



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 28, 2008

Mr. Charles G. Pardee
President and Chief Nuclear Officer
Exelon Nuclear
200 Exelon Way
Kennett Square, PA 19348

SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2 - ISSUANCE OF
AMENDMENTS TO EXTEND LOCAL POWER RANGE MONITOR
CALIBRATION INTERVAL (TAC NOS. MD7048 AND MD7049)

Dear Mr. Pardee:

The Commission has issued the enclosed Amendment No. 195 to Facility Operating License No. NPF-39 and Amendment No. 156 to Facility Operating License No. NPF-85, for Limerick Generating Station (LGS), Units 1 and 2. These amendments consist of changes to the Technical Specifications (TSs) in response to your application dated October 19, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML072970339), as supplemented by letters dated March 14, 2008, March 26, 2008, and July 18, 2008 (ADAMS Accession Nos. ML080850565, ML080990667, and ML082070201, respectively).

The amendments revise the LGS, Units 1 and 2 TSs, Table 4.3.1.1-1, "Reactor Protection System Instrumentation Surveillance Requirements." Specifically, the amendments increase the interval between local power range monitor calibrations from 1000 effective full power hours (EFPH) to 2000 EFPH.

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

Sincerely,

A handwritten signature in black ink that reads "Peter Bamford".

Peter Bamford, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-352 and 50-353

Enclosures:

1. Amendment No. 195 to License No. NPF-39
2. Amendment No. 156 to License No. NPF-85
3. Safety Evaluation

cc: Distribution via ListServ



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-352

LIMERICK GENERATING STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 195
License No. NPF-39

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Exelon Generation Company, LLC (the licensee), dated October 19, 2007, supplemented by letters dated March 14, 2008, March 26, 2008 and July 18, 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 Facility Operating License No. NPF-39 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 195, are hereby incorporated into this license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. Implementation Requirements:

The Limerick Generating 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 [minimum critical power ratio] 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



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

Attachment: Changes to the Technical
Specifications and Facility Operating License

Date of Issuance: October 28, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 195

FACILITY OPERATING LICENSE NO. NPF-39

DOCKET NO. 50-352

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

Remove

Page 3

Insert

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

3/4 3-8

Insert

3/4 3-8

- (3) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;
- (4) Pursuant to the Act and 10 CFR Parts 30, 40, 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
- (5) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility, and to receive and possess, but not separate, such source, byproduct, and special nuclear materials as contained in the fuel assemblies and fuel channels from the Shoreham Nuclear Power Station.

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I (except as exempted from compliance in Section 2.D. below) and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

Exelon Generation Company is authorized to operate the facility at reactor core power levels not in excess of 3458 megawatts thermal (100% rated power) in accordance with the conditions specified herein and in Attachment 1 to this license. The items identified in Attachment 1 to this license shall be completed as specified. Attachment 1 is hereby incorporated into this license.

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 1⁹⁵, are hereby incorporated into this license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

TABLE 4.3.1.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

<u>FUNCTIONAL UNIT</u>	<u>CHANNEL CHECK(n)</u>	<u>CHANNEL FUNCTIONAL TEST(n)</u>	<u>CHANNEL CALIBRATION(a)(n)</u>	<u>OPERATIONAL CONDITIONS FOR WHICH SURVEILLANCE REQUIRED</u>
9. Turbine Stop Valve - Closure	N.A.			1
10. Turbine Control Valve Fast Closure, Trip Oil Pressure - Low	N.A.			1
11. Reactor Mode Switch Shutdown Position	N.A.		N.A.	1, 2, 3, 4, 5
12. Manual Scram	N.A.		N.A.	1, 2, 3, 4, 5

- (a) Neutron detectors may be excluded from CHANNEL CALIBRATION.
- (b) The IRM and SRM channels shall be determined to overlap for at least 1/2 decades during each startup after entering OPERATIONAL CONDITION 2 and the IRM and APRM channels shall be determined to overlap for at least 1/2 decades during each controlled shutdown, if not performed within the previous 7 days.
- (c) Calibration includes verification that the OPRM Upscale trip auto-enable (not-bypass) setpoint for APRM Simulated Thermal Power is $\geq 30\%$ and for recirculation drive flow is $< 60\%$.
- (d) The more frequent calibration shall consist of the adjustment of the APRM channel to conform to the power values calculated by a heat balance during OPERATIONAL CONDITION 1 when THERMAL POWER $\geq 25\%$ of RATED THERMAL POWER. Adjust the APRM channel if the absolute difference is greater than 2% of RATED THERMAL POWER.
- (e) CHANNEL FUNCTIONAL TEST shall include the flow input function, excluding the flow transmitter.
- (f) The LPRMs shall be calibrated at least once per 2000 effective full power hours (EFPH).
- (g) The less frequent calibration includes the flow input function.
- (h) This function is not required to be OPERABLE when the reactor pressure vessel head is removed per Specification 3.10.1.
- (i) With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.
- (j) If the RPS shorting links are required to be removed per Specification 3.9.2, they may be reinstalled for up to 2 hours for required surveillance. During this time, CORE ALTERATIONS shall be suspended, and no control rod shall be moved from its existing position.
- (k) DELETED
- (l) Not required to be performed when entering OPERATIONAL CONDITION 2 from OPERATIONAL CONDITION 1 until 12 hours after entering OPERATIONAL CONDITION 2.
- (m) With THERMAL POWER $\geq 25\%$ of RATED THERMAL POWER.
- (n) Frequencies are specified in the Surveillance Frequency Control Program unless otherwise noted in the table.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-353

LIMERICK GENERATING STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 156
License No. NPF-85

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Exelon Generation Company, LLC (the licensee), dated October 19, 2007, supplemented by letters dated March 14, 2008, March 26, 2008 and July 18, 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 Facility Operating License No. NPF-85 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 156, are hereby incorporated into this license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. Implementation Requirements:

The Limerick Generating 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 [minimum critical power ratio] 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



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

Attachment: Changes to the Technical
Specifications and Facility Operating License

Date of Issuance: October 28, 2008

ATTACHMENT TO LICENSE AMENDMENT NO. 156

FACILITY OPERATING LICENSE NO. NPF-85

DOCKET NO. 50-353

Replace the following page of the Facility Operating License with the 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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3/4 3-8

- (4) Pursuant to the Act and 10 CFR Parts 30, 40, 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
- (5) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility, and to receive and possess, but not separate, such source, byproduct, and special nuclear materials as contained in the fuel assemblies and fuel channels from the Shoreham Nuclear Power Station.

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I (except as exempted from compliance in Section 2.D. below) and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

Exelon Generation Company is authorized to operate the facility at reactor core power levels of 3458 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 156, are hereby incorporated into this license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Fire Protection (Section 9.5, SSER-2, -4)*

Exelon Generation Company shall implement and maintain in effect all provisions of the approved Fire Protection Program as described in the Updated Final Safety Analysis Report for the facility, and as approved in the NRC Safety Evaluation Report dated August 1983 through Supplement 9, dated August 1989, and Safety Evaluation dated November 20, 1995, subject to the following provision:

The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

*The parenthetical notation following the title of license conditions denotes the section of the Safety Evaluation Report and/or its supplements wherein the license condition is discussed.

TABLE 4.3.1.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

<u>FUNCTIONAL UNIT</u>	<u>CHANNEL CHECK (n)</u>	<u>CHANNEL FUNCTIONAL TEST (n)</u>	<u>CHANNEL CALIBRATION(a)(n)</u>	<u>OPERATIONAL CONDITIONS FOR WHICH SURVEILLANCE REQUIRED</u>
9. Turbine Stop Valve - Closure	N.A.			1
10. Turbine Control Valve Fast Closure, Trip Oil Pressure - Low	N.A.			1
11. Reactor Mode Switch Shutdown Position	N.A.		N.A.	1, 2, 3, 4, 5
12. Manual Scram	N.A.		N.A.	1, 2, 3, 4, 5

- (a) Neutron detectors may be excluded from CHANNEL CALIBRATION.
- (b) The IRM and SRM channels shall be determined to overlap for at least 1/2 decades during each startup after entering OPERATIONAL CONDITION 2 and the IRM and APRM channels shall be determined to overlap for a least 1/2 decades during each controlled shutdown, if not performed within the previous 7 days.
- (c) Calibration includes verification that the OPRM Upscale trip auto-enable (not-bypass) setpoint for APRM Simulated Thermal Power is $\geq 30\%$ and for recirculation drive flow is $< 60\%$.
- (d) The more frequent calibration shall consist of the adjustment of the APRM channel to conform to the power values calculated by a heat balance during OPERATIONAL CONDITION 1 when THERMAL POWER $\geq 25\%$ of RATED THERMAL POWER. Adjust the APRM channel if the absolute difference is greater than 2% of RATED THERMAL POWER.
- (e) CHANNEL FUNCTIONAL TEST shall include the flow input function, excluding the flow transmitter.
- (f) The LPRMs shall be calibrated at least once per 2000 effective full power hours (EFPH).
- (g) The less frequent calibration includes the flow input function.
- (h) This function is not required to be OPERABLE when the reactor pressure vessel head is removed per Specification 3.10.1.
- (i) With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.
- (j) If the RPS shorting links are required to be removed per Specification 3.9.2, they may be reinstalled for up to 2 hours for required surveillance. During this time, CORE ALTERATIONS shall be suspended, and no control rod shall be moved from its existing position.
- (k) DELETED
- (l) Not required to be performed when entering OPERATIONAL CONDITION 2 from OPERATIONAL CONDITION 1 until 12 hours after entering OPERATIONAL CONDITION 2.
- (m) With THERMAL POWER $\geq 25\%$ of RATED THERMAL POWER.
- (n) Frequencies are specified in the Surveillance Frequency Control Program unless otherwise noted in the table.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 195 TO FACILITY OPERATING LICENSE NO. NPF-39
AND AMENDMENT NO. 156 TO FACILITY OPERATING LICENSE NO. NPF-85
EXELON GENERATION COMPANY, LLC
LIMERICK GENERATING STATION, UNITS 1 AND 2
DOCKET NOS. 50-352 AND 50-353

1.0 INTRODUCTION

By letter dated October 29, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML072970339), as supplemented by letters dated March 14, 2008, March 26, 2008, and July 18, 2008 (ADAMS Accession Nos. ML080850565, ML080990667, and ML082070201, respectively), Exelon Generation Company, LLC (Exelon, the licensee) requested changes to the Technical Specifications (TSs) for Limerick Generating Station (LGS or Limerick), Units 1 and 2.¹ The changes consist of an increase in the interval between local power range monitor (LPRM) calibrations from 1000 effective full power hours (EFPH) to 2000 EFPH. The supplements provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC or Commission) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on July 8, 2008 (73 FR 39055).

The reason for this proposed change is to take advantage of the improvements in core monitoring processes and nuclear instrumentation that have developed since the plant was licensed to justify the extended surveillance interval. The change will also reduce the time that certain primary containment isolation valves are open and reduce wear and tear on the Traversing Incore Probe (TIP) system, potentially resulting in fewer repairs in a high radiation area and consequentially, a lower overall dose to plant workers.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations*, (10 CFR) Part 50, paragraph 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.

1. Non-proprietary versions of the attachments for the letters dated March 14, 2008, and March 26, 2008, can be found at ADAMS Accession Nos. ML080870244 and ML080990668, respectively.

Paragraph 50.36(c)(3) of 10 CFR 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 50.36 require that LGS TS LCO 3.3.1 and the associated Surveillance Requirement 4.3.1.1, result in adequate assurance that the LPRM calibration interval will support LPRM accuracy requirements for input to the Average Power Range Monitoring (APRM) system and the Reactor Protection System (RPS). Similarly, the provisions of 10 CFR 50.36 require that TS LCO 3.3.1 and Surveillance Requirement 4.3.1.1 result in adequate assurance that the LPRM calibration interval will support Oscillation Power Range Monitor (OPRM) accuracy requirements for input to the 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 specified in TS 2.1.2.

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 3.2.3.

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 3.2.4, respectively. These are the SAFDLs that protect the fuel from mechanical failure.

The rod-block monitor (RBM) is designed to prohibit erroneous withdrawal of a control rod during operation at core high power levels. This prevents local fuel damage under permitted bypass and/or LPRM detector chamber failure conditions and prevents local fuel damage during a single rod withdrawal error. The RBM is required to be operable by TS LCO 3.1.4.3

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 to ensure that the plant would remain in compliance with TS 2.1.2, TS LCOs 3.1.4.3, 3.2.1, 3.2.3 and 3.2.4, and hence, 10 CFR 50.36.

The stability solution in place at LGS employs the use of an OPRM system, which relies on input from the LPRM detectors. Therefore, the NRC staff evaluated the requested change in LPRM calibration interval to ensure that the plant would remain in compliance with TS 2.2.1, 3.3.1 and 4.3.1.1 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 to ensure that the APRM system would not be unacceptably impacted by the requested extension.

3.0 TECHNICAL EVALUATION

The LPRM system is designed to provide a sufficient number of signals to satisfy the safety design basis of the APRM, OPRM, 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.

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, and the 3D MONICORE core monitoring system.

The LPRM system is comprised 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 TIP movable gamma detectors are periodically traversed to provide a continuous axial gamma flux profile at each LPRM string location. The data is used in the calibration of the 172 fixed LPRM fission detectors.

LPRM inputs to the 3D MONICORE system are used to calculate core power distribution and ensure operation within established fuel operating limits. The LPRM output signals are transmitted to the Power Range Neutron Monitoring System (PRNMS) operator display assemblies in the Main Control Room. LPRM readings are also directly displayed on the reactor control panel for detectors adjacent to a selected control rod.

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 string 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 factors are then applied to LPRM signals during the LPRM calibration process.

The overall LPRM signal uncertainty component of the total nodal power distribution uncertainty results from four factors. These factors are: (1) uncertainty from axial interpolation in between detectors; (2) random signal noise; (3) system non-linearity; and (4) instrument sensitivity decay arising from the period between LPRM calibrations. Of these four factors, only item (4), instrument sensitivity decay arising from the period between LPRM calibrations, is affected by

the requested revision to the LPRM calibration interval. This component is often referred to as the "LPRM update uncertainty" component of the overall LPRM signal uncertainty.

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.

A detailed discussion of the LPRM update uncertainty can be found in General Electric (GE) Company, "Power Distribution Uncertainties for Safety Limit MCPR Evaluations," NEDC-32694P-A, dated August, 1999 (ADAMS Accession Number ML003740151). The NRC staff previously evaluated its applicability to a 2000 EFPH calibration interval for the Peach Bottom and Clinton Power Stations in letters dated February 29, 2008 (ADAMS Accession No. ML0803900323) and September 17, 2008 (ADAMS Accession No. ML082180847), respectively.

Based on NRC technical concerns in similar license amendment requests by Exelon for the Peach Bottom and Clinton Power Stations, LGS provided supplemental information by letters dated March 14, 2008, March 26, 2008 and July 18, 2008. The March 26, 2008, letter contains, as an attachment, an evaluation of the effects of the update uncertainty on the SLMCPR calculation for the given interval for calibration. The licensee provided a demonstration of the LPRM exposure as a function of the calibration current. From this data it is reasonable to conclude that, a doubling of the LPRM update uncertainty would provide conservative results for the extended calibration interval.

For the licensee's Limerick-specific evaluation, after accounting for the LPRM update uncertainty, the total update uncertainty was then propagated to the total bundle power uncertainty and ultimately into the SLMCPR evaluation. Through this evaluation, the licensee demonstrated that doubling the LPRM update uncertainty increased the SLMCPR by an amount below the NRC staff's threshold of significance for the SLMCPR value, and hence, it is unlikely that the SLMCPR value would change and the fuel cladding integrity safety limit will remain in compliance.

By letter dated July 18, 2008, the licensee stated that it plans to amend the LGS Updated Final Safety Analysis Report (UFSAR) to incorporate the doubling of the LPRM update uncertainty into the plant licensing basis. This UFSAR change documenting the revised approved method of evaluation will be applied as an implementation requirement for this license amendment. This control provides reasonable assurance that the LPRM update uncertainty bounds the extended calibration interval.

3.2 APRM, OPRM, and RBM Systems

The licensee stated that the APRM, OPRM, RBM, and 3D MONICORE systems are the only nuclear instrumentation systems that use LPRM readings. LPRM gain settings are determined based on upon local neutron flux profiles derived from the TIP system. Appropriately gain adjusted LPRM readings establish the relative local neutron flux profile for input to the APRM, OPRM, and RBM systems.

The APRM system provides indication of core average thermal power and input to the RPS. In accordance with the licensee's TS requirements, the APRM readings are maintained within +/- 2-percent accuracy of core thermal power by weekly calibration to heat balance calculations. As a result of the APRM system being calibrated by means other than the TIP system, the requested increase in LPRM calibration interval does not affect the input to the APRM system.

The OPRM system monitors the reactor core for thermal-hydraulic instabilities, which are indicated by cyclic fluctuations in neutronic power, and provides input to the RPS. The OPRM system also generates an automatic suppression signal to terminate the instability if oscillation amplitude, growth, or period exceed predefined levels. The licensee stated that the OPRM system is insensitive to the absolute value of individual LPRM readings when the reactor is at equilibrium. Certain biases affecting the LPRM detectors could result in the propagation of the bias to the OPRM system. Such propagation could inhibit the function of the OPRM to detect a thermal-hydraulic instability in a reactor core. However, the NRC staff notes that the OPRM averaging function would eliminate any bias due to LPRM sensitivity decay and concludes that the requested interval extension is acceptable with respect to the function of the OPRM system.

The RBM is designed to prevent the withdrawal of selected control rods when local power is above a preset limit. This prevents local fuel damage under permitted bypass and/or LPRM detector chamber failure conditions and prevents local fuel damage during a single rod withdrawal error. The RBM does not perform a safety-related function. When a rod is selected, the RBM channel readings are automatically calibrated against an APRM reading and the rod block trips are set to a percentage, corresponding to the safety analysis, of the calibrated reading. Because the LPRM chamber responses are very linear over the interval involved, the RBM system response during rod withdrawal is not significantly affected.

3.3 3D MONICORE Uncertainties

The 3D-MONICORE system uses three-dimensional coarse-mesh diffusion theory methods, together with models for interfacing with the incore TIP and LPRM instrumentation, to determine the detailed core statepoint. The uncertainty in the 3D-MONICORE prediction of bundle power is determined by comparisons of measured and calculated TIP integrals and gamma scanned bundle powers.

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, the power distribution uncertainty is required to assure compliance with SAFDL, as demonstrated through the SLMCPR value. As discussed in Section 3.1, the licensee demonstrated, for LGS SLMCPR calculations, reasonable assurance is provided that the LPRM update uncertainty bounds the extended calibration interval.

3.4 LHGR and MAPLHGR Uncertainties

The requested LPRM calibration interval increase can adversely affect the 3D-MONICORE system's surveillance of linear heat generation rate limits. The licensee stated that LGS was well within its allowance for power distribution uncertainties for the LPRM calibration interval requested. The NRC staff agrees with the licensee's position; the technical basis is contained in Appendices A and B of NEDC-32694-P-A.

Specifically, the staff reviewed the effect the selection of a bounding LPRM update uncertainty would have on the total nodal power uncertainty using the methodology of NEDC-32694-P-A, Appendix B. This review shows the power distribution uncertainty allowance has sufficient margin to account for the LPRM update uncertainty for LHGR. Furthermore, the variability in MAPLHGR would be less than LHGR because of the exclusion of the local peaking uncertainty.

Because the nodal power uncertainty allowance includes the LPRM update uncertainty with reasonable margin, the requested calibration interval will provide for acceptable core monitoring performance with regard to the LHGR and MAPLHGR uncertainties. Additionally, the NRC staff does not require such explicit confirmation of the applicability of the LHGR bundle power distribution uncertainty because the NRC staff believes the demonstration of the larger margin existing on the LHGR bundle power distribution uncertainty than on the SLMCPR power distribution uncertainty is sufficient.

3.5 Other Considerations

The current surveillance interval of 1000 EFPH at Limerick is based on the using the original GE recommendations, GE P-1 Periodic Core Evaluation software for core power distribution, and fuel operating limits. The licensee notes that several improvements and conservatisms exist between the analysis that established the original 1000 EFPH calibration interval and current operation. The licensee currently uses the 3D MONICORE system, which the licensee states contains more sophisticated neutron diffusion and adaptive learning models than the original software. The original General Electric Thermal Analysis Basis (GETAB) was based on first generation LPRM detectors. LGS currently has NA 300 series LPRM chambers. The older design experienced more inaccuracies between calibrations, which, in turn, introduced larger uncertainties into the GETAB analysis. The current LPRM chambers exhibit less sensitivity loss as a function of exposure through their useful nuclear life, which is up to 40,000 MWD/T. The original analysis assumed the use of neutron TIPs, which are less accurate than the gamma TIPs used at LGS.

The licensee also notes several conservatisms in the analysis, as compared to LGS operational practices. For example:

- LGS typically operates with more TIP string data available than is assumed in the analysis.
- LGS typically operates with more LPRM detectors available than is assumed in the analysis.
- Operational practices of symmetric control rod patterns and core loading patterns, where the analysis has allowances for certain asymmetries

However, these are analytic operating practices that could change, or be affected by changes at LGS without NRC review and hence, will not be relied upon for this regulatory determination.

3.6 Summary

On the basis of the above evaluation, the NRC staff finds that the licensee's request to amend the TSs at Limerick to extend the LPRM calibration interval from 1000 EFPH to 2000 EFPH 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 4.3.1.1 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 conclusions are based the need to use a doubled LPRM update uncertainty in the SLMCPR calculations using current NRC-approved, Global Nuclear Fuel (GNF) methods which the licensee agreed to in its July 18, 2008, letter. Therefore, the corresponding UFSAR update incorporating this requirement becomes part of the LGS method of evaluation for power distribution uncertainties. The extended calibration interval will require further justification when using different core monitoring hardware and software, and analytical methods.

4.0 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.

5.0 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. 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 (73 FR 39055). 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.

6.0 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.

Principal Contributors: D. Jackson

Date: October 28, 2008

October 28, 2008

Mr. Charles G. Pardee
President and Chief Nuclear Officer
Exelon Nuclear
200 Exelon Way
Kennett Square, PA 19348

SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2 - ISSUANCE OF
AMENDMENTS TO EXTEND LOCAL POWER RANGE MONITOR
CALIBRATION INTERVAL (TAC NOS. MD7048 AND MD7049)

Dear Mr. Pardee:

The Commission has issued the enclosed Amendment No. 195 to Facility Operating License No. NPF-39 and Amendment No. 156 to Facility Operating License No. NPF-85, for Limerick Generating Station (LGS), Units 1 and 2. These amendments consist of changes to the Technical Specifications (TSs) in response to your application dated October 19, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML072970339), as supplemented by letters dated March 14, 2008, March 26, 2008, and July 18, 2008 (ADAMS Accession Nos. ML080850565, ML080990667, and ML082070201, respectively).

The amendments revise the LGS, Units 1 and 2 TSs, Table 4.3.1.1-1, "Reactor Protection System Instrumentation Surveillance Requirements." Specifically, the amendments increase the interval between local power range monitor calibrations from 1000 effective full power hours (EFPH) to 2000 EFPH.

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

Sincerely,

/RA/

Peter Bamford, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-352 and 50-353

Enclosures:

1. Amendment No. 195 to License No. NPF-39
2. Amendment No. 156 to License No. NPF-85
3. Safety Evaluation

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Amendments Accession Number: ML082750385 *by memo ** by email *** w/comments

	LPLI-2/PM	LPLI-2/LA	SRXB/BC	OGC- NLO	LPLI-2/BC
Name	PBamford	ABaxter **	GCranston *	AJones***	HChernoff 
Date	10/01/2008	10/02/2008	09/23/2008	10/14/2008	10/28/08