAFETY EVALUATION REPORT

ENGINEERING BRANCH

DIVISION OF OPERATING REACTORS

Description of the Proposal:

The current aluminum fuel storage racks have a storage capacity of 1140 fuel assemblies. The proposed spent fuel pool modification consists of replacing these existing racks with higher density, stainless steel fuel racks which will accommodate the storage of 1984 fuel assemblies in a sub-critical array. (The nominal center to center spacing varies between 5.8425 in. and 9.305 in.) Each fuel rack consists of an array of stainless steel boxes constructed of 0.09 in. thick stainless steel plate and edge welded to each other to form a honeycomb structure, with individual module storage capacities varying between 96 and 200 fuel assemblies. The racks are mounted on bases that are pre-placed and interconnected to form a seismically restrained foundation. The racks are cantilevered from the bases with no lateral supports at the top. The seismic restraint is provided by bumpers attached to the bases which bear against each other, snubbers fitted to the pool wall and mounting brackets imbedded in the fuel pool floor. Details of the fuel racks are shown in Figures 1, 2, 3, 5 and 6 of Attachment B to the Nine Mile Point Unit 1 license change request to Section 5.5 of the Technical Specifications, entitled "Nine Mile Point Unit 1 - Spent Fuel Pool Modification," dated December 3, 1976. Details of the rack bases and the arrangement of the new storage racks in the fuel pool are shown in Figures 1 through 4 of the "Responses to the June 30, 1977 Nuclear Regulatory Commission Questions," dated July 27, 1977.

Aspects of Review:

Structural and Mechanical

The supporting arrangements for the modules, including their restraints; the design, the fabrication, the installation procedures; the structural design and analyses procedures for all loadings, including the seismic and the impact loadings; the load combinations; the structural acceptance criteria; the quality control for the design, the fabrication and the installation; and the applicable industry codes were all reviewed in accordance with the applicable portions of Sections 3.7 and 3.8 of the U.S.N.R.C. Standard Review Plan. Since only the ground response spectrum was available, the reactor building model employed in the original seismic analysis of the Nine Mile Point Unit 1 reactor building was utilized with the fuel racks incorporated into the model at the proper elevation (Mass Point 4). A response spectrum dynamic analysis was then performed in accordance with the Nine Mile Point Unit 1 FSAR. The seismic accelerations were computed by the SRSS method for all significant modes of

vibration. The three components of earthquake input were applied to the racks and the maximum responses were combined in accordance with the requirements of Regulatory Guide 1.92, entitled "Combining Modal Responses and Spatial Components In Seismic Response Analyses." The OBE base accelerations were taken as one-half of the SSE accelerations. Variations in the material properties of the rack modules were accounted for by choosing the properties so as to maximize the response of the rack modules. The structural damping ratio utilized for the rack modules was 0.025. This value is 0.010 greater than that specified in the FSAR for welded structures. This increase in damping is acceptable since there is additional Coulomb damping due to the large contact area between the individual boxes which are spot welded together, and the bolting of the rack modules to their bases. Also, the margins of safety for the various seismic loading conditions were acceptable without the increases in the allowable stresses permitted by the U.S.N.R.C. Standard Review Plan for the less probable loading conditions. This introduces an inherent conservatism in the design of the rack modules. The existing pool structure has been analyzed to account for the increased dead load and seismic loads and the structure has been found to be acceptable. The peak concrete bearing and shear stresses in the fuel pool walls and floor are within the allowable stress limits of the ACI Reinforced Concrete Code 318,63.

Material:

The spent fuel storage rack modules, their associated hardware, the rack bases, the seismic lateral restraint system, and the pool liner are constructed entirely of Type 304 stainless steel. Since the possibility of long term storage of spent fuel exists, the effects of the pool environment on the racks, fuel cladding and pool liner are being investigated. Based upon our preliminary review and previous operating experience, we have concluded that at the pool temperature and the quality of the demineralized water, and taking no credit for inservice inspection, there is reasonable assurance that no significant corrosion of the racks, the fuel cladding or the pool liner will occur over the lifetime of the plant. However, if the results of the current generic review indicate that additional protective measures are warranted to protect the racks, the fuel cladding and the liner from the effects of corrosion, the necessary steps and/or inspection programs will be determined to assure that an acceptable level of safety is maintained. Any conceivable problems which could be uncovered are of a long term nature and warrant no need for immediate concern.

Evaluation:

The analyses, the design, the fabrication and the installation of the proposed fuel rack storage system are in accordance with accepted criteria. The entire design of the racks was governed by the applicable sections of the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. The design of the welds was based upon the applicable portions of ASME Section VIII, Division I and the AISC Steel Construction Manual, Part 5, "Specifications and Codes." Appropriate material allowables are taken at a temperature of 200°F. Installation of the racks is governed by ANSI Standard N45.2.2 (with Appendix) "Packaging, Shipping, Receiving,

Storage and Handling of Items for Nuclear Power Plants." The welds, welders, and welding procedures are qualified in accordance with the rules of Section IX of the ASME Boiler and Pressure Vessel Code.

The effects of the additional loads on the existing pool structure due to the high density storage racks have been examined. The pool structural integrity and leak tightness were determined to be adequate under the new loading conditions.

There is no existing evidence at this time to indicate that corrosion of the fuel cladding, the stainless steel racks or the liner will occur at the temperatures and quality of the demineralized water present in this pool.

We find that the subject modification proposed by the licensee is acceptable, and in part satisfies the requirements of the General Design Criteria 2, 4, and 61.