February 20, 2004

Mr. James F. Klapproth, Manager
Engineering & Technology
GE Nuclear Energy
175 Curtner Avenue
San Jose, CA 95125

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION – LICENSING TOPICAL REPORT NEDC-33006P, REVISION 1, "GENERAL ELECTRIC BOILING WATER REACTOR MAXIMUM EXTENDED LOAD LIMIT ANALYSIS PLUS" (TAC NO. MB6157)

Dear Mr. Klapproth:

By letter dated August 22, 2002, GE Nuclear Energy (GENE) submitted Licensing Topical Report (LTR) NEDC-33006P, "General Electric Boiling Water Reactor Maximum Extended Load Limit Analysis Plus," Revision 1. The NRC staff has reviewed the LTR and has prepared the enclosed request for additional information (RAI) (Enclosure 1) relating to core and fuel performance and emergency core cooling system-loss-of-coolant accident. The enclosure also includes the staff's positions on GENE's proposal to defer the thermal limits assessment to the reload and its "Separate Effects" approach.

By letter dated January 29, 2004, the NRC staff forwarded the RAI for GENE to determine if it contained proprietary information. By letter dated February 11, 2004, GENE responded that certain information contained in the RAI was considered by GENE to be proprietary. Therefore, the staff has prepared a redacted version and it is Enclosure 2.

If you have any questions regarding this RAI, please contact me at (301) 415-1445.

Sincerely,

/RA/

Alan B. Wang, Project Manager, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Project No. 710

Enclosures:
1. Request for Additional Information (Proprietary)
2. Request for Additional Information (Non-proprietary)

cc w/encl 2: See next page

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Engineering & Technology
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REQUEST FOR ADDITIONAL INFORMATION

LICENSING TOPICAL REPORT NEDC-33006P, REVISION 1, "GENERAL ELECTRIC

BOILING WATER REACTOR MAXIMUM EXTENDED LOAD LIMIT ANALYSIS PLUS"

GE NUCLEAR ENERGY (GENE)

PROJECT NO. 710

This request for additional information (RAI) pertains to the review of Licensing Topical Report (LTR) NEDC-33006P, Revision 1, "General Electric Boiling Water Reactor Maximum Extended Load Line Limit Analysis Plus," referred to as MELLLA+. This RAI relates to core and fuel performance and emergency core cooling system-loss-of-coolant accident (ECCS-LOCA). This RAI also includes the staff's positions on GENE's proposal to defer the thermal limits assessment to the reload and its "Separate Effects" approach.

1. Time Varying Axial Power Shapes (TVAPS)

   a. **[**

      ]

   b. (Based on the audit). Provide a background discussion on why the fuel channels experience axial power shape changes during pressurization transients.
      [

      ]

   c. What are the principal factors that control the severity of ΔCPR response to TVAPS? Does the severity of the CPR change with TVAPS increase for the extended power uprate (EPU)/MELLLA operating condition? Explain the impact of the EPU/MELLLA+ condition on the factors that control the severity of the CPR change due to TVAPS effect. Would the effect of the TVAPS on the ΔCPR be more severe for 55 percent core flow (CF), 80 percent CF, 100 percent CF along the MELLLA+ upper boundary or the EPU/ increased core flow (ICF) as an initial condition. For different pressurization transients, does the severity of the TVAPS effect on the CPR change?

   d. Amendment 27 to GESTAR II (submitted for staff review) states that "NRC-agreed upon methodology for evaluating GE11 and later fuel uses time varying axial power shape (TVAPS), thereby changing the need for assuring this check. See GENE-666-03-0393 and NRC staff agreement at meeting on April 14, 1993." Explain this statement and state if the NRC reviewed and approved the method used to check or account for the effect of TVAPS on the CPR change during pressurization transients.

e. If the method used to evaluate the effect of TVAPS during a pressurization transient was not reviewed by the staff in the supplement to Amendment 27, provide sufficient information, including sensitivity results so that the staff can review the method and the effects of TVAPS on the transient response for plants operating with the EPU/MELLLA+ core design.

2. TVAPS Effect for Brunswick. For the Brunswick EPU/MELLLA+ analyses, explain what method will be used to calculate TVAPS. According to the proposed Amendment 27 changes to Section 4.3.1.2.1 of GESTAR, the time varying axial power shape for GE 11 fuel and later products is calculated using ODYN. The staff has been informed that Progress Energy is using TRACG to perform the EPU/MELLLA+ reload analysis. As such, how does ODYN interface with TRACG? Based on the Brunswick EPU/MELLLA+ core, provide a description of how the TVAP effect on the CPR was accounted for and calculated. Provide plots of the results.

3. **[ ]**

a. **[**

]

b. **[**

]

i. the performance and accuracy of the results obtained from the codes used to perform core response, during steady state, transients, and accidents (e.g., TRACG, ODYN/ISCOR/PANCEA),

ii. the CPR response for all events,

iii. the calculation of the moister carryover and carryunder, and

iv. bundle level.

c. **[**

]

Explain how this modeling technique affects the accuracy of the corresponding results. State whether the effect **[**

]

d. [ ] detect and suppress instability response and the ATWS instability response. [ ] please reanalyze all supporting cases.

e. [ ] the ATWS instability, the detect and suppress instability, and the anticipated operational occurrence (AOO) analyses. For each event type, discuss what impact the water rod flow would have on the plant's response in terms of the parameters that are important in each phenomenon of interest. [ ]

4. Effects of Bypass Voiding. The operation at higher power at reduced core flow, the flatter power profile, and the over 24 percent higher steam flow during EPU/MELLLA+ operation may result in increased voiding in the upper bypass region, which affects both the low power range monitor (LPRM) and the traversing in-core probe (TIP) detector response. The effect of bypass voiding on the instrumentation is not random (and therefore cannot be combined with random uncertainties to determine an increase in uncertainty), but rather is a systematic effect which can bias the detector response. Therefore, the effect of bypass voiding on the core performance code systems (e.g., MONICORE - minimum critical power ratio (MCPR), linear heat generation rate (LHGR) and safety systems (e.g., average power range monitor, rod block monitor) which receive input from this instrumentation should be evaluated.

   a. Provide an evaluation of the potential for bypass voiding for the EPU and EPU/MELLLA+ operation. Describe how the bypass voiding affects the accuracy of the core monitoring instrumentation.

   b. Explain the bases for the [ ]

   c. Identify the codes and the corresponding models that would be affected by [ ] Explain the impact of bypass voiding on the accuracy and the assumptions of the codes and the corresponding models used to simulate the boiling water reactor (BWR) response during steady state, transient, or accident conditions.

   d. [ ] but would not be predicted by the core simulator. Evaluate the effect of potential errors introduced by [ ]

e. Supplement the MELLLA+ application to evaluate the potential and effects of bypass voiding. The supplement should provide sufficient justification and supporting sensitivity analyses to conclude that bypass voiding for the EPU and EPU/MELLLA+ will remain within an acceptable limit.

5. Bypass Voiding for Brunswick and Clinton

a. State whether Brunswick and Clinton are gamma tip plants. Gamma tip LPRMs are sensitive to bypass voiding.

b. Based on the MELLLA+ core design and the most limiting core power profile and hot bundle power condition, determine whether Brunswick and Clinton would experience bypass voiding. **[** **]** Perform the evaluation at the different statepoints on the EPU/MELLLA+ upper boundary. Specifically, demonstrate that the bypass voiding would remain **[** **]** for operation at the 55 percent CF and the 85 percent core flow statepoints.

c. **[** **]** justify why the predicted bypass voiding is accurate. Provide similar justifications for the TRACG analyses.

d. If the predicted bypass voiding is within the acceptable range, **[** **]** Suggest procedures or methods for checking this parameter during the reload. This is particularly important **[** **]** which could invalidate some of the analytical methods and affect the accuracy of the monitoring instrumentation.

6. Void Fractions Greater than 90 Percent. The Brown Ferry steady state TRACG analysis shows that the hot channel exit void fraction is greater than 90 percent. This could potentially affect the validity of the exit conditions assumed in the computational models used to perform the safety analyses. The audit documents indicates that GENE had evaluated the effect of the high exit void fraction on the analytical models, techniques and methods. However, the evaluations and the bases of the conclusions were not discussed in the MELLLA+ LTR or submitted for NRC review as an amendment to GESTAR II. The following RAIs address the effect of the high exit void fraction and quality on the EPU/MELLLA operation.

a. Provide an evaluation of the analytical methods that are affected by the hot channel high exit void fraction (>90 percent) and channel exit quality. Discuss the impact the active channel exit void fraction would have on:

i. the steady-state nuclear methods (e.g., PANAC/ISCOR),
ii. the transient analyses methods (e.g., ODYN/TASC/ODSYS),

iii. the GEXL correlation, and
iv. the plant instrumentation and monitoring.

b. Evaluate whether the higher channel void fraction would affect any benchmarking or separate effects testing performed to assess specific thermal-hydraulic and/or neutronic phenomena.

c. Include in your evaluation, the effect of the high void fractions on the accuracy and assessment of models used in all licensing codes that interface with and/or are used to simulate the response of BWRs, during steady state, transient, and accident conditions.

d. Submit an amendment to the appropriate NRC-approved codes (e.g., TRACG for AOO, ODYN/ISCOR/TASC, SAFER/GESTR/TASC, ODSYS) that updates and evaluates the impact of the EPU/MELLLA+ operating conditions such as the high exit void fraction on the computational modeling techniques and the applicability range.

e. Submit a supplement to the MELLLA+ LTR that addresses the impact of the EPU/MELLLA+ core operating conditions, including high exit void fraction, on the applicability of the currently approved licensing methods.

7. Brunswick and Clinton - Effect of Void Fractions Greater than 90 Percent

a. Explain how the core averaged void fraction reported in the heat balance table is computed. For example, the Brunswick MELLLA+ application reports core averaged void fractions in the range of 0.51 to 0.54 for different statepoints.

b. For the EPU/MELLLA+ core design, what is the hot channel exit void fraction for the steady state operation at the EPU 120 percent power/99 percent CF, EPU/MELLLA+ 120 percent power/85 percent CF and the EPU/MELLLA+ 77.6 percent power/55 percent CF statepoints? Use bounding conditions.

8. ICF: Are the shutdown margin, standby liquid control system shutdown capability and mislocated fuel bundle analyses performed at the rated conditions (100 percent EPU power/100 percent CF). If so, justify why the these calculations are not performed for the nonrated conditions such as the ICF condition. Provide supporting sensitivity analysis results for your conclusions or update the GESTAR II licensing methodology, stating that these calculations would be performed at the ICF statepoint.

9. The hot channel void fraction increases with decreasing flow along the MELLLA+ upper boundary. Therefore, the void fraction at the 55 percent CF and the 80 percent CF statepoints are higher than the void fraction at 99 percent CF. Consequently, it is feasible that the initial conditions of the hot channels could be higher at the minimum core flow statepoints or at the offfrated conditions.

a. Justify why the steady-state initial critical power ratio (ICPR) is assumed in determining the offrated AOO response, instead of the ICPR calculated from offrated conditions.

b. For the most bounding conditions, compare the steady-state ICPR calculated based on the actual conditions at the state points (rated, 80 percent CF, and 55 percent CF or offrated lower power and flow conditions).

10. ISCOR/ODYN/TASC Application. The transient CPR and the peak cladding temperature (PCT) calculations are performed using the ODYN/ISCOR/TASC combination. The staff understands that ISCOR calculates the initial steady-state thermal-hydraulic core calculations. ODYN (1-D code) provides the reactor power, heat flux, core flow conditions, and the axial power shapes of the hot bundle during the transient. [

]

The ISCOR/TASC combination is also used to calculate the PCT for ECCS-LOCA and Appendix R calculations. In addition, ISCOR/TGBLA/PANAC code combinations are also used in core and fuel performance calculations.

a. ISCOR is widely used in many of the safety analyses, but the code was never reviewed by the NRC. The use of a non-NRC-approved code in a combined code system applications is problematic. Therefore, submit the ISCOR code for NRC review.

b. Although ISCOR is not an NRC-approved code, our audit review did not reveal specific shortcomings. **[**

]

Therefore, include in the ISCOR submittal a description and evaluation of the ISCOR/ODYN or ISCOR/TGBLA/PANAC code combination discussed above. Provide sufficient information in the submittal, including sensitivity analyses, to allow the staff to assess the adequacy of these combined applications.

c. During the MELLLA+ audit , the staff discovered that GENE had internally evaluated a potential non-conservatism that may result from the use of the flow-driven ISOR/ODYN/TASC combination to calculate the transient ΔCPR. **[**

]

11. Plutonium Buildup. It is expected that a EPU/MELLLA+ core would produce more Pu(239). What are the consequences of this increase from a neutronic and thermal-hydraulic standpoint during steady-state, transient, and accident conditions?

12. Spectrum Hardening. How does the harder spectrum from the increased Pu affect surrounding core components such as the shroud, vessel, and steam dryer?

13. How do the thermal margins change as a function of flow and transients for a EPU/MELLLA+ cores?

14. Demonstrate that the rod withdraw error (RWE) for the EPU/MELLLA+ domain is less limiting than the non-MELLLA+ domain throughout the cycle.

15. If the axial power profile is expected to be more pronounced (more limiting) for a EPU/MELLLA+ core, demonstrate and provide a quantitative and qualitative technical justification of the effects of these more pronounced profiles on the normal and transient behavior of the core.

16. Reload Analyses. Since the startup and intermediate rod patterns are developed by the licensees and subject to change during plant maneuvers, explain how you ensure that the core and fuel assessment analyses performed during the reload are still applicable. For example, if the safety limit for minimum critical power (SLMCPR) is performed at different burnup conditions during the cycle, how do you ensure that the plant's operating history does not invalidate the reload assumptions? How are the corrections or adjustments made to the plant's core and fuel performance analyses to ensure the parameters and conditions assumed during the reload analyses remain applicable during the operation. The staff's concern stems from the additional challenges that EPU/MELLLA+ pose in terms of core and fuel performance.

17. Thermal Limits Assessment

    a. SLMCPR. It is possible that the impact on the critical heat flux (CHF) phenomena may be higher at the offrated or minimum core flow statepoints. Is the SLMCPR value provided in the SLMCPR amendment requests and reported in the TS based on the rated conditions? If so, justify why the SLMCPR is not calculated for statepoints other than the rated conditions. Quantitatively demonstrate that the SLMCPR calculated at the minimum 80 percent and 55 percent statepoints would be lower than the SLMCPR calculated at the rated conditions. Use power profiles and core designs that are representative of the EPU/MELLLA+ conditions. Discuss the assumptions made. Include the Brunswick EPU/MELLLA+ application in your sensitivity analyses.

    b. SLMCPR at EPU/MELLLA+ Upper Boundary. The SLMCPR at the nonrated conditions (EPU power/80 percent CF) could be potentially higher than the SLMCPR at rated conditions, explain how "statepoint-dependent" SLMCPR would be developed and implemented for operation at the EPU/MELLLA+ condition. Use the Brunswick EPU/MELLLA+ application to demonstrate the implementation of "statepoint-dependent" SLMCPR.

c. Exposure-Dependent SLMCPR. Discuss the development of the exposure-dependent SLMCPR calculation. State whether this is an NRC-approved method and refer to the applicable GESTAR II amendment request.

18. GEXL-PLUS Correlation. Confirm that the GEXL-PLUS correlation is still valid over the range of power and flow conditions of the EPU/MELLLA+ operations.

19. Using ATWS-Recirculation Pump Trip (RPT) for AOOs. GENE licensing methodology allows using anticipatory ATWS-RPT in some AOO transients to decrease the power and pressure response. Therefore, the anticipatory RPT is used in some plants to minimize the impact of the pressurization transient on the ΔCPR response. For the EPU MELLLA+ operation, RPT may subject the plant to instability. Evaluate the runbacks associated with the AOOs and demonstrate that the scram and the RPT timings would not lead to an AOO transient resulting in an instability.

20. Mechanical Overpower (MOP) and Thermal Overpower (TOP). Are the fuel-specific mechanical and thermal overpower limits determined based on the generic fuel design or for each plant-specific bundle lattice design? How is it confirmed that the generic MOP and TOP limits for GE14 fuel bounds the plant-specific GE14 lattice designs intended to meet the cycle energy needs at the EPU/MELLLA+ conditions?

21. Brunswick AOO. The Brunswick Units 1 and 2 are the first plants to apply TRACG for performing the reload analyses.

    a. Compare the Brunswick EPU and the EPU/MELLLA+ core designs and performance.

    b. State what is the benefit of using TRACG instead of ODYN for the EPU/MELLLA+ reload analyses.

    c. Provide a comparison of the TRACG and ODYN AOO analyses results based on the EPU/MELLLA+ core design.

22. Brunswick AOO Data Request. Submit the following data on compact disc for the Brunswick EPU/MELLLA+ core and fuel performance analyses.

    a. TRACG input file including the PANCEA wrap file for a limiting transient initiated from different statepoints along the EPU/MELLLA+ boundary, if available. Include the corresponding output file in ASCI form.

    b. ODYN output file (ASCI) for the same transients and statepoints.

23. Separate Effects, Mixed Vendor Cores and Related Staff Restrictions

    Separate effects: revise Section 1.0, "Introduction," of the MELLLA+ LTR and remove the list of "separate effects" changes. The MELLLA+ LTR lists plant-specific operating condition changes that could be implemented concurrently with the EPU/MELLLA+, but would be evaluated in a separate submittal. All of these lists of changes would affect the safety analyses that demonstrate the impact of EPU/MELLLA+ on the plant's response during steady-state, transients, accidents, and special events. The plant-specific EPU/MELLLA+ application must demonstrate how the plant would be operated during the implementation of MELLLA+. In addition, the EPU/MELLLA+ reduces the available plant margins. Therefore, the staff cannot make its safety finding based on assumed plant operating conditions that are neither bounding nor conservative relative to the actual plant operating conditions. Revise the MELLLA+ LTR and delete the paragraphs that propose evaluating additional operating condition changes in a separate submittal while the EPU/MELLLA+ application assumes that these changes would not be implemented.

Add the following statements in the MELLLA+ LTR to address staff restrictions including: (1) the implementation of additional changes concurrent with EPU/MELLLA+, (2) the applicability of the generic analyses supporting the EPU/MELLLA+ operation, and (3) the approach used to support new fuel designs or mixed vendor cores.

a. The plant-specific analyses supporting the EPU/MELLLA+ operation will include all planned operating condition changes that would be implemented at the plant. Operating condition changes include but are not limited to increase in the dome pressure, maximum core flow, increase in the fuel cycle length, or any changes in the currently licensed operation enhancements. For example, with increase in the dome pressure, the ATWS analysis, the American Society of Mechanical Engineers (ASME) overpressure analyses, the transient analyses, and the ECCS-LOCA analysis must be reanalyzed based on the increased dome pressure. Any changes to the safety system settings or actuation setpoint changes necessary to operate with the increased dome pressure should be included in the evaluations (e.g., safety relief valve setpoints).

b. For all of the principal topics that are reduced in scope or generically dispositioned in the MELLLA+ LTR, the plant-specific application will provide supporting analyses and evaluations that demonstrate the cumulative effect of EPU/MELLLA+ and any additional changes planned to be implemented at the plant. For example, if the dome pressure would be increased, the ECCS performance needs to be evaluated on a plant-specific basis.

c. Any generic sensitivity analyses provide in the MELLLA+ LTR will be evaluated to ensure that the key input parameters and assumptions used are still applicable and bounding. If the additional operating condition changes affects these generic sensitivity analyses, a bounding generic sensitivity analyses will be provided. For example, with increase in the dome pressure, the TRACG ATWS sensitivity analyses that model the operator actions (e.g., depressurization if the heat capacity temperature limit is reached) needs to be reanalyzed, using the bounding dome pressure condition.

d. If a new GE fuel or another vendor's fuel is loaded at the plant, the generic sensitivity analyses supporting the EPU/MELLLA+ condition will be reanalyzed. For example, the ATWS instability analyses supporting the EPU/MELLLA+ condition are based on the GE14 fuel response. New analyses that demonstrate the ATWS stability performance of the new GE fuel or legacy fuel for the EPU/MELLLA+ operation needs to be provided. The new ATWS instability analyses can be provided as supplement to the MLTR or as an Appendix to the plant-specific application.

e. If a new GE fuel or another vendor's fuel is loaded at the plant, analyses supporting the EPU/MELLLA+ application will be based on core specific configuration or bounding core conditions. In addition, any principle topics that are generically dispositioned or reduced in scope will be demonstrated to be applicable or new analyses based on the transition core conditions or bounding conditions would be provided.

f. If a new GE fuel or another vendor's fuel is loaded at the plant, the plant-specific application will reference the fuel-specific stability detect and suppress method supporting the EPU/MELLLA+ operation. The plant-specific application will demonstrate that the analyses and evaluation supporting the stability detect and suppress method are applicable to the fuel loaded in the core.

g. For EPU/MELLLA+ operation, instability is possible in the event of transient or plant maneuvers that place the reactor at high power/low flow condition. Therefore, plants operating at the EPU/MELLLA+ condition must have an NRC reviewed and approved instability detect and suppress method operable. In the event the stability protection method is inoperable, the applicant must employ NRC reviewed and approved backup stability method or must operate the reactor at a condition in which instability is not possible in the event of transient. The licensee will provide technical specification changes that specify the instability method operability requirements for EPU/MELLLA+ operation.

24. Reactor Safety Performance Evaluations. From the AOO audit, the staff determined that (1) GENE did not provide statistically adequate sensitivity studies that demonstrate the impact of EPU/MELLLA+ operation, **[**

] (3) the generic anticipatory reactor trip system (ARTS) response may not be applicable for all BWR applications, and (4) the EPU/MELLLA+ impact was not insignificant. The staff also finds that it is not acceptable to makes safety findings on two major changes (20 percent uprate based on the CPPU approach and MELLLA+) without reviewing the plant-specific results. **[**

] EPU/MELLLA+ applications must provide plant-specific fuel thermal margin and AOO evaluations and results. The following discussion summarizes the staff's bases for concluding that the plant-specific EPU/MELLLA+ application must provide a plant-specific thermal limits assessment and plant-specific transient analyses results.

a. EPU/MELLLA+ Core Design. Operation in the MELLLA+ domain will require significant changes to the BWR core design. Expected changes include (1) adjustments to the pin-wise enrichment distribution to flatten the local power distribution, reduce the r-factor, and increase CPR margin; (2) increased gadolinium (Gd) loading in the bottom of the fuel bundle to reduce the axial power peaking resulting from increased coolant voiding, and (3) changes in the core depletion due to the sequential rod withdrawal/flow increase maneuvers expected during operation in the MELLLA+ flow window. **[**

] However, the model used for these AOO calculations is not based on a MELLLA+ core, which has been designed for reduced flow at uprated power. Therefore, none of the sensitivity analyses supporting MELLLA+ operation have been performed for a core which includes the unique features of a MELLLA+ core design. Consequently, the effect of MELLLA+ on AOO ΔCPR has not been adequately quantified.

b. Reload-Specific Evaluation of the AOO Fuel Thermal Margin. **[**

] The available data is also limited.

c. Offrated Limits. The staff determined that the offrated limits (including along the MELLLA+ upper boundary) ΔCPR response may be more limiting than transients initiated from rated conditions. Therefore, AOO results from EPU applications cannot be used as sufficient bases to justify not providing the core and fuel performance results for the plant-specific MELLLA+ applications. Moreover, it has not been demonstrated that the generic ARTS limits are applicable and will bound the plant and core-specific offrated transient response for all of the BWR fleet. Therefore, offrated transient analyses must be performed to demonstrate the plant's ΔCPR response.

d. Mixed Core. Many of the BWRs seeking to implement the EPU/MELLLA+ operating domain may have mixed vendor cores. GENE's limited (MELLLA+) sensitivity analyses were based on GE14 fuel response of two BWR plants. Additional supporting analyses and a larger MELLLA+ operating experience database will be required before generic conclusions can be reached about the impact of MELLLA+ on core and fuel performance. Specifically, there is no operating experience or corresponding database available for assessing the performance of mixed vendor cores designed for EPU/MELLLA+ operation. As such, plant-specific fuel and core performance results must be submitted until a sufficient operating experience and analyses data base is available. In addition, new fuel designs in the future may change the core and fuel performance for the operation at the EPU/MELLLA+ operation. Therefore, the staff's EPU/MELLLA+ safety finding must be based on plant-specific core and fuel performance.

e. For the CPPU applications, the core and fuel performance assessments are deferred to the reload. Therefore, MELLLA+ LTR proposes that the staff approve an EPU/MELLLA+ application without reviewing the plant's response for two major operating condition changes. This approach would not meet the agency's safety goals.

25. Large Break ECCS-LOCA

a. Mixed Core. For a plant-specific EPU/MELLLA+ application, state if equilibrium ECCS-LOCA analyses of each type would be performed or core configuration specific ECCS-LOCA analyses would be performed. If a core configuration specific ECCS-LOCA analyses will be performed, state which NRC-approved codes or methods would be used.

b. Reporting Limiting ECCS-LOCA Results. The MELLLA+ audit indicated that the rated ECCS-LOCA results are reported although it may not be for the most limiting results. For the EPU/MELLLA+ operation, the most limiting ECCS-LOCA result is at the MELLLA+ statepoint of 55 percent CF. Revise the MELLLA+ LTR to state that the ECCS-LOCA result at rated condition, minimum core flow at EPU power level and at the 55 percent CF statepoint will be reported. In addition, revise the applicable documents that specify the GENE licensing methods to state that the ECCS-LOCA result corresponding to the rated and the most limiting statepoint will be provided. Report in the supplemental reload licensing report (SRLR), the ECCS-LOCA results at the rated and the most limiting statepoints. Confirm that the steady-state initial conditions (e.g., operating limit maximum critical power ratio [OLMCPR]) assumed in the ECCS-LOCA analyses will be reported in the SRLR.

c. Adder Approach. Was the licensing bases PCT calculated by incorporating a delta PCT adder to the Appendix K PCT? If this is the method used, please justify why the 10 CFR 50.44 insignificant change criteria is acceptable.

26. Small Break ECCS-LOCA Response. **[**

] assuming high pressure coolant injection (HPCI) failure and automatic depressurization system depressurization. At the 55 percent CF statepoint (Point M), the hot bundle may be at a more limiting initial condition in terms of initial void content and the ADS would depressurize the reactor leading to core uncovery as well. Provide a sensitivity ECCS-LOCA analysis, using the bounding initial condition. Provide a small break LOCA analysis at point M (77.6 percent Power/55 percent CF), based on the bounding initial condition, worst case small break scenario and placing the hot bundle at the most limiting conditions (peaking factors). Use initial SLMCPR and OLMCPR condition that is bounding for operation at 80 percent CF or 55 percent CF statepoint.

27. Small Break Containment Response. Using the most limiting small break LOCA, in terms of containment response (possibly at rated condition if limiting), demonstrate whether the suppression pool temperature response to a design basis accident is limiting. Wouldn't a small break LOCA (e.g., assuming HPCI failure and depressurization of the reactor) be more limiting in terms of suppression pool response? Base your evaluations on the Brunswick and Clinton applications.

28. Assumed Axial Power Profile for ECCS-LOCA. **[**

]

Base your discussion on the predicted response in terms of dryout times. In addition, explain what the axial power peaking would be if the fuel is placed at the LHGR limit at rated conditions, 80 percent CF and 55 percent CF condition. If the axial power peaking would be higher for the non-rated flow conditions, state what axial power peaking were used in the ECCS-LOCA sensitivity analyses reported in MELLLA+ LTR for the 80 percent and 55 percent CF statepoints.

29. Power/Flow Map. The MELLLA+ LTR states that the slope of the linear upper boundary was derived primarily from reactor operating data. Expand on this statement. Explain what operating data was used. Were all plant types represented? Was the line developed as a bounding line or as a fit to the referred reactor operating data?

30. Power/Flow Map. The MELLLA+ minimum statepoint for rated EPU power was limited to 80 percent CF. Explain what the limitations were in establishing the minimum core flow statepoint. Similarly, discuss the limitations considered in establishing the 55 percent core statepoint. Discuss why the feedwater heater out-of-service and single loop operation is also not allowed for the EPU/MELLLA+ operation.