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PROPRIETARY INFORMATION – WITHHOLD UNDER 10 CFR 2.390

10 CFR 50.90

May 27, 2010

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Peach Bottom Atomic Power Station, Unit 2
Renewed Facility Operating License No. DPR-44
NRC Docket No. 50-277

Subject: License Amendment Request - Safety Limit Minimum Critical Power Ratio Change

In accordance with 10 CFR 50.90, Exelon Generation Company, LLC (Exelon) requests a proposed change to modify Technical Specification (TS) 2.1.1 ("Reactor Core SLs"). Specifically, this change incorporates revised Safety Limit Minimum Critical Power Ratios (SLMCPRs) due to the cycle specific analysis performed by Global Nuclear Fuel for Peach Bottom Atomic Power Station (PBAPS), Unit 2, Cycle 19.

The proposed changes have been reviewed by the Peach Bottom Atomic Power Station Plant Operations Review Committee, and approved by the Nuclear Safety Review Board in accordance with the requirements of the Exelon Quality Assurance Program.

In order to support the upcoming refueling outage at PBAPS, Unit 2, Exelon requests approval of the proposed amendment by September 1, 2010. Once approved, this amendment shall be implemented within 30 days of issuance. Additionally, there are no commitments contained within this letter.

Attachment 1 contains the evaluation of the proposed changes. Attachments 2 and 3 provide the marked up TS page and the retyped TS page, respectively.

Attachment 4 (letter from J. M. Downs (Global Nuclear Fuel) to J. Tusar (Exelon Generation Company, LLC), dated May 6, 2010) specifies the new SLMCPRs for PBAPS, Unit 2, Cycle 19. Attachment 4 contains information proprietary to Global Nuclear Fuel. Global Nuclear Fuel requests that the document be withheld from public disclosure in accordance with 10 CFR 2.390(b)(4). An affidavit supporting this request is also contained in Attachment 4. Attachment 5 contains a non-proprietary version of the Global Nuclear Fuel document. Attachment 6 contains the power/flow map for Cycles 18 and 19.

In accordance with 10 CFR 50.91, Exelon is notifying the State of Pennsylvania of this application for license amendment by transmitting a copy of this letter and its attachments to the designated State Official.

Attachment 4 transmitted herewith contains Proprietary Information.
When separated from attachments, this document is decontrolled.

Should you have any questions concerning this letter, please contact Tom Loomis at (610) 765-5510.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 27th of May 2010.

Respectfully,

Pamela B. Cowan
Director, Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachments: 1) Evaluation of Proposed Changes
2) Markup of Technical Specifications Page
3) Retyped Technical Specifications Page
4) Proprietary Version of Global Nuclear Fuel Letter
5) Non-Proprietary Version of Global Nuclear Fuel Letter
6) Power/Flow Map for Cycles 18 and 19

cc: USNRC Region I, Regional Administrator
USNRC Senior Resident Inspector, PBAPS
USNRC Project Manager, PBAPS
R. R. Janati, Commonwealth of Pennsylvania
S. T. Gray, State of Maryland

Attachment 1

Peach Bottom Atomic Power Station, Unit 2

Renewed Facility Operating License No. DPR-44

Evaluation of Proposed Changes

ATTACHMENT 1 CONTENTS

SUBJECT: Safety Limit Minimum Critical Power Ratio (SLMCPR) Change

1.0 SUMMARY DESCRIPTION

This evaluation supports a request to amend Renewed Facility Operating License No. DPR-44 for Peach Bottom Atomic Power Station (PBAPS), Unit 2.

The proposed change modifies Technical Specification (TS) 2.1.1 ("Reactor Core SLs"). Specifically, this change incorporates revised Safety Limit Minimum Critical Power Ratios (SLMCPRs) due to the cycle specific analysis performed by Global Nuclear Fuel for Peach Bottom Atomic Power Station (PBAPS), Unit 2, Cycle 19.

2.0 DETAILED DESCRIPTION

The proposed change involves revising the SLMCPRs contained in TS 2.1.1 for two recirculation loop operation and single recirculation loop operation. The SLMCPR value for two-loop operation is being changed from ≥ 1.07 to ≥ 1.10. The SLMCPR value for single-loop operation is being changed from ≥ 1.09 to ≥ 1.14.

Marked up Technical Specification page 2.0-1 showing the requested changes is provided in Attachment 2.

3.0 TECHNICAL EVALUATION

The proposed TS change will revise the SLMCPRs contained in TS 2.1.1 for two recirculation loop operation and single recirculation loop operation to reflect the changes in the cycle specific analysis performed by Global Nuclear Fuel for PBAPS, Unit 2, Cycle 19.

The new SLMCPRs are calculated using NRC-approved methodology described in NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," Revision 16. A listing of the associated NRC-approved methodologies for calculating the SLMCPRs is provided in Section 1.0 ("Methodology") of Attachment 4.

The SLMCPR analysis establishes SLMCPR values that will ensure that during normal operation and during abnormal operational transients, at least 99.9% of all fuel rods in the core do not experience transition boiling if the limit is not violated. The SLMCPRs are calculated to include cycle specific parameters and, in general, are dominated by two key parameters: 1) flatness of the core bundle-by-bundle MCPR distribution, and 2) flatness of the bundle pin-by-pin power/R-factor distribution. Information to support the cycle specific SLMCPRs is included in Attachment 4. That attachment summarizes the methodology, inputs, and results for the change in the SLMCPRs. The PBAPS, Unit 2 Cycle 19 core will consist of GE14 and GNF2 fuel types.

Attachment 6 contains the power/flow map for Cycles 18 and 19.

No plant hardware or operational changes are required with this proposed change.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR 50.36, "Technical specifications," paragraph (c)(1), requires that power reactor facility TS include safety limits for process variables that protect the integrity of certain physical barriers that guard against the uncontrolled release of radioactivity. The fuel cladding integrity

SLMCPR is established to assure that at least 99.9% of the fuel rods in the core do not experience boiling transition during normal operation and abnormal operating transients. Thus, the SLMCPR is required to be contained in TS.

4.2 Precedents

The NRC has approved similar SLMCPR changes for a number of plants:

1) Letter from M. H. Chernoff (U.S. Nuclear Regulatory Commission) to K. W. Singer (Tennessee Valley Authority), "Browns Ferry Nuclear Plant, Unit 1 - Issuance of Amendment Regarding Cycle-Specific Safety Limit Minimum Critical Power Ratio (TAC NO. MD1721) (TS-455)," dated February 6, 2007

2) Letter from J. Kim (U.S. Nuclear Regulatory Commission) to Site Vice President (Entergy Nuclear Operations, Inc.), "Pilgrim Nuclear Power Station – Issuance of Amendment RE: Technical Specification Change Concerning Safety Limit Minimum Critical Power Ratio (TAC NO. ME0241)," dated March 26, 2009

3) Letter from J. Wiebe (U.S. Nuclear Regulatory Commission) to C. Pardee (Exelon Generation Company, LLC), "Quad Cities Nuclear Power Station, Units 1 and 2 - Issuance of Amendments RE: Safety Limit Minimum Critical Power Ratio (TAC NOS. MD7374 AND MD7375)," dated February 28, 2008

4) Letter from C. Lyon (U.S. Nuclear Regulatory Commission) to Vice President, Operations (Entergy Operations, Inc.), "Grand Gulf Nuclear Station, Unit 1 - Issuance of Amendment RE: Change to the Minimum Critical Power Ratio Safety Limit (TAC NO. ME2474)," dated March 25, 2010

4.3 No Significant Hazards Consideration

Exelon Generation Company, LLC (Exelon) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The derivation of the cycle specific Safety Limit Minimum Critical Power Ratios (SLMCPRs) for incorporation into the Technical Specifications (TS), and their use to determine cycle specific thermal limits, has been performed using the methodology discussed in NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," Revision 16.

   The basis of the SLMCPR calculation is to ensure that during normal operation and during abnormal operational transients, at least 99.9% of all fuel rods in the core do not experience transition boiling if the limit is not violated. The new SLMCPRs preserve the existing margin to transition boiling.

The MCPR safety limit is reevaluated for each reload using NRC-approved methodologies. The analyses for Peach Bottom Atomic Power Station (PBAPS), Unit 2, Cycle 19 have concluded that a two loop MCPR safety limit of ≥ 1.10, based on the application of Global Nuclear Fuel's NRC-approved MCPR safety limit methodology, will ensure that this acceptance criterion is met. For single-loop operation, a MCPR safety limit of ≥ 1.14 also ensures that this acceptance criterion is met. The MCPR operating limits are presented and controlled in accordance with the PBAPS, Unit 2 Core Operating Limits Report (COLR).

The requested Technical Specification changes do not involve any plant modifications or operational changes that could affect system reliability or performance or that could affect the probability of operator error. The requested changes do not affect any postulated accident precursors, do not affect any accident mitigating systems, and do not introduce any new accident initiation mechanisms. Therefore, the proposed TS changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The SLMCPR is a TS numerical value, calculated to ensure that during normal operation and during abnormal operational transients, at least 99.9% of all fuel rods in the core do not experience transition boiling if the limit is not violated. The new SLMCPRs are calculated using NRC-approved methodology discussed in NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," Revision 16. The proposed changes do not involve any new modes of operation, any changes to setpoints, or any plant modifications. The proposed revised MCPR safety limits have been shown to be acceptable for Cycle 19 operation. The core operating limits will continue to be developed using NRC-approved methods. The proposed MCPR safety limits or methods for establishing the core operating limits do not result in the creation of any new precursors to an accident. Therefore, this change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

   Response: No.

   There is no significant reduction in the margin of safety previously approved by the NRC as a result of the proposed change to the SLMCPRs. The new SLMCPRs are calculated using methodology discussed in NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," Revision 16. The SLMCPRs ensure that during normal operation and during abnormal operational transients, at least 99.9% of all fuel rods in the core do not experience transition boiling if the limit is not violated, thereby preserving the fuel cladding integrity. Therefore, the proposed TS changes do not involve a significant reduction in the margin of safety previously approved by the NRC.

Based on the above, Exelon Generation Company, LLC, concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of no significant hazards consideration is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

1) NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel," Revision 16.

ATTACHMENT 2

Markup of Technical Specifications Page

Revised TS Page

2.0-1 (Unit 2)

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10% rated core flow:

THERMAL POWER shall be ≤ 25% RTP.

2.1.1.2 With the reactor steam dome pressure ≥ 785 psig and core flow ≥ 10% rated core flow:

1.10

MCPR shall be ≥ 1.07 for two recirculation loop operation or ≥ 1.09 for single recirculation loop operation.

1.14

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be ≤ 1325 psig.

2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

(continued)

ATTACHMENT 3

Retyped Technical Specifications Page

Revised TS Page

2.0-1 (Unit 2)

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10% rated core flow:

THERMAL POWER shall be ≤ 25% RTP.

2.1.1.2 With the reactor steam dome pressure ≥ 785 psig and core flow ≥ 10% rated core flow:

MCPR shall be ≥ 1.10 for two recirculation loop operation or ≥ 1.14 for single recirculation loop operation.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be ≤ 1325 psig.

2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

(continued)

ATTACHMENT 5

Non-Proprietary Version of Global Nuclear Fuel Letter

May 2010

GNF-0000-0110-4753-R0-NP

eDRFSection: 0000-0110-4753 R0

GNF Additional Information Regarding the Requested Changes to the Technical Specification SLMCPR

Peach Bottom 2 C19

Proprietary Information Notice

This document is the GNF non-proprietary version of the GNF proprietary report. From the GNF proprietary version, the information denoted as GNF proprietary (enclosed in double brackets) was deleted to generate this version.

Important Notice Regarding Contents of this Report
Please Read Carefully

The information contained in this document is furnished solely for the purpose(s) stated in the transmittal letter. The only undertakings of GNF-A with respect to information in this document are contained in the contracts between GNF-A and its customers or participating utilities, and nothing contained in this document shall be construed as changing that contract. The use of this information by anyone for any purpose other than that for which it is intended is not authorized; and with respect to any unauthorized use, GNF-A makes no representation or warranty, and assumes no liability as to the completeness, accuracy, or usefulness of the information contained in this document.

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1.0 Methodology

GNF performed the Peach Bottom 2 C19 Safety Limit Minimum Critical Power Ratio (SLMCPR) calculation in accordance to NEDE-24011-P-A "General Electric Standard Application for Reactor Fuel" (Revision 16) using the following NRC-approved methodologies and uncertainties:

- NEDC-32601P-A "Methodology and Uncertainties for Safety Limit MCPR Evaluations" (August 1999).
- NEDC-32694P-A "Power Distribution Uncertainties for Safety Limit MCPR Evaluations" (August 1999).
- NEDC-32505P-A "R-Factor Calculation Method for GE11, GE12 and GE13 Fuel" (Revision 1, July 1999).
- NEDO-10958-A "General Electric BWR Thermal Analysis Basis (GETAB): Data, Correlation and Design Application" (January 1977).

Table 2 identifies the actual methodologies used for the previous cycle and the current cycle SLMCPR calculations.

2.0 Discussion

In this discussion, the TLO nomenclature is used for two recirculation loops in operation, and the SLO nomenclature is used for one recirculation loop in operation.

2.1. Major Contributors to SLMCPR Change

In general, the calculated safety limit is dominated by two key parameters: (1) flatness of the core bundle-by-bundle MCPR distribution, and (2) flatness of the bundle pin-by-pin power/R-factor distribution. Greater flatness in either parameter yields more rods susceptible to boiling transition and thus a higher calculated SLMCPR. MIP (MCPR Importance Parameter) measures the core bundle-by-bundle MCPR distribution and RIP (R-factor Importance Parameter) measures the bundle pin-by-pin power/R-factor distribution. The impact of the fuel loading pattern on the calculated TLO SLMCPR using rated core power and rated core flow conditions has been correlated to the parameter MIPRIP, which combines the MIP and RIP values.

Table 3 presents the MIP and RIP parameters for the previous cycle and the current cycle along with the TLO SLMCPR estimate using the MIPRIP correlation. If the minimum core flow case is applicable, the TLO SLMCPR estimate is also provided for that case although the MIPRIP correlation is only applicable to the rated core flow case. This is done only to provide some reasonable assessment basis of the minimum core flow case trend. In addition, Table 3 presents estimated impacts on the TLO SLMCPR due to methodology deviations, penalties, and/or uncertainties deviations from approved values. Based on the MIPRIP correlation and any impacts due to deviations from approved values, a final estimated TLO SLMCPR is determined. Table 3 also provides the actual calculated Monte Carlo SLMCPRs. Given the bias and uncertainty in the MIPRIP correlation [[ ]] and the inherent variation in the Monte Carlo results [[ ]], the change in the Peach Bottom 2 C19 calculated Monte Carlo TLO SLMCPR using rated core power and rated core flow conditions is consistent with the corresponding estimated TLO SLMCPR value.

2.2. Deviations in NRC-Approved Uncertainties

Tables 4 and 5 provide a list of NRC-approved uncertainties along with values actually used. A discussion of deviations from these NRC-approved values follows; all of which are conservative relative to NRC-approved values. Also, estimated impact on the SLMCPR is provided in Table 3 for each deviation.

2.2.1. R-Factor

At this time, GNF has generically increased the GEXL R-Factor uncertainty from [[ ]] to account for an increase in channel bow due to the emerging unforeseen phenomena called control blade shadow corrosion-induced channel bow, which is not accounted for in the channel bow uncertainty component of the approved R-Factor uncertainty. The step "σ RPEAK" in Figure 4.1 from NEDC-32601P-A, which has been provided for convenience in Figure 3 of this attachment, is affected by this deviation. Reference 4 technically justifies that a GEXL R-Factor uncertainty of [[ ]] accounts for a channel bow uncertainty of up to [[ ]].

Peach Bottom 2 has experienced control blade shadow corrosion-induced channel bow to the extent that an increase in the NRC-approved R-Factor uncertainty [[ ]] is deemed prudent to address its impact. Accounting for the control blade shadow corrosion-induced channel bow, the Peach Bottom 2 C19 analysis shows an expected channel bow uncertainty of [[ ]], which is bounded by a GEXL R-Factor uncertainty of [[ ]]. Thus the use of a GEXL R-Factor uncertainty of [[ ]] adequately accounts for the expected control blade shadow corrosion-induced channel bow for Peach Bottom 2 C19.

2.2.2. Core Flow Rate and Random Effective TIP Reading

At this time, GNF has not been able to show that the NRC-approved process to calculate the SLMCPR only at the rated core power and rated core flow condition is adequately bounding relative to the SLMCPR calculated at rated core power and minimum core flow, see Reference 5. The minimum core flow condition can be more limiting due to the control rod pattern used. GNF has modified the NRC-approved process for determining the SLMCPR to include analyses at the rated core power and minimum licensed core flow point in addition to analyses at the rated core power and rated core flow point. GNF believes this modification is conservative and may in the future provide justification that the original NRC-approved process is adequately bounding.

For the TLO calculations performed at 82.8% core flow, the approved uncertainty values for the core flow rate (2.5%) and the random effective TIP reading (1.2%) are conservatively adjusted by dividing them by 82.8/100. The steps "σ CORE FLOW" and "σ TIP (INSTRUMENT)" in Figure 4.1 from NEDC-32601P-A, which has been provided for convenience in Figure 3 of this attachment, are affected by this deviation, respectively.

Historically, these values have been construed to be somewhat dependent on the core flow conditions as demonstrated by the fact that higher values have always been used when performing SLO calculations. It is for this reason that GNF determined that it is appropriate to consider an increase in these two uncertainties when the core flow is reduced. The amount of increase is determined in a conservative way. For both parameters it is assumed that the absolute uncertainty remains the same as the flow is decreased so that the percentage uncertainty increases inversely proportional to the change in core flow. This is conservative relative to the core flow uncertainty since the variability in the absolute flow is expected to decrease somewhat as the flow decreases. For the random effective TIP uncertainty, there is no reason to believe that the percentage uncertainty should increase as the core flow decreases for TLO. Nevertheless, this uncertainty is also increased as is done in the more extreme case for SLO primarily to preserve the historical precedent established by the SLO evaluation. Note that the TLO condition is different than the SLO condition because for TLO there is no expected tilting of the core radial power shape.

The treatment of the core flow and random effective TIP reading uncertainties is based on the assumption that the signal to noise ratio deteriorates as core flow is reduced. GNF believes this is conservative and may in the future provide justification that the original uncertainties (non-flow dependent) are adequately bounding.

The core flow and random TIP reading uncertainties used in the SLO minimum core flow SLMCPR analysis remain the same as in the rated core flow SLO SLMCPR analysis because these uncertainties (which are substantially larger than used in the TLO analysis) already account for the effects of operating at reduced core flow.

2.2.3. LPRM Update Interval and Calculated Bundle Power

To adequately address the LPRM update/calibration interval in the Peach Bottom 2 Technical Specifications, GNF has increased the LPRM update uncertainty in the SLMCPR analysis for Peach Bottom 2 C19. The approved uncertainty values for the contribution to bundle power uncertainty due to LPRM update [[ ]] and the resulting total uncertainty in calculated bundle power [[ ]] are conservatively increased. The steps "σ TIP (INSTRUMENT)" and "σ BUNDLE (MODEL)" in Figure 4.1 from NEDC-32601P-A, which has been provided for convenience in Figure 3 of this attachment, are affected by this deviation.

[[

]] The total bundle power uncertainty is a function of the LPRM update uncertainty as detailed in Section 3.3 of NEDC-32694P-A.

2.3. Departure from NRC-Approved Methodology

No departures from NRC-approved methodologies were used in the Peach Bottom 2 C19 SLMCPR calculations.

2.4. Fuel Axial Power Shape Penalty

At this time, GNF has determined that higher uncertainties and non-conservative biases in the GEXL correlations for the various types of axial power shapes (i.e., inlet, cosine, outlet and double hump) could potentially exist relative to the NRC-approved methodology values, see References 3, 6, 7 and 8. The following table identifies, by marking with an "X", this potential for each GNF product line currently being offered:

[[

]]

Axial bundle power shapes corresponding to the limiting SLMCPR control blade patterns are determined using the PANACEA 3D core simulator. These axial power shapes are classified in accordance to the following table:

[[

]]

If the limiting bundles in the SLMCPR calculation exhibit an axial power shape identified by this table, GNF penalizes the GEXL critical power uncertainties to conservatively account for the impact of the axial power shape. Table 6 provides a list of the GEXL critical power uncertainties determined in accordance to the NRC-approved methodology contained in NEDE-24011-P-A along with values actually used.

For the limiting bundles, the fuel axial power shapes in the SLMCPR analysis were examined to determine the presence of axial power shapes identified in the above table. These power shapes were not found; therefore, no power shape penalties were applied to the calculated Peach Bottom 2 C19 SLMCPR values.

2.5. Methodology Restrictions

The four restrictions identified on Page 3 of NRC's Safety Evaluation relating to the General Electric Licensing Topical Reports NEDC-32601P, NEDC-32694P, and Amendment 25 to NEDE-24011-P-A (March 11, 1999) are addressed in References 1, 2, 3, and 9.

No new GNF fuel designs are being introduced in Peach Bottom 2 C19; therefore, the NEDC-32505P-A statement "...if new fuel is introduced, GENE must confirm that the revised R-Factor method is still valid based on new test data" is not applicable.

2.6. Minimum Core Flow Condition

For Peach Bottom 2 C19, the minimum core flow SLMCPR calculation performed at 82.8% core flow and rated core power condition was limiting as compared to the rated core flow and rated core power condition. At low core flows, the search spaces for the limiting rod pattern and the nominal rod pattern are essentially the same. Additionally, the condition that MIP [[ ]], establishes a reasonably bounding limiting rod pattern. Hence, the rod pattern used to calculate the SLMCPR at 100 percent rated power/82.8 percent rated flow reasonably assures that at least 99.9% of the fuel rods in the core would not be expected to experience boiling transition during normal operation or anticipated operational occurrences during the operation of Peach Bottom 2 C19. Consequently, the SLMCPR value calculated from the 82.8% core flow and rated core power condition limiting MCPR distribution reasonably bounds this mode of operation for Peach Bottom 2 C19.

2.7. Limiting Control Rod Patterns

The limiting control rod patterns used to calculate the SLMCPR reasonably assures that at least 99.9% of the fuel rods in the core would not be expected to experience boiling transition during normal operation or anticipated operational occurrences during the operation of Peach Bottom 2 C19.

2.8. Core Monitoring System

For Peach Bottom 2 C19, the 3DMonicore system will be used as the core monitoring system.

2.9. Power/Flow Map

The utility has provided the current and previous cycle power/flow map in a separate attachment.

2.10. Core Loading Diagram

Figures 1 and 2 provide the core-loading diagram for the current and previous cycle respectively, which are the Reference Loading Pattern as defined by NEDE-24011-P-A. Table 1 provides a description of the core.

2.11. Figure References

Figure 3 is Figure 4.1 from NEDC-32601P-A. Figure 4 is Figure III.5-1 from NEDC-32601P-A. Figure 5 is Figure III.5-2 from NEDC-32601P-A.

2.12. Additional SLMCPR Licensing Conditions

For Peach Bottom 2 C19, no additional SLMCPR licensing conditions are included in the analysis.

2.13. Summary

The requested changes to the Technical Specification SLMCPR values are 1.10 for TLO and 1.14 for SLO for Peach Bottom 2 C19.

3.0 References

1. Letter, Glen A. Watford (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to R. Pulsifer (NRC), "Confirmation of 10x10 Fuel Design Applicability to Improved SLMCPR, Power Distribution and R-Factor Methodologies", FLN-2001-016, September 24, 2001.

2. Letter, Glen A. Watford (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to J. Donoghue (NRC), "Confirmation of the Applicability of the GEXL14 Correlation and Associated R-Factor Methodology for Calculating SLMCPR Values in Cores Containing GE14 Fuel", FLN-2001-017, October 1, 2001.

3. Letter, Glen A. Watford (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Joseph E. Donoghue (NRC), "Final Presentation Material for GEXL Presentation – February 11, 2002", FLN-2002-004, February 12, 2002.

4. Letter, John F. Schardt (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Mel B. Fields (NRC), "Shadow Corrosion Effects on SLMCPR Channel Bow Uncertainty", FLN-2004-030, November 10, 2004.

5. Letter, Jason S. Post (GENE) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Chief, Information Management Branch, et al. (NRC), "Part 21 Final Report: Non-Conservative SLMCPR", MFN 04-108, September 29, 2004.

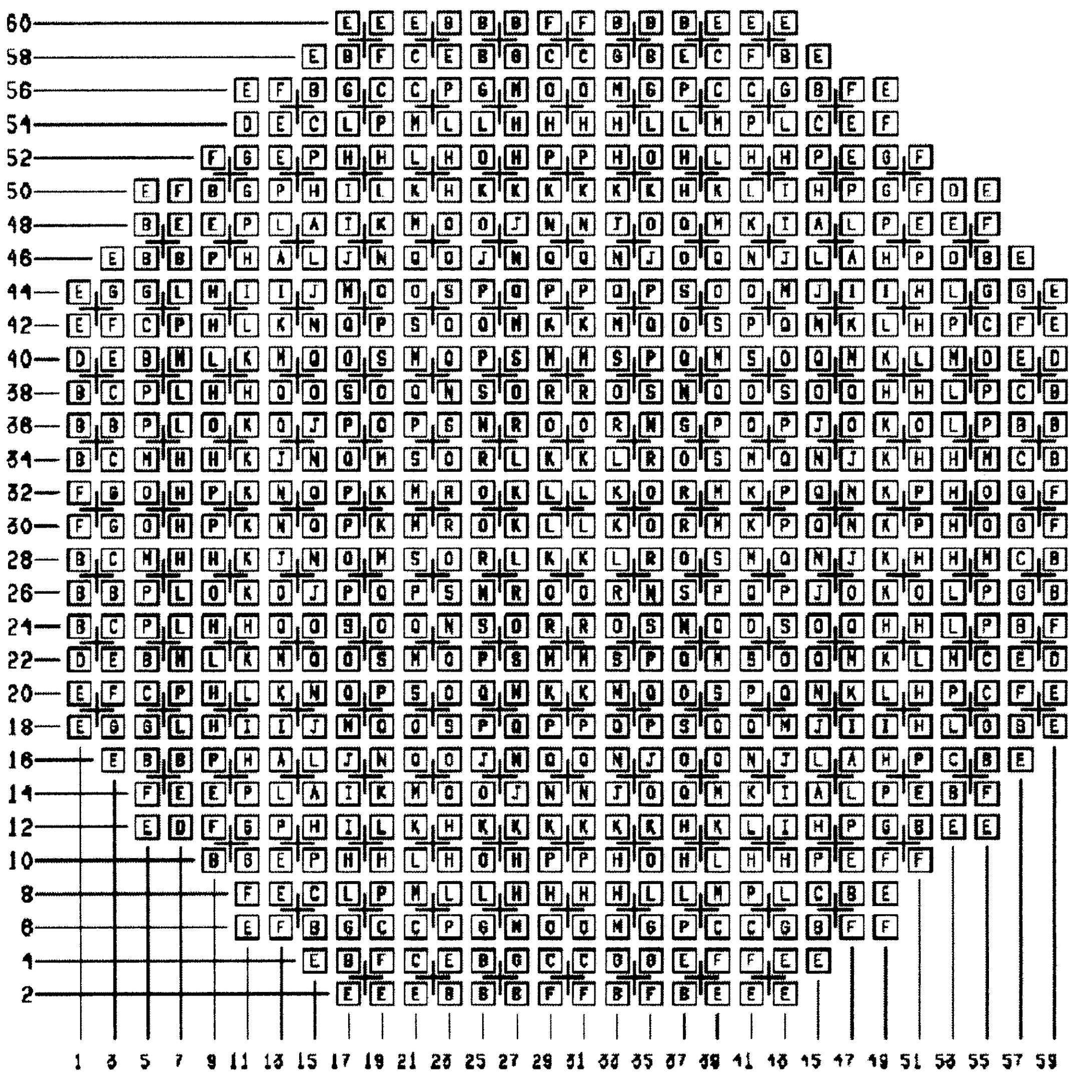
6. Letter, Glen A. Watford (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Alan Wang (NRC), "NRC Technology Update – Proprietary Slides – July 31 – August 1, 2002", FLN-2002-015, October 31, 2002.

7. Letter, Jens G. Munthe Andersen (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with attention to Alan Wang (NRC), "GEXL Correlation for 10X10 Fuel", FLN-2003-005, May 31, 2003.

8. Letter, Andrew A. Lingenfelter (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with cc to MC Honcharik (NRC), "Removal of Penalty Being Applied to GE14 Critical Power Correlation for Outlet Peaked Axial Power Shapes", FLN-2007-031, September 18, 2007.

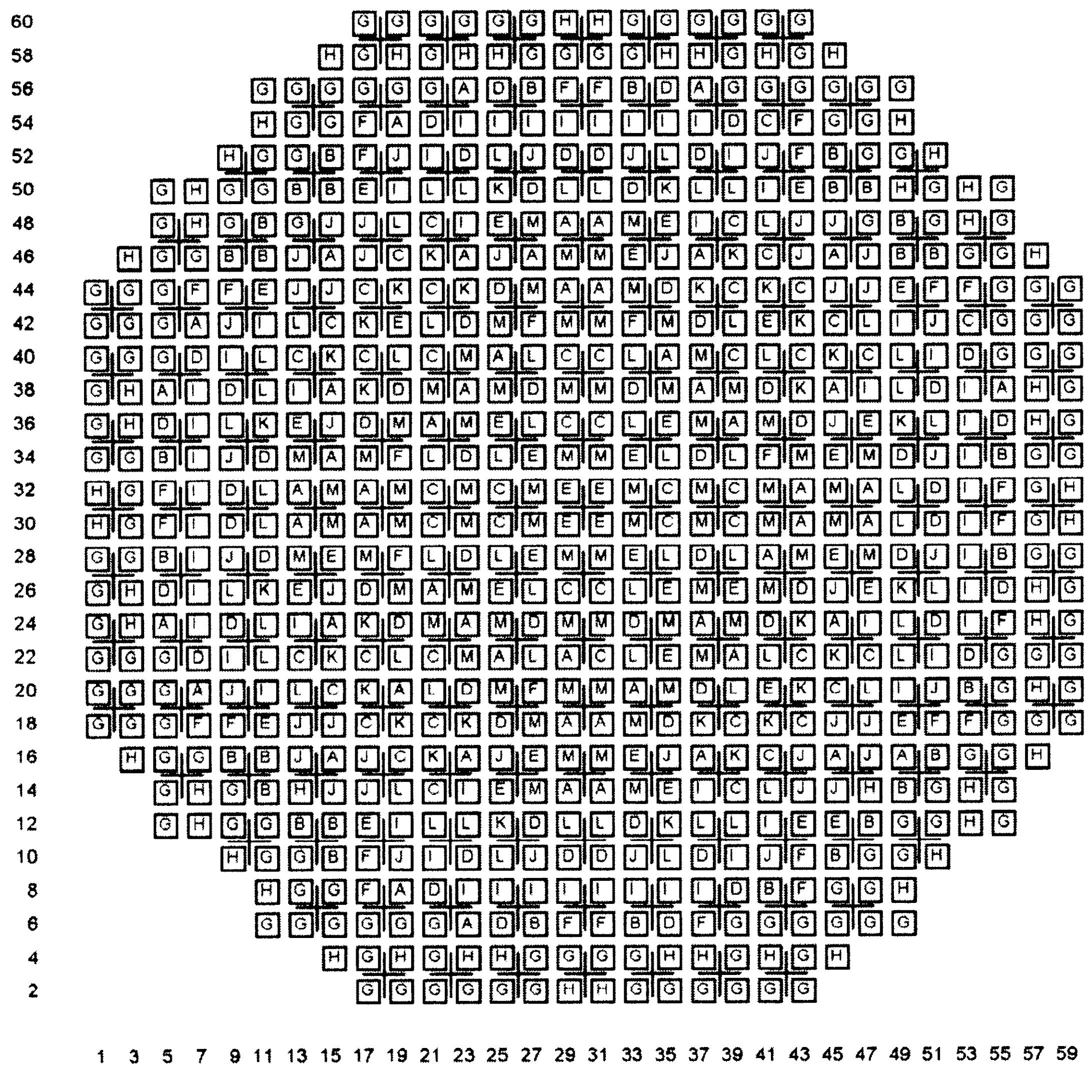
9. Letter, Andrew A. Lingenfelter (GNF-A) to U.S. Nuclear Regulatory Commission Document Control Desk with cc to MC Honcharik (NRC), "GNF2 Advantage Generic Compliance with NEDE-24011-P-A (GESTAR II), NEDC-33270P, Revision 2, June 2009 and GEXL Correlation for GNF2 Fuel, NEDC-33292P, Revision 3, June 2009", MFN 09-436, June 30, 2009.

Figure 1. Current Cycle Core Loading Diagram



Fuel Type	
A=GNF2-P10DG2B393-15GZ-100T2-150-T6-3334	K=GNF2-P10DG2B392-15GZ-100T2-150-T6-3335
B=GE14-P10DNAB416-15GZ-100T-150-T6-2908	L=GE14-P10DNAB420-13GZ-100T-150-T6-3097
C=GE14-P10DNAB417-13G6.0-100T-150-T6-2909	M=GE14-P10DNAB416-15GZ-100T-150-T6-3098
D=GE14-P10DNAB415-15GZ-100T-150-T6-2910	N=GE14-P10DNAB416-15GZ-100T-150-T6-2911
E=GE14-P10DNAB416-15GZ-100T-150-T6-2911	O=GE14-P10DNAB411-15GZ-100T-150-T6-3099
F=GE14-P10DNAB416-15GZ-100T-150-T6-2912	P=GE14-P10DNAB409-15GZ-100T-150-T6-2913
G=GE14-P10DNAB409-15GZ-100T-150-T6-2913	Q=GNF2-P10DG2B388-6G8.0/6G7.0/2G6.0-100T2-150-T6-3336
H=GNF2-P10DG2B406-12G6.0-100T2-150-T6-3337	R=GNF2-P10DG2B392-15GZ-100T2-150-T6-3335
I=GNF2-P10DG2B393-15GZ-100T2-150-T6-3334	S=GNF2-P10DG2B392-15GZ-100T2-150-T6-3332
J=GNF2-P10DG2B388-6G8.0/6G7.0/2G6.0-100T2-150-T6-3336	

Figure 2. Previous Cycle Core Loading Diagram



Fuel Type	
A=GE14-P10DNAB416-15GZ-100T-150-T6-2908	H=GE14-P10DNAB415-16GZ-100T-150-T6-2790
B=GE14-P10DNAB417-13G6.0-100T-150-T6-2909	I=GE14-P10DNAB420-13GZ-100T-150-T6-3097
C=GE14-P10DNAB415-15GZ-100T-150-T6-2910	J=GE14-P10DNAB416-15GZ-100T-150-T6-3098
D=GE14-P10DNAB416-15GZ-100T-150-T6-2911	K=GE14-P10DNAB416-15GZ-100T-150-T6-2911
E=GE14-P10DNAB416-15GZ-100T-150-T6-2912	L=GE14-P10DNAB411-15GZ-100T-150-T6-3099
F=GE14-P10DNAB409-15GZ-100T-150-T6-2913	M=GE14-P10DNAB409-15GZ-100T-150-T6-2913
G=GE14-P10DNAB415-15GZ-100T-150-T6-2789	

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Figure 3. Figure 4.1 from NEDC-32601P-A

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Figure 4. Figure III.5-1 from NEDC-32601P-A

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Figure 5. Figure III.5-2 from NEDC-32601P-A

Table 1. Description of Core

Description	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
Number of Bundles in the Core	764		764	
Limiting Cycle Exposure Point (i.e. BOC/MOC/EOC)	EOC	EOC	EOC	EOC
Cycle Exposure at Limiting Point (MWd/STU)	13400	13400	12700	13300
% Rated Core Flow	82.8	100	82.8	100
Reload Fuel Type	GE14		GNF2	
Latest Reload Batch Fraction, %	35.6		35.6	
Latest Reload Average Batch Weight % Enrichment	4.14		3.94	
Core Fuel Fraction: GE14 GNF2	 1.000 0.000		 0.644 0.356	
Core Average Weight % Enrichment	4.15		4.07	

Table 2. SLMCPR Calculation Methodologies

Description	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
Non-power Distribution Uncertainty	NEDC-32601P-A		NEDC-32601P-A	
Power Distribution Methodology	NEDC-32601P-A		NEDC-32601P-A	
Power Distribution Uncertainty	NEDC-32694P-A		NEDC-32694P-A	
Core Monitoring System	3DMonicore		3DMonicore	

Table 3. Monte Carlo Calculated SLMCPR vs. Estimate

Description	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
[[				

Table 3. Monte Carlo Calculated SLMCPR vs. Estimate

Description	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case

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Table 4. Non-Power Distribution Uncertainties

	Nominal (NRC-Approved) Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
GETAB					
Feedwater Flow Measurement	1.76	N/A	N/A	N/A	N/A
Feedwater Temperature Measurement	0.76	N/A	N/A	N/A	N/A
Reactor Pressure Measurement	0.50	N/A	N/A	N/A	N/A
Core Inlet Temperature Measurement	0.20	N/A	N/A	N/A	N/A
Total Core Flow Measurement	6.0 SLO/2.5 TLO	N/A	N/A	N/A	N/A
Channel Flow Area Variation	3.0	N/A	N/A	N/A	N/A
Friction Factor Multiplier	10.0	N/A	N/A	N/A	N/A
Channel Friction Factor Multiplier	5.0	N/A	N/A	N/A	N/A

Table 4. Non-Power Distribution Uncertainties

	Nominal (NRC-Approved) Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
NEDC-32601P-A					
Feedwater Flow Measurement	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Feedwater Temperature Measurement	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Reactor Pressure Measurement	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Core Inlet Temperature Measurement	0.2	0.2	0.2	0.2	0.2
Total Core Flow Measurement	6.0 SLO/2.5 TLO	6.0 SLO/3.02 TLO	6.0 SLO/2.5 TLO	6.0 SLO/3.02 TLO	6.0 SLO/2.5 TLO
Channel Flow Area Variation	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Friction Factor Multiplier	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Channel Friction Factor Multiplier	5.0	5.0	5.0	5.0	5.0

Table 5. Power Distribution Uncertainties

Description	Nominal (NRC-Approved) Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
GETAB/NEDC-32601P-A					
GEXL R-Factor	[[ ]]	N/A	N/A	N/A	N/A
Random Effective TIP Reading	2.85 SLO/1.2 TLO	N/A	N/A	N/A	N/A
Systematic Effective TIP Reading	8.6	N/A	N/A	N/A	N/A
NEDC-32694P-A, 3DMONICORE					
GEXL R-Factor	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Random Effective TIP Reading	2.85 SLO/1.2 TLO	2.85 SLO/1.45 TLO	2.85 SLO/1.2 TLO	2.85 SLO/1.45 TLO	2.85 SLO/1.2 TLO
TIP Integral	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Four Bundle Power Distribution Surrounding TIP Location	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Contribution to Bundle Power Uncertainty Due to LPRM Update	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]

Table 5. Power Distribution Uncertainties

Description	Nominal (NRC-Approved) Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case
Contribution to Bundle Power Due to Failed TIP	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Contribution to Bundle Power Due to Failed LPRM	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Total Uncertainty in Calculated Bundle Power	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]
Uncertainty of TIP Signal Nodal Uncertainty	[[ ]]	[[ ]]	[[ ]]	[[ ]]	[[ ]]

Table 6. Critical Power Uncertainties

Description	Nominal Value ± σ (%)	Previous Cycle Minimum Core Flow Limiting Case	Previous Cycle Rated Core Flow Limiting Case	Current Cycle Minimum Core Flow Limiting Case	Current Cycle Rated Core Flow Limiting Case

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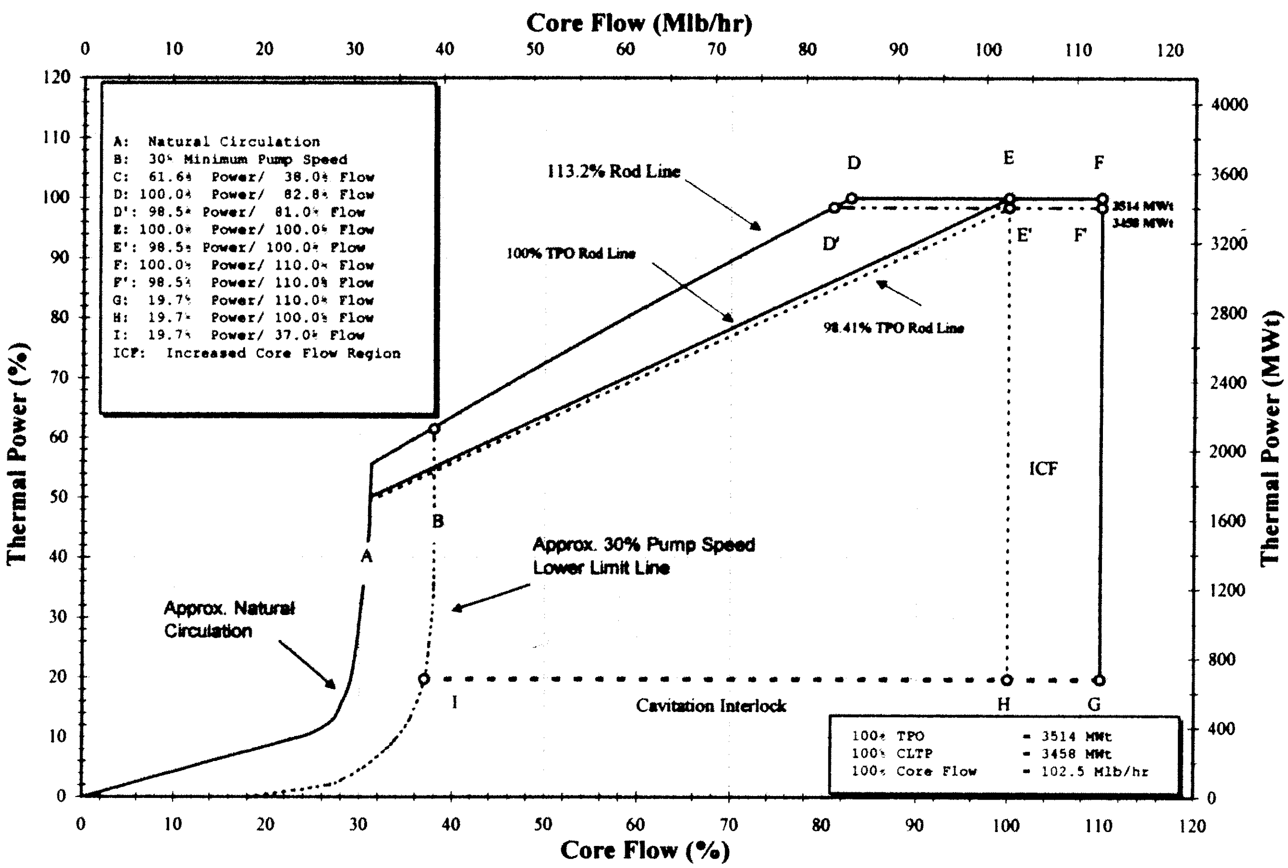
ATTACHMENT 6

Power/Flow Map for Cycles 18 and 19



Core Flow (Mlb/hr)
A: Natural Circulation
B: 30% Minimum Pump Speed
C: 61.6% Power/ 38.0% Flow
D: 100.0% Power/ 82.8% Flow
D': 98.5% Power/ 81.0% Flow
E: 100.0% Power/ 100.0% Flow
E': 98.5% Power/ 100.0% Flow
F: 100.0% Power/ 110.0% Flow
F': 98.5% Power/ 110.0% Flow
G: 19.7% Power/ 110.0% Flow
H: 19.7% Power/ 100.0% Flow
I: 19.7% Power/ 37.0% Flow
ICF: Increased Core Flow Region
113.2% Rod Line
100% TPO Rod Line
98.41% TPO Rod Line
3514 MWt
3458 MWt
ICF
Approx. 30% Pump Speed
Lower Limit Line
Approx. Natural
Circulation
Cavitation Interlock
100% TPO = 3514 MWt
100% CLTP = 3458 MWt
100% Core Flow = 102.5 Mlb/hr
Thermal Power (%)
Thermal Power (MWt)
Core Flow (%)