February 29, 2008

Mr. Charles G. Pardee
Chief Nuclear Officer and Senior Vice President
Exelon Generation Company, LLC
200 Exelon Way
Kennett Square, PA 19348

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 - ISSUANCE OF AMENDMENTS TO EXTEND LOCAL POWER RANGE MONITOR CALIBRATION INTERVAL (TAC NOS. MD3717 AND MD3718)

Dear Mr. Pardee:

The Nuclear Regulatory Commission has issued the enclosed Amendment Nos. 266 and 270 to Renewed Facility Operating License Nos. DPR-44 and DPR-56 for the Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. These amendments consist of changes to the Technical Specifications (TS) in response to your application dated November 17, 2006 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML063380360), as supplemented by letters dated September 21, 2007, December 21, 2007, February 1, 2008, and February 14, 2008 (ADAMS Accession Nos. ML072640607, ML073620054, ML080380222 and ML080460559, respectively).

The amendments revise the PBAPS Units 2 and 3 TS Surveillance Requirement 3.3.1.1.8. Specifically, the amendment increases the interval between local power range monitor calibrations from 1000 megawatt-days/ton (MWD/T) to 2000 MWD/T.

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

***/ra/***

John D. Hughey, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosures:
1. Amendment No. 266 to Renewed DPR-44
2. Amendment No. 270 to Renewed DPR-56
3. Safety Evaluation

cc w/encls: See next page

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A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

***/ra/***

John D. Hughey, Project Manager
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Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

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Accession Nos: Package/ML080390028; Amendment/ML080390032;
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EXELON GENERATION COMPANY, LLC

PSEG NUCLEAR LLC

DOCKET NO. 50-277

PEACH BOTTOM ATOMIC POWER STATION, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 266
License No. DPR-44

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (Exelon Generation Company), and PSEG Nuclear LLC (the licensees), dated November 17, 2006, as supplemented by letters dated September 21, 2007, December 21, 2007, February 1, 2008, and February 14, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Renewed Facility Operating License No. DPR-44 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 266, are hereby incorporated in the license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications.

3. Implementation Requirements:

   The Peach Bottom Atomic Power Station Updated Final Safety Analysis Report shall be updated, in the next scheduled revision, to reflect that the update uncertainty assigned to the Local Power Range Monitor (LPRM) will be twice the LPRM update uncertainty value specified in the methodology contained in General Electric Licensing Topical Report NEDC-32694P-A, "Power Distribution Uncertainties for Safety Limit MCPR Evaluations," dated August 1999.

   This license amendment is effective as of the date of issuance, and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

***/ra/***

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the License
and Technical Specifications

Date of Issuance: February 29, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 266

RENEWED FACILITY OPERATING LICENSE NO. DPR-44

DOCKET NO. 50-277

Replace the following page of the Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

| Remove | Insert |
|---|---|
| Page 3 | Page 3 |

Replace the following page of the Appendix A, Technical Specifications, with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

| Remove | Insert |
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| 3.3 – 4 | 3.3 – 4 |

EXELON GENERATION COMPANY, LLC

PSEG NUCLEAR LLC

DOCKET NO. 50-278

PEACH BOTTOM ATOMIC POWER STATION, UNIT 3

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 270
License No. DPR-56

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (Exelon Generation Company), and PSEG Nuclear LLC (the licensees), dated November 17, 2006, as supplemented by letters dated September 21, 2007, December 21, 2007, February 1, 2008, and February 14, 2008, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Renewed Facility Operating License No. DPR-56 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 270, are hereby incorporated in the license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications.

3. Implementation Requirements:

   The Peach Botom Atomic Power Station Updated Final Safety Analysis Report shall be updated, in the next scheduled revision, to reflect that the update uncertainty assigned to the Local Power Range Monitor (LPRM) will be twice the LPRM update uncertainty value specified in the methodology contained in General Electric Licensing Topical Report NEDC-32694P-A, "Power Distribution Uncertainties for Safety Limit MCPR Evaluations," dated August 1999.

   This license amendment is effective as of the date of issuance, and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

***/ra/***

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the License
and Technical Specifications

Date of Issuance: February 29, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 270

RENEWED FACILITY OPERATING LICENSE NO. DPR-56

DOCKET NO. 50-278

Replace the following page of the Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

| Remove | Insert |
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| Page 3 | Page 3 |

Replace the following page of the Appendix A, Technical Specifications, with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 266 TO RENEWED FACILITY OPERATING

LICENSE NO. DPR-44 AND AMENDMENT NO. 270 TO RENEWED FACILITY OPERATING

LICENSE NO. DPR-56

EXELON GENERATION COMPANY, LLC

PSEG NUCLEAR LLC

PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3

DOCKET NOS. 50-277 AND 50-278

## 1.0 INTRODUCTION

By letter dated November 17, 2006 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML063380360), Exelon Generation Company, LLC, the licensee for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, requested to amend the Technical Specifications (TSs), Appendix A, of Renewed Facility Operating License numbers DPR-44 and DPR-56 for PBAPS Units 2 and 3. The amendment increases the interval between local power range monitor (LPRM) calibrations from 1000 megawatt-days/ton (MWD/T) to 2000 MWD/T as required in PBAPS Units 2 and 3 TS Surveillance Requirement 3.3.1.1.8.

During its review, the Nuclear Regulatory Commission (NRC) staff determined that additional information was necessary. Exelon Generation Company, LLC (the licensee), responded to the NRC's request for additional information (RAI) by letter dated September 21, 2007, ADAMS Accession No. ML072640607. The licensee also provided supplemental information by letters dated December 21, 2007, February 1, 2008, and February 14, 2008 (ADAMS Accession Nos. ML073620054, ML080380222 and ML080460559, respectively). The response and supplemental information clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on August 28, 2007, (72 FR 49577).

The NRC staff has completed its review and finds that that the requested modification is acceptable, as discussed in this safety evaluation.

## 2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations*, Part 50, (10 CFR Part 50) Section 50.36(c)(2)(ii)(B), specifies that a TS limiting condition for operation (LCO) must be established for, among other things, each operating restriction that is an initial condition of a design-basis accident or transient analysis that either assumes failure of or presents a challenge to the integrity of a fission product barrier.

Section 50.36(c)(3) of 10 CFR Part 50 specifies that "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained..."

Together, these two provisions of 10 CFR Section 50.36 require that the surveillance practice contained in Surveillance Requirement 3.3.1.1.8 and the associated LCO 3.3.1.1 result in adequate assurance that the LPRM calibration interval will support LPRM accuracy requirements for input to the Reactor Protective System (RPS).

The safety limit minimum critical power ratio (SLMCPR) is a parameter applied to boiling water reactors to assure compliance with specified acceptable fuel design limits (SAFDL). It is calculated using a statistical process that takes into account all operating parameters and associated uncertainties. The SLMCPR is the core-wide critical power ratio (CPR) at which 99.9 percent of the rods in the core would not be expected to undergo boiling transition during normal operation. The SLMCPR is contained in TS 2.1.1.2.

The minimum critical power ratio (MCPR) fuel cladding integrity safety limit ensures that during normal operation and during anticipated operational occurrences, at least 99.9 percent of the fuel rods in the core do not experience transition boiling. This is accomplished by the determination of a CPR margin for transients, which is added to the SLMCPR to determine the operating limit MCPR (OLMCPR). At the OLMCPR, at least 99.9 percent of the fuel rods would be expected not to experience transition boiling during normal operations and transients caused by single operator error or equipment malfunction. The OLMCPR is contained in the Core Operating Limits Report, and its adherence is required by TS LCO 3.2.2.

The average planar linear heat generation rate (APLHGR) and linear heat generation rate (LHGR) limits are established, also in accordance with the requirements of 10 CFR 50.36, to protect the fuel from excessive heat generation, which would cause gross mechanical failure of the fuel system. These limits are established on a cycle-specific basis using an approved methodology, and their observance is required by TS LCOs 3.2.1 and 3.2.3. These are the SAFDLs that protect the fuel from mechanical failure.

The online core monitoring system is used to establish that the core is operating within the OLMCPR, and within the peak LHGR limits. As the LPRM reading is a parameter that feeds into the core monitoring system and is used to determine the core-wide MCPR and peak LHGR, its uncertainty must be accounted for in the statistical determination of the SLMCPR, which forms the basis for the OLMCPR, and in the thermal-mechanical analysis used to determine the LHGR limits. Therefore, the NRC staff evaluated the effects that increased calibration intervals would have on the power distribution uncertainties at PBAPS to ensure that the plant would

remain in compliance with TS 2.1.1.2 and TS LCOs 3.2.1 through 3.2.3, and hence, 10 CFR Section 50.36.

The stability solution in place at PBAPS employs the use of an oscillation power range monitor (OPRM) system, which relies on input from the LPRM detectors. Therefore, the staff evaluated the requested change in LPRM calibration interval to ensure that the plant would remain in compliance with TS 2.1.1.2, with respect to the LPRM input function to the OPRM system. The staff's evaluation considered whether increased core monitoring uncertainty would negatively impact the ability of the OPRM system to detect and suppress unstable power oscillations prior to challenging the fuel cladding integrity safety limit.

The NRC staff also evaluated the effects of the requested LPRM calibration interval extension to ensure that the average power range monitor (APRM) and rod block monitor (RBM) systems would not be unacceptably affected by the requested extension.

## 3.0 TECHNICAL EVALUATION

The LPRM system is composed of fission chamber detectors, signal conditioning equipment, display and alarm equipment, associated power supplies, cabling, and trip functions. The LPRM system provides neutron flux signal inputs to the APRM system, OPRM system, RBM system, and the 3D MONICORE core monitoring system.

The APRM system provides indication of core average thermal power and input to the RPS. The OPRM system is capable of detecting thermal-hydraulic instability by monitoring oscillations in the local neutron flux within the reactor core. It also provides input to the RPS. The RBM system prevents the withdrawal of selected control rods when local power is above a preset limit. LPRM inputs to the 3D MONICORE system are used to calculate core power distribution and ensure operation within established fuel thermal operating limits.

At PBAPS, the LPRM system is composed of 43 LPRM detector strings, radially distributed throughout the core. Each detector string contains four fission chambers located at fixed axial elevations. Each fission chamber produces an output current that is processed by the LPRM signal-conditioning equipment to provide the desired scale indications. Adjacent to each LPRM string is a calibration tube through which traversing in-core probe (TIP) movable gamma detectors are periodically traversed to provide a continuous axial gamma flux profile at each LPRM string location. These data are used in the calibration of the 172 fixed LPRM fission detectors.

The LPRM system is designed to provide a sufficient number of LPRM signals to satisfy the safety design basis of the APRM, OPRM, RBM, and 3D MONICORE systems. This safety design basis is to detect conditions in the core that threaten the overall integrity of the fuel barrier due to excessive power generation and provide signals to the RPS so that the release of radioactive material from the fuel barrier is limited. The LPRM system also incorporates features designed to diagnose and display various system trip and inoperative conditions.

3.1 LPRM Calibration Uncertainty

Gamma TIP data are used to perform periodic LPRM channel calibrations. These calibrations compensate for small changes in detector sensitivity resulting from the depletion of fissile material lining the individual LPRM fission chambers. LPRM calibrations are performed while the reactor is operating at power due to the limited sensitivity of the LPRM detectors. Adjacent to each LPRM string is a calibration tube, through which TIP movable gamma detectors are traversed to provide a continuous gamma flux profile at each LPRM location. From these gamma flux profiles, thermal neutron flux profiles are calculated. Appropriate gain adjustment factors are determined for each LPRM detector based on this information. These gain adjustment values are then applied to LPRM signals during the LPRM calibration process.

The changes in LPRM detector sensitivity discussed above contribute to the LPRM update uncertainty, which is a quantification of the uncertainty that results from the sensitivity changes during the interval over which the LPRM detector is calibrated. The LPRM update uncertainty is one component that is combined with others to obtain a radial power distribution uncertainty, which ultimately is convoluted with still other uncertainties to assess the required margin in the fuel cladding integrity safety limit. The statistical margin included in the fuel cladding integrity safety limit assures compliance, in part, with the SAFDL.

3.2 APRM, OPRM, and RBM Systems

The licensee stated that the APRM, the OPRM, and the RBM systems are the only nuclear instrumentation systems that use LPRM readings. According to the licensee's justification, the APRM readings are maintained within TS-required accuracy limits via weekly comparison to heat balance calculations. Because the APRM system is calibrated using a means other than the TIP system comparison for which the interval extension has been requested, the NRC staff finds that the APRM system will not be adversely affected by the requested extension. The staff finds, therefore, that the requested calibration interval extension is acceptable with respect to the LPRM input to the APRM system.

The licensee stated that the OPRM system is insensitive to the absolute value of individual LPRM readings when the reactor is at equilibrium. The OPRM system is designed to monitor the core for thermal-hydraulic instabilities, which are indicated by cyclic fluctuations in neutronic power. Certain biases affecting the LPRM detectors could result in the propagation of the bias to the OPRM system. Such a propagation could inhibit the function of the OPRM to detect a thermal-hydraulic instability in a reactor core. The licensee stated that the requested calibration interval extension would not affect the functionality of the OPRM system.

The cyclic fluctuations indicative of an instability are monitored by averaging signals from a small number, typically 2-4, of LPRMs to determine the magnitude of power oscillations in the 0.3-0.7 Hz range. The magnitude is defined as the ratio of the peak LPRM signal to its average. The OPRM system in use at PBAPS is described more comprehensively in the NRC staff's safety evaluation for Amendment Numbers 251 and 254 to the facility operating licenses for PBAPS Units 2 and 3, respectively (ADAMS Accession No. ML050820561), and in Boiling Water Reactors Owners Group Licensing Topical Report NEDO-32465-A, "Reactor Stability Detect and Suppress Solutions Licensing Basis Methodology for Reload Applications," dated August, 1996.

In its September 21, 2007, response to the NRC staff's RAI, the licensee provided data about the LPRM signal uncertainty to show how the signal uncertainty changes as a function of exposure (ADAMS Accession No. ML072640607). The data illustrated that, in the range of the requested calibration interval extension, there is very little change in LPRM signal uncertainty. In comparison, the 0.3-0.7 Hz oscillation cycles expected in an instability are short. Therefore, a bias in an LPRM detector associated with the increased calibration interval could reasonably be construed as constant over the duration of a postulated instability.

Because the bias associated with the LPRM detector sensitivity decay is effectively constant, the averaging function used by the OPRM system would eliminate the bias.

Based on these considerations:

1. The averaging function of the OPRM would eliminate any bias due to LPRM sensitivity decay; and

2. The LPRM sensitivity decay is minimal through the duration of the requested calibration interval extension.

The NRC staff agrees with the licensee that the requested calibration interval extension will not affect the functionality of the OPRM system. Therefore, the proposed calibration interval extension is acceptable with regard to the functionality of the OPRM system.

In a manner similar to the OPRM, the RBM monitors relative changes in LPRM response to perform its function. The purpose of the RBM is to protect the core from excessive localized heat addition associated with an erroneous control rod withdrawal by blocking rod movement. Similar to the detection of oscillations discussed above, such a control rod manipulation is a short evolution compared to the LPRM sensitivity decay as shown in the licensee's RAI response. Therefore, the NRC staff agrees with the licensee that the RBM system is insensitive to the absolute value of individual LPRM readings. The proposed LPRM calibration interval extension is therefore acceptable in consideration of the RBM system.

3.3 3D MONICORE Uncertainties

The 3D MONICORE system does not compensate for the LPRM uncertainty. Thus, the LPRM uncertainty becomes a component of the overall power distribution uncertainty associated with the core monitoring system. Because the power distribution data are used to determine the on-line margin to fuel cladding integrity, an acceptably quantified power distribution uncertainty is required to assure compliance with SAFDL.

The licensee provided a technical basis for requesting the LPRM calibration interval increase that included several reasons why the LPRM update uncertainty would not significantly affect the power distribution uncertainty. These bases are presented and evaluated in the following subsections.

3.3.1 LPRM Response Uncertainty Bounded by GE Thermal Analysis Basis

The licensee stated that the calibration frequency has a small effect on the overall power distribution uncertainty associated with LPRM based operation between successive LPRM calibrations. The licensee also stated that the small additional uncertainty would not be permitted to increase the total power distribution uncertainty to a value in excess of the value allowed by the GE Thermal Analysis Basis (GETAB) safety limit analysis.

To confirm the applicability of this argument, the NRC staff reviewed recently-approved license amendments at PBAPS to determine how the SLMCPRs were calculated. The SLMCPR is the licensed fuel cladding integrity safety limit. In the information supporting License Amendment 252 to PBAPS, Unit 3, the power distribution uncertainty is less than the value referenced in GETAB that forms the basis for this argument (ADAMS Accession No. ML031840462).

To verify the basis for the uncertainty inputs to the SLMCPR calculations, the NRC staff requested that the licensee confirm the power distribution uncertainties currently used in the PBAPS SLMCPR analysis. In response to the NRC staff's RAI (ADAMS Accession No. ML072640607), the licensee stated that PBAPS, Units 2 and 3, currently use "reduced" uncertainty allowable values. The total nodal power distribution uncertainty acceptance criterion for the reduced uncertainty allowable value referenced by the licensee was less than the value referenced in GETAB (NEDE-10958P-A, 1977).

The NRC staff finds, therefore, that the GETAB uncertainty argument presented in the license amendment request is not reflective of the safety analyses in use at PBAPS, and is, therefore, inapplicable.

In response to the NRC staff's RAI (ADAMS Accession No. ML072640607), the licensee stated further that, despite the selection of total power distribution uncertainty, the basis presented in the license amendment request remains valid, because the overall contribution of increased LPRM update uncertainty to the total power distribution uncertainty is sufficiently minor, so as to be bounded by the reduced uncertainty allowable value as well. This statement is addressed in Section 3.3.2.

3.3.2 Hardware and Software Improvements

The licensee stated that the original surveillance frequency was based on using the older GE P 1 Periodic Core Evaluation software in the evaluation of core power distribution and fuel operating limits. This original software has subsequently been replaced with the current 3D MONICORE system, which contains sophisticated neutron diffusion and adaptive learning models. The licensee also stated that the original surveillance frequency was based on a different type of LPRM detector. This older type of detector has been replaced at PBAPS with a detector that introduces less uncertainty into the power distribution calculations.

While the NRC staff agrees that the use of more sophisticated software and more reliable hardware will reduce the LPRM signal uncertainty, the data that supported reduced power distribution uncertainty allowables were also based on these improvements. The data presented in NEDC-32694P-A, Power Distribution Uncertainties for Safety Limit MCPR Evaluations," dated August 1999, for instance, were based on calculations performed using 3D

MONICORE. Therefore, the NRC staff concludes that it is inappropriate to justify increasing the LPRM calibration interval to 2000 MWD/T based on the referenced hardware and software improvements, because the overall power distribution uncertainty allowables in use at PBAPS have been reduced for the same reason.

The licensee stated in its RAI response (ADAMS Accession No. ML072640607) that the PANAC11 version of 3D MONICORE is substantially more accurate and contains less uncertainty than do previous versions of PANACEA. NEDC-32694P-A is based on the older, less accurate versions of PANACEA. The NRC staff agrees that the bundle power uncertainty used in the SLMCPR analysis at PBAPS is conservatively higher than the bundle power uncertainty associated with PANAC11. However, the conservatively higher bundle power uncertainty forms the technical basis for the NRC approval of the method described in NEDC-32694P-A and the licensee's SLMCPR is determined in accordance with this approved method. The NRC staff finds, therefore, that it is not possible to credit the conservatively higher uncertainty allowable value, used in the SLMCPR analysis, to support the licensee's amendment request.

3.3.3 Detailed Statistical Evaluations

The licensee stated, "the technical bases for extending the interval between LPRM calibrations to 2000 MWD/T have been previously reviewed and approved by the NRC staff." In this statement, the licensee refers to the NRC safety evaluation that approved NEDC 32694P-A. However, the statistical evaluations contained in Section 3.2 of NEDC-32694P-A were presented to support an adequately conservative method to calculate and convolute the uncertainties that are input to the SLMCPR. The NRC staff did not approve NEDC-32694P-A as a means to justify extending the LPRM calibration interval, and the safety evaluation does not provide for this extension. It is the NRC staff's position that Section 3.2 of NEDC-32694P-A evaluation is provided as an example to explain why the selected uncertainties were appropriate.

During a teleconference held between the NRC staff and the licensee on November 27, 2007, the NRC discussed its position with the licensee regarding the applicability of NEDC-32694P-A as a technical basis for the requested calibration interval extension. In response, the licensee provided a supplement to its application on December 28, 2007.

The supplement contained an evaluation performed by Global Nuclear Fuels (GNF) regarding the technical applicability of Section 3.2 of NEDC-32694P-A as a technical basis for the requested LPRM calibration interval extension. The evaluation contains a detailed summary of relevant uncertainties used in the PBAPS SLMCPR calculation, and a recapitulation of the information contained in Section 3.2 of NEDC-32694P-A. The supplement also contains a GNF-authored evaluation of the original submittal provided to the NRC by the licensee, and a technical position by GNF, concluding, "operation with the LPRM calibration interval up to 2000 EFPH [effective full-power hour], which is equivalent to 2000 MWD/st core exposure at PBAPS, is justified using safety evaluations as stated by the USNRC in the SER of Reference 6."

In light of the fact that GNF is the entity responsible for NEDC-32694P-A, the NRC staff reviewed the Licensing Topical Report (LTR) and its attached documentation, including the NRC staff's requests for additional information submitted during the review. The NRC staff re-

evaluated Section 3.2 of the LTR, and the associated review documentation, to determine whether the NRC staff had previously evaluated the statistical evaluation presented in Section 3.2 for its generic applicability at a 2000 MWD/T LPRM calibration interval for any BWR.

In its re-evaluation, to confirm GNF's statement regarding the NRC's approval, and the applicability, of NEDC-32694P-A for the requested purpose, the staff sought to determine whether:

1. Sufficient review activity, as evidenced by RAIs, was shown in the LTR's supporting documentation to show that the staff evaluated the generic applicability of the 2000 EFPH extent of the statistical evaluation.

2. The evaluation presented in Section 3.2 of NEDC-32694P-A was based on a broad enough sample of data to warrant its generic applicability at a 2000 MWD/T LPRM calibration interval.

3. In the 9-year history of the LTR's approval, whether there was a precedent showing a plant-specific application of the LTR in this fashion.

It should be noted that the NRC staff discusses the statistical evaluation performed in NEDC-32694P-A in terms of EFPH, because the studies presented are based on these exposure intervals. The NRC staff discusses the LPRM surveillance interval in MWD/T, because the calibration interval in the TS is based on burnup. In the case of PBAPS, the licensee has demonstrated, based on the mass of fuel in each core, that the units are effectively equivalent.

The NRC staff found that there were no RAIs or responses docketed during the review of NEDC-32694P-A concerning the nature of the statistical evaluation discussed in Section 3.2 of NEDC-32694P-A. The NRC staff finds that, based on the referenced evaluation, there is reasonable assurance that the LPRM update uncertainty associated with a 1000 MWD/T LPRM calibration interval is less than the value presented in NEDC-32694P-A. However, the staff does not find that the evaluation contained in NEDC-32694P-A was reviewed with sufficient rigor to confirm that the case presented in NEDC-32694P-A is generically applicable for any plant seeking an LPRM calibration interval increase to 2000 MWD/T. Specifically, the extent of the data presented in the evaluation is not comprehensive enough to warrant its generic justification of an LPRM calibration interval extension to 2000 MWD/T. In consideration of the NRC staff's view in this regard, there is not reasonable assurance that the LPRM update uncertainty evaluated in NEDC-32694P-A would be applicable in light of the operating strategy, core design, and hardware system in use at PBAPS for an LPRM calibration interval of 2000 MWD/T.

3.3.4 Operating Practice at PBAPS

The NRC staff requested that the licensee provide an uncertainty evaluation showing that potential increases in the LPRM calibration uncertainty remain bounded by uncredited conservatisms in the total power distribution uncertainty. In response to the NRC staff's RAI (ADAMS Accession No. ML072640607), the licensee identified several operational practices at PBAPS that are different from the assumptions set forth in the statistical evaluation presented in NEDC-32694P-A. These differences include:

1. PBAPS routinely completes LPRM calibrations with zero missing TIP strings, in contrast to the amount assumed missing in NEDC-32694P-A.

2. The evaluation in NEDC-32694P-A assumed a certain number of failed LPRMs, and an associated uncertainty component. This component would be less at PBAPS, because both plants operate with significantly fewer failed LPRMs.

3. TIP signal nodal uncertainty is experimentally verified at PBAPS once per cycle and demonstrated to be significantly less than the uncertainty limit.

4. Typical operating practice at PBAPS is conservative relative to core loading and control rod pattern asymmetries assumed in the total nodal power distribution uncertainty.

5. PBAPS uses gamma TIPs, which are more accurate than the neutron TIPs assumed in the analysis set forth in NEDC-32694P-A.

6. Operating practice at PBAPS provides for avoiding the use of the 25 percent extension on surveillance intervals allowed by the TSs.

7. The LPRM update uncertainty increase assumes decreasing detector sensitivity with increasing core neutron exposure, which could be conservative based on the actual operational behavior of the detector.

The NRC staff evaluated each of these differences between the assumptions in NEDC-32694P-A and actual operation at PBAPS. Items 1-4 and 6 are operating practices that the licensee could change at any time without NRC regulatory involvement. These operating practices could change, for instance, upon the introduction of lead test assemblies into the core at either PBAPS plant. Furthermore, sufficient information was not provided in the RAI response for the NRC staff to verify these practices and statements. Therefore, the NRC staff cannot base safety conclusions on these arguments. Regarding items 5 and 7, it is not clear to the NRC staff what effect these differences would have on the total nodal power uncertainty at PBAPS. To evaluate these differences, specific data and quantifiable uncertainty differences would be required.

The NRC staff has considered the statistical analysis in NEDC-32694P-A, which was referenced by the licensee, and the differences between operating practice at PBAPS and the assumptions in NEDC-32694P-A. The NRC staff finds that this existing analysis demonstrates an appropriately conservative method considering the current operational practices and flexibilities. However, the NRC staff finds that the statistical evaluations do not form an adequate basis to increase the LPRM calibration interval as requested.

3.3.5 Precedential Approvals

The licensee stated that the NRC has previously approved similar amendment requests at James A. Fitzpatrick Nuclear Power Plant (ADAMS Accession No. ML030860088), Vermont Yankee Nuclear Power Station (ADAMS Accession No. ML003733066), and River Bend Station Unit 1 (ADAMS Accession No. ML021620290). These amendments were approved in 2003, 2000, and 1999, respectively. The NRC staff noted that the James A. Fitzpatrick Nuclear Power

Plant approval was based on a plant-specific evaluation performed by General Electric. The River Bend Station and Vermont-Yankee Nuclear Power Station provided detailed and robust statistical analyses in support of their amendment requests as opposed to the largely qualitative justification provided in the licensee's request. The NRC staff, therefore, finds that the referenced precedents are dissimilar to and do not support the approach used in this license amendment request.

3.3.6 Increased Bundle Power Distribution Uncertainty

In light of the inapplicability of the uncertainty evaluation presented in NEDC-32694P-A as a technical basis for the requested calibration interval extension, the licensee provided supplemental information by letter dated February 14, 2008. The letter contains, as an attachment, an evaluation of the effects that doubling the LPRM update uncertainty has on the SLMCPR. The resulting increase in SLMCPR, determined by the evaluation, is below the NRC staff's threshold of significance for the SLMCPR.

The NRC technical staff finds that an implementation condition shall require the use of the doubled LPRM update uncertainty for PBAPS SLMCPR calculations. This condition will provide reasonable assurance that the LPRM update uncertainty bounds the extended calibration interval.

The NRC staff reviewed the original LPRM update uncertainty evaluation presented in Section 3.2 of NEDC-32694P-A. The uncertainty parameter was determined by comparing power distribution predictions running in the "LPRM Adaptive" monitoring mode for 2000 EFPH, and comparing to TIP system readings. The NRC staff agrees that this study demonstrates, albeit in a bounding sense, the power distribution uncertainty associated specifically with LPRM detector sensitivity decay.

Although the NRC staff views the study presented in Section 3.2 of NEDC-32694P-A as a bounding study, the NRC staff agrees that doubling the observed LPRM update uncertainty limit is a conservative approach to establish the effects of using a bounding LPRM update uncertainty for the SLMCPR analysis for a 2000 MWD/T calibration interval at PBAPS. This conclusion is also supported by the demonstrated LPRM detector sensitivity decay behavior shown in the RAI response dated September 21, 2007 (ADAMS Accession No. ML072640607).

3.3.7 Acceptable LHGR and MAPLHGR Uncertainties

As addressed in Section 3.3 of this safety evaluation, the requested LPRM calibration interval increase can also adversely affect the 3D-MONICORE system's surveillance of linear heat generation rate limits. The licensee addressed this issue in its December 21, 2007 (ADAMS Accession No. ML073620054), supplement to the license amendment request. In the attachment to the supplemental letter, GNF stated that the licensee was well within its allowance for power distribution uncertainties for the LPRM calibration interval requested. The staff agrees with GNF's position in this regard; the technical basis is contained in Appendices A and B of NEDC-32694P-A.

The staff independently evaluated the effect the selection of a bounding LPRM update uncertainty would have on the uncertainty, and concluded that increasing the LPRM update uncertainty in a fashion similar to that employed by GNF in the SLMCPR evaluation would not violate the uncertainty allowance used in the thermal-mechanical analyses.

With regard to the LHGR uncertainties, therefore, the NRC staff finds that the requested calibration interval will provide for acceptable core monitoring performance. The NRC staff's finding is based on the fact that the power distribution uncertainty allowance for the LHGR is greater than the actual value, which, as GNF stated, includes the LPRM update uncertainty. Because a greater margin exists on the LHGR bundle power distribution uncertainty than on the SLMCPR power distribution uncertainty, the NRC staff does not require such explicit confirmation of the applicability of the LHGR bundle power distribution uncertainty.

### 3.4 Summary

On the basis of the above evaluation, the NRC staff finds that the licensee's request to amend the TSs at PBAPS to extend the LPRM calibration interval from 1000 MWD/T to 2000 MWD/T is acceptable.

The NRC staff is reasonably assured that the increase in power distribution uncertainty resulting from the calibration interval extension would be bounded by the doubled value assumed in the licensee's SLMCPR calculation, and by the allowance for power distribution uncertainty in the LHGR thermal-mechanical evaluations. As such, the NRC staff finds reasonable assurance that the requested modification to TS Surveillance Requirement 3.3.1.1.8 would meet the requirements of 10 CFR 50.36. The NRC staff concludes further that the proposed calibration interval extension will not adversely affect the performance of the APRM, OPRM or RBM systems, for which the LPRMs provide input. Therefore, the NRC staff finds that there is reasonable assurance that there will be adequate protection of public health and safety and the environment if the requested amendment is implemented.

The NRC staff's conclusions are based on the imposition of an implementation condition requiring the use of a doubled LPRM update uncertainty in the licensee's SLMCPR calculations using current NRC-approved, GNF methods. The extended calibration interval will require further justification if different core monitoring hardware and software, and analytical methods are utilized.

## 3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendment. The State official had no comments.

## 4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes SRs. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (72 FR 49577). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

## 5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (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.

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