August 16, 2007

Mr. Keith J. Polson
Vice President Nine Mile Point
Nine Mile Point Nuclear Station, LLC
P.O. Box 63
Lycoming, NY 13093

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING NINE MILE POINT NUCLEAR STATION, UNIT NO. 2, IMPLEMENTATION OF ARTS/MELLLA (TAC NO. MD5233)

Dear Mr. Polson:

By letter dated March 30, 2007, Nine Mile Point Nuclear Station, LLC requested an amendment to the Nine Mile Point Nuclear Station, Unit No. 2 (NMP2) Renewed Facility Operating License. The proposed license amendment would change the NMP2 technical specifications to reflect an expanded operating domain resulting from implementation of Average Power Range Monitor/Rod Block Monitor/Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA).

The Nuclear Regulatory Commission (NRC) staff has reviewed the information provided in that letter and has determined that additional information is needed to complete its review. Enclosed is the NRC staff's request for additional information (RAI). The RAI was discussed with your staff on August 8 and 9, 2007, and it was agreed that your response would be provided within 60 days from the date of this letter.

Sincerely,

/RA/

Marshall J. David, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-410

Enclosure:
RAI

cc w/encl: See next page

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* RAI provided by memo on date shown

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REQUEST FOR ADDITIONAL INFORMATION

NINE MILE POINT NUCLEAR STATION, UNIT NO. 2

IMPLEMENTATION OF ARTS/MELLLA

The Nuclear Regulatory Commission (NRC) staff has performed its initial review of your March 30, 2007, request to revise the Nine Mile Point Nuclear Station, Unit No. 2 (NMP2) technical specifications (TSs) to reflect an expanded operating domain resulting from implementation of Average Power Range Monitor/Rod Block Monitor/Technical Specifications/Maximum Extended Load Line Limit Analysis (ARTS/MELLLA). As a result of that review, we have determined that additional information is required to adequately evaluate the acceptability of the proposed revision.

1. On page 4-12 of Attachment (7) of your request, it was stated that the performance of the system was upgraded such that the rod withdrawal error (RWE) event will never be the limiting transient. The RWE transient minimum critical power ratio (MCPR) is determined by the rod block monitor (RBM) setpoints. These setpoints will be selected based on the operating limit minimum critical power ratio, as established by other anticipated operational occurrences (AOOs), and the RBM setpoints will remain in the TS. The NRC staff understands that in the event the setpoints are exceeded due to failure of RBM, then the RWE will violate the safety limit minimum critical power ratio (SLMCPR). If that is the case, then why should the RBM not be treated similar to other safety related systems, and be classified as such? Please explain.

2. Regarding the turbine trip with no bypass (TTNBP), load rejection with no bypass (LRNBP), and main steamline isolation valve (MSIV) closure with a flux scram (MSIVF) transients:

   a. Following the initiating event for the TTNBP and LRNBP transients at NMP2, describe how the sequence of reactor protection system initiation differs between the two transient events? At NMP2, which of these two events is limiting, and why?

   b. TTNBP, LRNBP and MSIVF - all three of these transients are pressurization events. The TTNBP and LRNBP events need to be evaluated for MELLLA operation; whereas, in Section 5 of Attachment (7) of your request, it was stated that ARTS/MELLLA does not affect the vessel overpressure protection analysis. Please explain.

   c. Considering all the pressurization events at NMP2, which transient is most limiting; and at what operating domain?

3. In Table 7-2 of Attachment (7) of your request, two licensing basis peak cladding temperature (PCT) values were reported - current licensing basis PCT as 1370 ^{0}F, and updated PCT as 1480 ^{0}F, both for a 0.07 ft^{2} small break loss-of-coolant accident (LOCA). Provide the following additional information:

a. Which of these two analyses (and the resulting PCT) is considered as the analysis of record?

b. What was the basis for 20 ^{0}F higher feedwater temperature used for the updated analysis?

c. What was the licensing basis PCT at the rated power and MELLLA flow (100 percent current licensed thermal power (CLTP)/80 percent rated core flow (RCF)), which is state point E in Figure 1-1 of Attachment (7) of your request?

d. Describe the changes made to the current analysis, and the basis for the change, in order to obtain the results for the updated analysis.

4. As one travels from state points F towards E along the higher MELLLA load line shown in Figure 1-1 of Attachment (7) of your request, power-to-flow ratio and core inlet subcooling increase. As a result, two competing phenomena, i.e., the time of boiling transition and core recovery time, affect the limiting PCT. The NRC staff believes that it is possible that the limiting PCT can occur somewhere between points F and E, depending on how these competing phenomena play out. Therefore, in order to confirm the limiting PCT for MELLLA operation at NMP2, provide a PCT value for the mid-point between F and E. Otherwise, please provide justification for not calculating a mid-point PCT.

5. Describe your training program for the operators in preparation for implementing the ARTS/MELLLA operation at NMP2.

6. On page 7 of Attachment (1) of your request, it is stated that the anticipated transient without scram (ATWS) analysis resulted in a peak upper plenum pressure that is 5 pounds per square inch greater than the current analysis. It was further stated that the increase in peak upper plenum pressure is not due to implementation of MELLLA, but rather to differences in the modeling assumptions used in the revised ATWS analysis based on a new One Dimensional Core Transient (ODYN) model. Provide the following additional information:

   a. What necessitated use of a new ODYN ATWS model? Was that because the current model was not adequate and not acceptable?

   b. Did the NRC staff review and approve the new model?

7. On July 24, 2003, NMP2 experienced a failure of a power supply which lead to the concurrent failure of the steam flow, recirculation, and level control systems and subsequently resulted in a feedwater pump and a recirculation pump runback and downshift. The transient was terminated by an oscillation power range monitor (OPRM) SCRAM.

   a. Demonstrate that the OPRM setpoints in the Option III stability solution will provide adequate protection against exceeding specified acceptable fuel design limit (SAFDLs) by performing an analysis of the same initiating event starting

from the limiting point in exposure from the most limiting point on the MELLLA power/flow map. Specifically address the consequences of regional mode oscillations for the planned first ARTS/MELLLA cycle core and anticipated operating strategy.

b. The OPRM armed region of the power/flow map was generically defined. The ARTS/MELLLA operating domain, however, allows for operation at certain powers off the rod line for that power. Provide an analysis of the core and channel decay ratio at a few points along the OPRM armed region boundary using an approved NRC method (such as ODYSY). Use the "dog-bite correlation" to draw conclusions regarding susceptibility to regional mode oscillations. Based on the analysis, discuss (1) any conservatism in the selection of the OPRM armed boundary, and (2) the impact of rod patterns off the rod line associated with that power on core wide stability.

8. Regarding limiting core-wide AOOs:

a. Section 3.1 of Attachment (7) of your request describes the limiting transients considered for the plant specific MELLLA application. The section refers to generic assessments of several transients. Describe the salient design features of the boiling water reactor (BWR)/5 considered in the assessments. If a specific BWR/5 was considered as part of the assessment, provide either the plant name or a brief description of the design differences between the plant considered in the assessment and NMP2.

b. What is meant by Option A or Option B in Section 3.0?

c. Section 3.1 of Attachment (7) of your request states that: “The LFWH [loss of feedwater heating] event is not limiting for NMP2 and the effect of MELLLA on the LFWH severity is sufficiently small that the LFWH remains non-limiting for MELLLA…considering that the LFWH event becomes less limiting as the power decreases (less feedwater to be affected by loss of heating), the LFWH event was not considered in the determination or validation of the off-rated limits.” Provide the results of LFWH transient calculations starting from 100 percent CLTP and at 105 percent RCF at beginning-of-cycle. Compare the transient change in thermal margins to those for rapid pressurization events.

d. Describe the potential consequences of an inadvertent HPCS initiation at end-of-cycle (EOC) conditions at the 100 percent CLTP/80 percent RCF point in the MELLLA operating domain.

9. Verify that the first ARTS/MELLLA cycle core will be comprised of only General Electric fuel bundles.

10. Regarding the ATWS event:

a. The standby liquid control system (SLCS) relief valve setpoint is the same as the design pressure. The NRC staff does not understand how the relief valve will protect the SLCS unless the relief valve setpoint pressure is sufficiently lower

than the design pressure to allow the flow of the full SLCS injection flow rate from the pump discharge to the relief valve. Explain the claim that the revised relief valve setpoint will continue to ensure compliance with Section III of the ASME Boiler and Pressure Vessel code.

b. Boiling transition was not considered as a fuel integrity acceptance criterion. Describe the consequences of a non-isolation ATWS initiated by an inadvertent dual recirculation pump trip from the 100 percent CLTP/80 percent RCF operating point at EOC. Determine the limiting non-isolation ATWS event, considering two-loop operation, that results in the greatest number of fuel rods subject to boiling transition, and describe the consequences of this event assuming that control rods do not insert (no credit taken for redundant or diverse SCRAM signals or control rod insertion devices).

11. Regarding the LOCA:

a. Provide a table that describes the break spectrum and single failures analyzed to determine the licensing basis PCT.

b. Provide the results of licensing analyses that demonstrate compliance with all Title 10 of the *Code of Federal Regulations*, Part 50, Section 50.46 acceptance criteria. Namely provide the oxidation and hydrogen generation results and a discussion of the applicability of NEDO-20566A to MELLA with increased core flow.

c. Verify that LOCA analyses are performed with concurrent loss of offsite power. Provide a list of the single failures that were considered as part of the licensing basis.

d. Section 8.5 of Attachment (7) of your request describes the analysis of the vessel annulus loading and states: "For the feedwater line break, MELLLA implementation will result in a compartment differential pressure increase of less than 2.25 percent. ... For breaks other than the feedwater line, MELLLA implementation will result in an increase in compartment differential pressure of as much as 6.8 percent for full power conditions and as much as 3.0 percent in the vicinity of the minimum flow point on the MELLLA line." Provide a table describing the breaks and associated initial core conditions that were assumed in the analysis as well as the differential pressure change for each case considered. Provide a qualitative discussion to justify that the limiting case has been considered. Describe the limiting break scenario for the current licensed operating domain.

e. For the limiting licensing basis LOCA scenario, provide figures showing the transient MCPR, downcomer water level, collapsed liquid bypass level, system pressures, steam line flow, break flow, automatic depressurization system flow, high pressure core spray flow, low pressure core spray flow, low pressure coolant injection flow, total of all egress flows, total of all injection flows, and PCT.

f. Evaluate the consequences of a small break occurring as a consequence of a double ended guillotine rupture of the bottom vessel head drain line at MELLLA flow with a top peaked axial power shape. Consider the limiting break size as determined by the break spectrum presented in the topical report. Consider the worst single failure and compare the PCT to the licensing basis PCT.

12. Regarding operations:

a. Provide a figure on the same scale as Figure 1-1 of Attachment (7) of your request that shows and defines the previous and updated average power range monitor (APRM) rod block trip and SCRAM setpoints, the proposed MELLLA operating domain and APRM setpoints, and the Extended Load Line Limit Analysis operating domain and APRM setpoints.

b. Provide a list and associated description of those updates and upgrades related to the NUMAC-PRNM to support operation in the MELLLA domain.

13. List all of the SCRAM signals that would be encountered, but not credited, in the determination of the peak vessel pressure following a MSIV closure before crediting the flux SCRAM.

14. The RBM withdrawal permissive removed trip set points are predicated on a SLMCPR value of 1.07. For single-loop operation (SLO), the SLMCPR is 1.09 for NMP2. Describe how the RBM ensures that the fuel does not exceed SAFDLs during a RWE during SLO.

15. In Section 8.2 of Attachment (7) of your request, an initial drywell temperature of 105 ^{0}F was assumed in the design-basis accident LOCA short-term containment pressure/temperature response analysis for MELLLA. If drywell temperature could be lower than 105 ^{0}F during plant operations, provide assurance that drywell accident pressure will not exceed design pressure.

16. In Tables 8-1 and 8-2 of Attachment (7) of your request, there is a nomenclature difference between Case No. 4 ("Low Pump Speed MFCV-MELLLA") in Table 8-1 and the last case ("MELLLA-MPS") in Table 8-2. Please confirm that they are one and same.