February 24, 1995

Mr. B. Ralph Sylvia
Executive Vice President, Nuclear
Niagara Mohawk Power Corporation
Nine Mile Point Nuclear Station
P.O. Box 63
Lycoming, NY 13093

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING CORE SHROUD REPAIR FOR NINE MILE POINT NUCLEAR STATION UNIT NO. 1 (NMP-1) (TAC NO. M91273)

Dear Mr. Sylvia:

By letters dated January 6, 1995, and January 23, 1995, Niagara Mohawk Power Corporation (NMPC), submitted an application for repairs to the Nine Mile Point Nuclear Station Unit No. 1 core shroud.

The NRC staff has begun its review of NMPC's January 6, 1995, and January 23, 1995, submittals. However, we have determined that additional information, as identified in the enclosure, is required to complete our review of the submittals. As indicated in the attached request for additional information (RAI), additional information is required. A preliminary copy of the RAI was provided to NMPC on February 17, 1995. NMPC is requested to respond to this RAI by February 28, 1995, in order for us to complete our review in a timely manner.

This requirement affects one respondent and, therefore, is not subject to Office of Management and Budget review under P.L. 96-511.

Sincerely,

Original signed by

Donald S. Brinkman, Senior Project Manager
Project Directorate I-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-220

Enclosure: Request for Additional Information

cc w/encl: See next page

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

February 23, 1995

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Niagara Mohawk Power Corporation
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B. Ralph Sylvia
Niagara Mohawk Power Corporation

Nine Mile Point Nuclear Station
Unit No. 1

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REQUEST FOR ADDITIONAL INFORMATION

REGARDING PROPOSED CORE SHROUD REPAIR

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT NUCLEAR STATION UNIT NO. 1

DOCKET NO. 50-220

1. Wedges between the core support and the shroud (also called the clamp/spacer) have been provided at each stabilizer location to prevent motion of the core plate relative to the shroud. In order to verify that these wedges prevent both lateral and vertical motion, we request that you provide the analyses and calculations to demonstrate the adequacy of the wedges to prevent relative motion in the presence of postulated 360° through wall cracks at welds H_{6A} and H_{6B}.

2. The summary of the hardware stresses provided with the repair hardware analysis, Generic Electric (GE) Report No. GE-NE-B13-01739-04, indicates that the stresses in the toggle and lower support are at or near the allowable values for the steamline break and design-basis earthquake (DBE) events. Provide the details of these calculations to demonstrate that the bending stresses in the toggle due to postulated failures of welds H_7 and H_8 have been considered in the evaluations.

3. The assessment to determine the impact of the tie rod assembly on the stresses at the H_8 weld, provided in Report No. GE-NE-B13-01739-04, Appendix A, is based on an uncracked shroud condition. What would be the impact of the tie rod assembly on the H_8 weld stresses if it were postulated to be cracked throughwall in the vicinity of the attachment points of the tie rod assembly?

4. The postulated 360° through wall failures of H_2, H_{6A}, H_7, and H_8 was judged to be the most representative for including gaps in the finite element model as stated in Section 3.5.14 of Report No. GE-NE-B13-01739-04. Provide the rationale for not including postulated failures of welds H_3 and H_{6B} in the analytical model. Also, provide the magnitudes of the calculated gaps at the postulated failed weld locations H_2, H_3, H_{6A}, H_{6B}, H_7, and H_8 for both normal operating and accident conditions.

5. Identify the most adverse combination of postulated weld failures and loading conditions in evaluating the shroud conical support deformations and provide documentation to demonstrate that the limiting deformations have been factored in the calculation of the tie rod preloads and the gap calculations requested in question #4 above.

Enclosure

6. An upset condition wherein cold water is introduced into the annulus while the reactor inlet plenum remains at 545 °F is considered a bounding upset thermal event for the tie rod assembly. This situation could potentially occur with the loss of feedwater followed by restoring the feedwater flow, but without heating. Provide the reference document "GE-NE Specification 383 HA 718: Thermal Cycles, Reactor Vessel and Nozzle, Description Basis and Assumptions," which contains typical assumptions leading to this event. Identify the conditions assumed for the NMP-1 analysis and provide documentation to demonstrate that the stresses in the tie rod assemblies and attachment point remain within allowable limits during this transient for the limiting combination of postulated weld failures.

7. During a combined steamline break and DBE event, the tie rod load has been determined to be in excess of 300,000 lbs. With postulated failures of welds H_7 and H_8, the H_8 lower weld bracket would impose a bending moment on the H_8 upper weld bracket in the vicinity of the adjustable foot. Provide calculations to demonstrate the structural integrity of the bracket under these loading conditions.

8. Provide Figure 3-12 of Report No. GE-NE-B13-01739-04 relating to the longitudinal displacement of the tie rod C-spring. This figure is missing in the submitted document.

9. GE-NE-B13-01739-04, Revision 0, stated that potential stagnant flow conditions were considered at the H9 location. Provide information on the stagnant flow conditions and the criteria for acceptability.

10. Provide a copy of Reference 7 (Letter to Roy Corieri and George Inch from J.A. Villalta and A. Mahadevan, Subject: Displacement of the Nine Mile Unit 1 Shroud due to DBE and Recirculation Line Break, dated September 26, 1994) which discusses the asymmetric loads during a recirculation line break.

11. Provide analysis of the downcomer flow characteristics with the four tie rod assemblies installed. Specifically address the available flow area in the annulus and the associated pressure drop.

12. GE-NE-B13-01739-05, Revision 1, stated that with the stabilizers and H_8 brackets installed, no vertical displacement would occur during normal operations if any or all welds were completely cracked. Provide analysis of the potential leakage through all postulated cracked welds with no displacement. Specifically, address cracks above the core plate, below the core plate, and total leakage from all welds.

13. Provide the analysis performed to demonstrate the integrity of the core spray piping when subjected to shroud displacements of 0.904 inches and 0.61 inches in the horizontal and vertical directions, respectively.

14. The NMP-1 Reactor Core Shroud Repair Design Summary discussed the maximum vertical displacement during a main steamline break (MSLB). Provide the analysis which supports the conclusion that the tie rods elastically stretch during a MSLB with postulated failed welds. Provide information on the maximum separation of each postulated failed weld during a MSLB.

15. In the design specification 25A5583, Revision 2, the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualification, 1989 Edition, was referenced. Identify under what conditions will welding be applied during the fabrication and installation of the core shroud repair components. What are the controls or mitigation methods that will be implemented to minimize the magnitude of the residual stresses and material sensitization when applying welding?

16. Boiling-Water Reactor Vessel and Internals Project (BWRVIP) has issued the following documents to provide guidelines for visual examination (VT) and ultrasonic examination (UT) of core shrouds: (1) BWRVIP, "Standards For Visual Inspection of Core Shrouds," September 8, 1994, and (2) BWRVIP Core Shroud NDE Uncertainty & Procedure Standard, November 21, 1994. Provide a confirmation that the guidelines in these documents will be followed in the examination of the core shroud and repair assemblies. The subject BWRVIP documents should also be referenced in the appropriate examination specifications.

17. The NRC staff noted that in Section 4.0 of Repair Examination in the field disposition instruction (FDI) specification (0245-90800), the required resolution for the television camera is defined as capable of resolving a 0.001-inch wire on a neutral gray background. This requirement should be changed to be consistent with the required resolution of a 0.0005-inch wire as recommended in the BWRVIP documents referenced in Item 16 above for visual examination of core shrouds.

18. In the safety evaluation of GE core shroud repair design (GE-NE-B13-01739-05, Revision 1) Part A.2 Materials, GE referenced a statement from the shroud repair fabrication specification (GE-NE Specification: 25A5584, Revision 1), which stated that the successful completion of the sensitization testing (ASTM A262, Practice A or E) shall be accepted as evidence of the correct solution heat treatment and water quenching if time and temperature charts and water quenching records are not available. The NRC staff considers that in a good quality assurance program, accurate records of time, temperature and cooling rate are necessary to be maintained as evidences that a proper heat treatment has been performed. Therefore, the use of sensitization test results as a substitute for the proper heat treatment documentation is not acceptable.

19. GE stated in their safety evaluation (GE-NE-B13-01739-05, Revision 1) of core shroud repair design that the tie rod threads (low carbon type 316

or type 316 stainless steel) would be induction annealed after machining to remove a possible cold worked layer.

(a) Provide details regarding how the induction heating process was qualified and the results of your metallurgical evaluation of the tie rod threads after induction annealing such as its effect on the material hardness, surface exidation, and the state of sensitization.

(b) GE stated that a minimum of 0.030 inches of Alloy X-750 materials will be removed after high temperature annealing as a control of intergranular attack (IGA). Will this process or any other process be applied to Type 316 tie rod threads after induction annealing to ensure there is no IGA? Provide the test data to support that the removal of 0.030 inches surface material would effectively eliminate the IGA effect resulting from the high temperature annealing.

(c) Will induction annealing or any other process be applied to machined threads made of Alloy X-750 such as toggle bolts to minimize the effect of cold work?

20. Identify all the threaded areas and locations of crevices and stress concentration in each component of the core shroud repair assemblies. In the planning of inservice inspection (ISI), those areas should be emphasized for inspection because these areas are most susceptible to stress corrosion cracking. Please provide these information in tables and supplement it with sketches.

21. Provide details of your controls in the practices of machining, grinding, and threading to minimize the effect of cold work, such as amount of materials to be removed in each pass, application of coolant and sharpness of the tool.

22. In Part B.12.1 of GE-NE-B13-01739-05, Revision 1, GE stated that all parts have been designed so that they can be removed and replaced. This design feature should be taken advantage of when planning ISI of the components of the core shroud repair assemblies. The NRC staff realizes that the repair assemblies may be inspected by a combination of visual and ultrasonic examinations. However, the NRC staff has some concerns regarding the reliability of such inspection to identify the potential degradation in the threaded joints and areas of crevices and stress concentration, which have limited access for inspection. Please provide a discussion and/or propose an alternative inspection such as disassembling the threaded joints for inspection to ensure that the areas mentioned above in the repair assemblies will be adequately inspected for early detection of potential degradation.

23. Provide details of your planned baseline ISI (location, extent, frequency, methodology, and justification) of the core shroud before and after repair.

24. Provide details of your planned ISI (location, extent, frequency, methodology, and justification) of the installed core shroud repair components. Your planned inspection should consider the NRC staff recommendation in Item 22.

    If complete information for Items 23 and 24 can not be provided at this time, identify the date when such information will be provided.

25. Identify the lubricants that would be used on the machined threads during installation. What are the controls of the content of chlorides, sulfides, halogens, and other elements that are known to promote stress corrosion cracking in stainless steel and high nickel alloy?

26. Provide a discussion on how the magnitude of the spring preload will be monitored to ensure there is no substantial relaxation of the preload. Please also discuss the safety consequences if the spring preload is completely relaxed.

27. Recently, intergranular stress-corrosion cracking was observed in the welds (heat-affected zones) of the top guide and core support plate in an overseas BWR. Therefore, the NRC staff recommends that the welds in the top guide and core support plate at NMP-1 should be inspected during the upcoming refueling outage to ensure there is no unacceptable degradation.