Docket No. 50-220

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Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, New York 13202

Attention: Mr. Minot H. Pratt
Vice President and
Executive Engineer

Gentlemen:

This refers to Amendment No. 2, dated June 1, 1967, to your application for a construction permit and operating license for the Nine Mile Point Nuclear Station located in the town of Scriba, New York.

During meetings held on April 10 and 11, 1968, we discussed several technical aspects of the facility design with your representatives and indicated that additional information would be necessary to continue our review. This information concerns seismic design, transient analysis and accident design considerations. A list of specific comments illustrating the kind of information needed is enclosed.

We will continue our review of the foregoing matters upon receipt of the additional information. We will be available to discuss and clarify any of the specific comments.

Sincerely yours,

Original Signed by
Peter A. Morris

Peter A. Morris, Director
Division of Reactor Licensing

Enclosure:
Request for Additional Information

cc: Mr. Arvin E. Upton, Esquire
LeBoeuf, Lamb, Leiby & MacRae

OFFICE ▶	DRL:RP	DRL:RP	DRL:RT	DRL:RP	DRL	
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DATE ▶	5/23/68	5/23/68	5/24/68	6/3/68	6/6/68	

Form AEC-318 (Rev. 9-53)

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ADDITIONAL INFORMATION REQUIRED

NINE MILE POINT STATION

NIAGARA MOHAWK POWER CORPORATION

DOCKET NO. 50-220

I. GENERAL

1. Your application defines Class I, Class II and Class III structures and components as follows:

Class I Structures and Components -

Structures and components whose failure could cause significant release of radioactivity or which are vital to safe shutdown and isolation of the reactor.

Class II Structures and Components -

Structures and components which are important to reactor operation but are not essential to safe shutdown or isolation, and could not result in substantial release of radioactive materials.

Class III Structures and Components -

Structures and components that are not essential for safe shutdown and isolation of the reactor and whose failure will not result in significant release of radioactive materials.

Define and describe the bases for the limits of the "release of radioactive materials" associated with each of these definitions.

2. Provide complete lists of Class I and Class II structures and systems, of structures constructed of elements of more than one class, and of Class I equipment housed in, adjacent to, or supported by a Class II or Class III structure. Describe the design techniques used for Class I and Class II structures.

3. For Class II structures and for structures consisting in whole or in part of Class I elements, state the criteria used to determine the design basis load combinations to be considered and the allowable stresses or the allowable deformations for each design basis load combination.

4. State the design basis load combinations, allowable stresses and/or allowable deformations, and calculated deformations for each structure, system or component consisting in whole or in part of Class I elements.

5. Discuss the seismic exposure assumptions and the criteria relating to spectra, amplification, damping and other appropriate factors used in the design of the Class II structures and for structures consisting in whole or in part of Class I elements. Provide justification for the damping levels assumed for the stack.

6. The Preliminary Hazards Summary Report stated that Class II structures will be designed for a ground motion of the 0.11g design earthquake. It is not clear that this criterion was followed rigorously; please clarify.

7. Describe the present capability of the plant to withstand a tornado.

8. Discuss the basis for the development of the acceleration response spectra shown in Plate C-22 of the First Supplement to the Preliminary Hazards Summary Report. Were these spectra used in all dynamic analyses? What is the basis for the large "saw tooth" variation in the range of 0.1 to 0.3 seconds for 0 percent critical damping? What is the basis for the sharp change in acceleration at a period of about 0.12 seconds in all the spectra?

9. For all systems, components, or structures analyzed, were the allowable values for stresses resulting from the combination of operating loads and earthquakes increased by 33 1/3 percent in accordance with code practices?

10. Describe the method used to combine seismic stresses with the stresses caused by operating and other loads.

11. Was the ratio of vertical to horizontal excitation equal to one-half throughout the analyses in all cases?

12. For those cases analyzed using the reserve energy technique, what was the maximum level of deformation that was permitted in the analysis?

13. Discuss the design criteria used to assure that the function of any structure will not be lost because adjacent structures strike each other under seismic excitation. Provide estimates (with bases) of the magnitude of relative motions of adjacent structures and a discussion of the provisions made to ensure the continued integrity of connections (e.g., piping) between buildings. In view of the shaly laminations at the site, discuss the permanent relative displacements that can occur and the design features that ensure required performance under these conditions.

II. STRUCTURES

1. Describe the basis for the selection of the acceleration factors of 0.20g horizontal and 0.10g vertical for the control room components. Were these factors also used for essential instrumentation, controls protection system and electrical system components in the control room? What acceleration factors were used for these components at other locations?
2. Describe the portion of the intake structure designed as a Class I structure.
3. Evaluate the effect of wind speed and the shape of the reactor building on the validity of estimated leakage from the reactor building and on the validity of the reactor building leakage tests.
4. Evaluate the consequences of a stack failure in which portions of the stack strike the plant.

III. REACTOR

1. Describe the assumptions, method of calculation and uncertainty in the prediction of the beginning of life and end of life power coefficients.
2. Describe the model and assumptions used to account for reactivity changes due to void changes caused by rapid isolation of reactor coolant system (e.g., turbine trip without bypass).
3. Describe the spacer pellet adjacent to the fuel rod spacers in the center fuel pin of each fuel bundle.
4. What is the expected life of the control rod if water leaks into the B_4C; what effect would it have on dimensions of the control rod?

5. Specify the reactor components which must maintain their functional capabilities to assure safe shutdown of the reactor. For each such component describe:

   (a) the design basis load combinations

   (b) the expected stress and deformation

   (c) the stress and deformations at which the component is unable to function

   (d) the margin of safety

   (e) the effects of irradiation on material properties and deformation limits.

6. Confirm that the integrity analysis for the reactor vessel internals is identical to Amendment 12 to Docket No. 50-219, Oyster Creek Nuclear Power Plant, Unit No. 1, Jersey Central Power and Light Company.

7. Discuss the effects of vibration during normal operation on the components inside the reactor vessel. Describe design features to prevent or limit vibration. Describe tests and instrumentation to determine if unexpected vibration is present.

IV. CONTAINMENT

1. Establish the compatibility of dynamic deformations (for the earthquake and the combined accident plus earthquake conditions) occurring in the drywell, the torus and the connecting vents, including expansion joints. No positive anchorage system appears to be provided between the interior concrete structure supporting the reactor, the lower part of the drywell shell, and the concrete foundation under the dry well. The dynamic characteristics of these three structures are very different and their response to a seismic disturbance will be dissimilar. In view of this provide a discussion of the following:

   a. The validity for the assumption that the three structures are rigidly connected at the foundation level. It may be

that differential sliding of the structures, which may rotate about the common center of rotation (center of the spherical part of the dry well) will occur and rupture the bond between the steel and the concrete.

b. If such sliding occurs, what are the consequences from the point of view of dynamic stresses and strains for the three structures?

c. If the bond between the steel and the concrete is broken can corrosion of the steel shell occur? Consider, in this discussion the effect of the temperature gradient, and of the resulting thermal expansion of the shell, on the bond between steel and concrete.

d. Provide diagrams for each of the three structures indicating the earthquake accelerations at different levels, the overturning, or bending moments and the shears, and the relative displacements.

e. If the three structures mentioned above are interconnected at the bottom, provide a discussion of the design of the installed anchors.

2. Provide a detailed discussion of the design bases for the gap between the primary containment and the concrete shielding. Discuss the construction technique used to establish the gap and the materials involved in the procedure. How is the gap to be ventilated and drained?

3. Evaluate the effect of debris in the air gap between the drywell and the shielding on the integrity of the containment under accident conditions.

4. What portion of the drywell air gap can be inspected?

5. Provide analyses of the deformation of the dry well wall due to jet forces acting on the wall or on elements connected to the wall which show that such forces will not result in breaching of the containment. This analysis should include an evaluation of the effect of jets or missiles impinging on the containment at locations opposite steel flanges at the form joints that are close to the surface of the concrete. What are the applicable stress and strain criteria? Is there any possibility of jets hitting the wall of the torus of the pressure suppression chamber? We understand that Chicago Bridge and Iron Company conducted tests simulating the effect of the jet forces on the drywell steel shell. Discuss the reliability of the results of these tests as applied to the actual conditions existing during an incident, considering that the dynamic effect of the jet and the thermal effect of the hot fluid on the steel plates have been neglected.

6. Provide a more detailed description of, and the design basis for, the containment penetrations, particularly those for high temperature lines. Include (a) the methods of stress analysis employed for the penetrations, both large and small, to assure their continued integrity under combined normal, seismic and accident loads, (b) the leak test capability for the penetrations, and (c) fatigue design

of the penetrations. Include material specifications, NDTT considerations, and applicable codes.

7. Describe the effect of jet and reaction loads on the integrity of containment penetrations.

8. Describe the effect of the loads on containment check valves on the integrity of the containment for loads produced from line breaks that occur outside of the containment.

9. State the design criteria for the containment valves applicable to insuring their operation during and following an earthquake.

10. Discuss the extent to which post-accident containment flooding has been considered in the structural design of the containment vessel. If venting systems have been incorporated into the design, provide an evaluation of the selected concept. Indicate the design criteria that apply to seismic forces in combination with a flooded containment and the corresponding limiting stress levels and deformations in the drywell, in the vents, and in the torus (and its supports). Discuss the water temperature and the required NDTT.

11. For each load combination on the containment, discuss how the loads are shared in the containment supports.

12. The foundation of the containment rests on bedrock described as Substantial Oswego Sandstone. Discuss:

    a. The construction procedure used to avoid damage to rock during the time interval between excavating and installing of foundations.

    b. The shape of the excavation under the containment. Has the rock directly under the dry well foundation been excavated to the same level as the rock under the pressure suppression chamber or not?

c. The behavior of shaly laminations from the point of view of accelerated weathering during construction.

d. Supporting evidence for the statement that the behavior of Oswego sandstone under dynamic loading is similar to that of sound rock, despite the lenticular nature of the rock and the presence of cross-bedding and shaly laminations. How has this condition been taken care of in dynamic analysis of the structure? What value of damping has been used?

13. Provide a detailed discussion of the primary containment pneumatic testing including the extent to which the acceptance test pressure stress loadings simulates design basis accident loadings and combinations of accident and earthquake loadings.

14. Provide a detailed discussion of the primary containment leakage tests. Describe the supporting bases for the tests and include a detailed description of test procedures and test results. In respect to the strength and leak rate test of the drywell and pressure suppression system, discuss the following:

   a. How was the drywell and the torus supported during these tests? If on temporary supports, describe the type used and provisions made for removal of the temporary supports after the tests. Has local overstressing of the steel plates been avoided?

   b. The lower part of the drywell shell is sandwiched between the concrete foundation under it and the slab supporting the interior concrete structure; it will therefore be impossible to inspect this part of the steel shell after the construction is completed. Has the soap bubble test been

extended at this location to the full area of the steel plates or only to the welded seams?

15. Provide information to support the claim that the proposed test methods can demonstrate the secondary containment building's capability to maintain a negative pressure under various environmental conditions.

V. REACTOR AUXILIARY AND EMERGENCY SYSTEMS

1. Discuss the release of radioactive material from the components stored in the fuel storage pool that can result from heavy objects (e.g., fuel shipping cask) falling upon fuel stored in the pool. Describe the operating restraints or design features which reduce the probability of this type of accident.

2. Discuss the release of radioactive material that may result if the fully loaded fuel shipping cask were to drop from the maximum height (80') to which it is raised during fuel transfer operations.

3. Discuss the consequences to the valve operations that occur if the instrument air supply fails.

4. Discuss how the release of radioactive material during refueling or fuel shipping accidents is detected. How is safety action initiated for these releases?

VI. APPENDIX E - SAFETY ANALYSIS

1. Section 3.7 Valve Operation

   a. Describe the interaction of reactivity effects that determine the neutron flux vs time characteristic.

   b. Identify the parameters that determine the magnitudes of the neutron flux peaks, the number of neutron flux peaks and the

decay of the neutron flux indicated for this transient.

c. Describe the distribution throughout the core of the energy released during this transient.

2. Section 3.11 Turbine Trip with Failure of Bypass System

a. Provide curves of reactivity changes vs time for the four (4) seconds following the initiation of the transient. Provide separate curves for reactivity changes due to each of the following: void changes, control rod insertion, and Doppler effect.

b. Describe the changes in power density at the location of void collapse, the hot spot factors and MCHFR throughout the core during this transient.

c. What is the total energy stored in the core while the neutron flux is greater than its initial value prior to occurrence of the transient.

d. What is the maximum UO_2 temperature during this transient?

e. Describe the effects on items a thru d above for this transient occurring at the end of a fuel cycle. What is the gap between the Zr clad and UO_2 pellet prior to the transient and at the time of maximum UO_2 temperature after initiation of the transient?