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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Peach Bottom Atomic Power Station, Units 2 and 3
Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: Response to Request for Additional Information
License Amendment Request
Activation of the Trip Outputs of the Oscillation Power Range Monitor
Portion of the Power Range Neutron Monitoring System

References: (1) Letter from M. P. Gallagher, Exelon Generation Company, LLC, to U. S. Nuclear Regulatory Commission, dated February 27, 2004

(2) Letter from G. F. Wunder, U. S. Nuclear Regulatory Commission, to C. M. Crane, Exelon Generation Company, LLC, dated August 13, 2004.

In Reference 1, Exelon Generation Company, LLC (Exelon), requested a change to the Technical Specifications (TS), Appendix A, of Facility Operating License Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, respectively. The proposed change supports the activation of the trip outputs of the previously-installed Oscillation Power Range Monitor (OPRM) portion of the General Electric (GE) Nuclear Measurement Analysis and Control (NUMAC) Power Range Neutron Monitoring (PRNM) system.

In Reference 2, the NRC requested additional information concerning the Reference 1 submittal. The attachment to this letter restates the NRC questions and provides Exelon's response to each question.

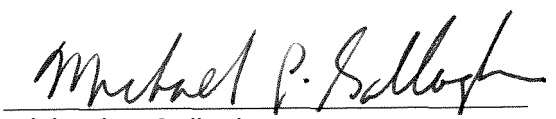
Exelon has concluded that the information provided in this response does not impact the conclusions of the: (1) Technical Analysis, (2) No Significant Hazards Consideration under the standards set forth in 10 CFR 50.92(c), or (3) Environmental Consideration as provided in the original submittal (Reference 1).

There are no regulatory commitments contained within this letter.

If you have any questions or require additional information, please contact Glenn Stewart at 610-765-5529.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 13th day of September, 2004.

Respectfully,



Michael P. Gallagher
Director, Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachment: Response to Request for Additional Information
Enclosure: Core Operating Limits Report Sample Format

Attachment

License Amendment Request

Peach Bottom Atomic Power Station, Units 2 and 3
Docket Nos. 50-277 and 50-278

Activation of the Trip Outputs of the Oscillation Power Range Monitor Portion of the Power Range Neutron Monitoring System

Response to Request for Additional Information

ATTACHMENT

Response to Request for Additional Information
Peach Bottom Oscillation Power Range Monitor
Trip Activation License Amendment Request

In Reference 1, Exelon Generation Company, LLC (Exelon), requested a change to the Technical Specifications (TS), Appendix A, of Facility Operating License Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, respectively. The proposed change supports the activation of the trip outputs of the previously-installed Oscillation Power Range Monitor (OPRM) portion of the General Electric (GE) Nuclear Measurement Analysis and Control (NUMAC) Power Range Neutron Monitoring (PRNM) system.

In Reference 2, the NRC requested additional information concerning the Reference 1 submittal. Each NRC question is restated below followed by our response.

Question No. 1.

Please provide the detailed procedures to verify the accuracy of trip setpoints for the new oscillation power range monitor (OPRM) instrumentation based on available data of the system calibration tests during normal operation as well as the shutdown and subsequent start-up from refueling outage.

Response

The OPRM trip setpoints are entered into the GE NUMAC PRNM system as digital, configurable parameters like all other PRNM system parameters. Since the settings are digital, they possess no drift component as in an analog setting. All OPRM setpoints will be validated against the approved setpoints identified in the associated design and licensing documents.

The accuracy of the NUMAC PRNM system signal processing is verified by performance of the following 24-month electronic calibration surveillance tests:

SI2N-60A-APRM-11C2; 21C2; 31C2 & 41C2 (Unit-2)
SI3N-60A-APRM-11C2, 21C2, 31C2 & 41C2 (Unit-3)

These surveillance tests, which satisfy TS Surveillance Requirement (SR) 3.3.1.1.12, verify all internal voltage, resistance and time references to National Institute of Standards and Technology (NIST) traceable standards. This calibration of the PRNM system's internal references assures proper and accurate digital processing of the OPRM trip algorithms which digitally monitor the changes in normalized Local Power Range Monitor (LPRM) cell averages. In addition, the recirculation flow signals that are used in part to determine when to automatically arm the OPRM trip logic are calibrated as part of the 24-month TS SR 3.3.1.1.12 which is implemented by the following surveillance procedures:

SI2N-60A-110-AEC2; BFC2; CGC2 & DHC2 (Unit-2)
SI3N-60A-110-AEC2; BFC2; CGC2 & DHC2 (Unit-3)

Similarly, the Simulated Thermal Power value within the PRNM system, also used to automatically arm the OPRM trip logic, is calibrated as necessary throughout plant operation to

a calculated calorimetric heat balance per TS SR 3.3.1.1.2 via performance of the following surveillance procedures:

ST-O-60A-210-2 (Unit-2)
ST-O-60A-210-3 (Unit-3)

Question No. 2.

Please provide a detailed description of the methodology for calculation of the plant-specific Delta CPR/Initial CPR Vs. Oscillation Magnitude (DIVOM) correlation and the OPRM setpoints for Technical Specification (TS) 3.3.1.1. Also, provide a detailed description of the procedure to generate the OPRM period based algorithm setpoint and confirmation counts for future cycles. Please identify any plant-specific differences from the generic values specified in NEDO-32465-A such as period based detection algorithm (PBDA) period confirmation setpoints in Table 3-1, PBDA trip setpoints in Table 3-2, and generic DIVOM curve slope. Provide specific values for OPRM scram setpoints and the DIVOM correlation for the next cycle.

Response

The Boiling Water Reactor Owners Group (BWROG) Stability Long-Term Solution Option III methodology for establishing the OPRM PBDA trip setpoints is described in the NRC approved topical report NEDO-32465-A (Reference 3). For plant/cycle-specific application, the methodology described in NEDO-32465-A remains unchanged, with the exception of utilizing a plant/cycle-specific DIVOM curve slope in place of the generic DIVOM curve slope. The acceptability of utilizing a plant/cycle-specific DIVOM curve is documented in BWROG letter BWROG-03048 (Reference 4).

The methodology for developing the DIVOM curve is described in Section 4.4 of NEDO-32465-A. For plant/cycle-specific application, the methodology for developing the DIVOM curve is described in Section 4.4 of NEDO-32465-A except that plant and cycle-specific parameters (e.g., core power and flow, core loading, cycle energy, fuel types, etc.) are utilized in place of the generic fleet parameters. The values of other OPRM system parameters, such as the PBDA period confirmation setpoints in Table 3-1 of NEDO-32465-A, remain within their original acceptable range. The current values of these setpoints have been established based on recent industry operational experience of the Option III OPRM system. The PBDA trip setpoints in Table 3-2 of NEDO-32465-A remain unchanged. As described in Section 4.4.4 of NEDO-32465-A, TRACG analyses will be performed to determine the relationship between the hot bundle oscillation magnitude and the change in critical power ratio (CPR), i.e., the DIVOM correlation. These analyses will utilize plant and cycle-specific inputs/parameters as described above.

The OPRM PBDA trip setpoints will be determined by applying the plant/cycle-specific DIVOM to the process for initial applications described in Section 5 of NEDO-32465-A. In this process, the final minimum critical power ratio (FMCPR) is calculated from the initial minimum critical power ratio (IMCPR) based on the following equation:

$$FMCPR = IMCPR - IMCPR * \left\{ \frac{\Delta CPR}{IMCPR} \right\}$$

The FMCPR is then compared to the Safety Limit MCPR (SLMCPR). If the FMCPR is greater than the SLMCPR, the OPRM PBDA trip setpoints are acceptable.

The evaluation of the initial plant/cycle-specific DIVOM correlation and OPRM PBDA trip setpoints for Peach Bottom has not been completed at this time. Therefore, these values are not yet available. Exelon will provide the Peach Bottom initial DIVOM correlation and OPRM PBDA trip setpoints for information once the evaluation is complete.

For future cycles, a reload review process as described in Section 6 of NEDO-32465-A will be utilized. An evaluation of the applicability of the previous cycle DIVOM curve to the upcoming cycle will be performed. If required, a new DIVOM curve will be calculated. Once the appropriate DIVOM curve is established, the same process for determining the OPRM PBDA trip setpoints, as described above, is applied.

Question No. 3.

Please provide a detailed description of the alternate method to detect and suppress thermal hydraulic instability oscillation stated in TS 3.3.1.1, Action I.1, including its functional relationship with Required Action I.1 stated in TS 3.3.1.1 for OPRM. Also, provide the rationale to delete Figure 3.4.1-1 from the TSs and identify any role of Figure 3.4.1-1 in the reactor operating manual.

Response

The alternate method to detect and suppress thermal hydraulic instability (THI) required by TS 3.3.1.1, Action I.1, will be implemented via performance of a newly created backup stability solution operations procedure that will be entered in response to inoperability of the OPRM trip system. This new procedure, which will remain in use until the OPRM trip function can be returned to an Operable status, contains the same required actions currently in effect at PBAPS relative to THI monitoring and avoidance. These actions are based on the Interim Corrective Actions (ICAs) for instability prevention recommended by the BWROG and committed to in the PECO Energy Company (now Exelon Generation Company, LLC) response (Reference 5) to NRC Generic Letter 94-02 (Reference 6). The new backup stability solution operations procedure maintains the same guidance on how and when to monitor for THI, and contains detailed power-to-flow operating maps that depict "Immediate Exit" and "Immediate Scram" regions of high power and low flow to enable manual operator actions for preventing plant operation in areas where the potential for THI is increased.

Once the OPRM trips are made active at PBAPS, and as long as the OPRM function remains Operable, there is no longer any technical need to retain Figure 3.4.1-1 in the TS. This figure identified the conditions of core power and recirculation flow where the potential for THI is increased. This figure was necessary as part of the ICA methodology to prevent THI by avoiding operating regions where THI occurrence was likely. Since the OPRM is an NRC approved instability detect and suppress solution, the system constantly monitors for conditions of THI and provides an automatic trip signal to protect the MCPR Safety Limit, thus eliminating the need for manual actions for THI protection. The power-to-flow operating maps contained within the new backup stability solution operations procedure described above re-instate the manual THI preventative actions for which Figure 3.4.1-1 was intended.

Question No. 4.

Please provide an example of the new core operating limit report format for the next cycle as shown in Table 3.3.1.1-1, Function 2.f, and justify allowable value is NA as stated in footnote d to the table.

Response

Footnote 'd' to TS Table 3.3.1.1-1 indicates that the OPRM PBDA setpoints are located in the Core Operating Limits Report (COLR). A sample of the new COLR format for the OPRM PBDA trip setpoints is provided in the Enclosure.

BWROG Stability Long-Term Solution Option III is implemented utilizing the OPRM system. The OPRM system, which is a subsystem of the GE NUMAC PRNM system, is a digitally based system. As such, the OPRM system and its components are not subject to setpoint drift attributable to typical analog systems. Furthermore, the input signals to the OPRM system (i.e., LPRM signals) are continuously self-normalized such that the OPRM PBDA amplitude setpoint is based on a relative comparison to a value of unity (one). Therefore, the OPRM system is not subject to uncertainty due to LPRM drift or inoperability. The PBDA confirmation counts are discretely determined and counted by the digital system. Because of these factors, the OPRM system utilizes analytically determined trip setpoints and allowable values are not required. In addition, this is consistent with the NRC approved Licensing Topical Report NEDC-32410P-A (Reference 7).

References:

(1) Letter from M. P. Gallagher, Exelon Generation Company, LLC, to U. S. Nuclear Regulatory Commission, dated February 27, 2004

(2) Letter from G. F. Wunder, U. S. Nuclear Regulatory Commission, to C. M. Crane, Exelon Generation Company, LLC, dated August 13, 2004.

(3) NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," dated August 1996.

(4) BWROG-03048, "Utility Commitment to NRC for OPRM Operability at Option III Plants," dated September 30, 2003.

(5) Letter dated September 9, 1994, from G. A. Hunger, PECO Nuclear to USNRC.

(6) Generic Letter (GL) 94-02, "Long-Term Solutions and Upgrade of Interim Operating Recommendations for Thermal Hydraulic Instabilities in Boiling Water Reactors," dated July 11, 1994.

(7) NEDC-32410P-A, "Nuclear Measurement Analysis and Control Power Range Neutron Monitor (NUMAC PRNM) Retrofit Plus Option III Stability Trip Function," Supplement 1, dated November 1997.

Enclosure

License Amendment Request

Peach Bottom Atomic Power Station, Units 2 and 3
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Core Operating Limits Report Sample Format

Oscillation Power Range Monitor (OPRM)

Table 6 provides the OPRM Period Based Detection Algorithm (PBDA) Trip Settings for Cycle XX (Ref. 2). Reference 12 (PBAPS Doc. # G-080-VC-150) provides the relationship between amplitude and confirmation count trip settings. The PBDA is the only OPRM setting credited in the safety analysis as documented in the licensing basis for the OPRM system (Ref. 12). The OPRM Growth Rate Algorithm (GRA) and Amplitude Based Algorithm (ABA) trip settings can be found in the Power Range Neutron Monitoring Configuration Control Documents (SPID's) G-080-VC-174 through 177 (Unit-3).

REFERENCES

1) "Technical Specifications for Peach Bottom Atomic Power Station Unit 3", Docket No. 50-278, Appendix A to License No. DPR-56.

2) "Supplemental Reload Licensing Report for Peach Bottom Atomic Power Station Unit 3, Reload 12, Cycle 13", GNF Document No. J11-03549SRLR, Rev. 1, December 2000.

3) "Lattice Dependent MAPLHGR Report for Peach Bottom Atomic Power Station Unit 3 Reload 12 Cycle 13", J11-03549MAPL, Revision 3, January 2001.

4) "General Electric Standard Application for Reactor Fuel", NEDE-24011-P-A-14, June 2000; and NEDE-24011-P-A-14-US, June 2000.

5) "Maximum Extended Load Line Limit and ARTS Improvement Program Analyses for Peach Bottom Atomic Power Station Unit 2 and 3", NEDC-32162P, Revision 2, March 1995.

6) "Letter from R. M. Butrovich to H. J. Diamond, "Peach Bottom-2 Cycle 11 Turbine Bypass Valve Capacity Variation from Design Basis", January 9, 1995.

7) Letter from G. V. Kumar to G. C. Storey, "PBAPS Evaluation of Turbine Bypass Surveillance Requirements", January 19, 1995.

8) PECO Energy Calc. PM-0875, "GE NSSS Setpoints Required to Support Power Rerate."

9) “Peach Bottom Atomic Power Station Evaluation for Extended Final Feedwater Temperature Reduction of 90^{o} F”, NEDC-32707P, Supplement 1, May 1998.

10) “ARTS Flow-Dependent Limits with TBVOOS for Peach Bottom Atomic Power Station and Limerick Generating Station”, NEDC-32847P, June 1998.

11) PECO Calculation PE-0173 , “Determination of Total Time Required to Initiate the trip Signal to the EOC-RPT Circuit Breaker.”

12) “Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications”, NEDO-32465-A, August 1996.

TABLE 6

Oscillation Power Range Monitor (OPRM)

Period Based Detection Algorithm (PBDA) Trip Settings*

PBDA Trip Amplitude	Corresponding Maximum Confirmation Count Trip Setting
1.15	16

*The PBDA is the only OPRM setting credited in the safety analysis as documented in the licensing basis for the OPRM system. The OPRM Growth Rate Algorithm (GRA) and Amplitude Based Algorithm (ABA) trip settings can be found in the Power Range Neutron Monitoring Configuration Control Documents (SPID's) G-080-VC-174 through 177 (Unit-3).