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July 22, 2010

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

Limerick Generating Station, Units 1 and 2
Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: Additional Information Supporting Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate

References:
1. Letter from M. D. Jesse (Exelon Generation Company, LLC) to U. S. NRC, "Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate," dated March 25, 2010
2. Letter from P. Bamford (U. S. NRC) to M. J. Pacilio (Exelon Generation Company, LLC), "Limerick Generating Station, Unit Nos. 1 and 2 – Request for Additional Information Related to Request for License Amendment Regarding Measurement Uncertainty Recapture Power Uprate," dated June 25, 2010

In Reference 1, Exelon Generation Company, LLC (EGC) requested an amendment to Facility Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (LGS), Units 1 and 2, respectively. Specifically, the proposed changes revise the Operating License and Technical Specifications to implement an increase in rated thermal power of approximately 1.65%. In Reference 2, the NRC requested additional information to support review of the proposed changes. In response to this request, EGC is providing the attached information.

EGC has reviewed the information supporting a finding of no significant hazards consideration and the environmental consideration provided to the NRC in Reference 1. The additional information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration. In addition, the

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additional information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this letter, please contact Mr. Kevin Borton at (610) 765-5615.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 22nd day of July 2010.

Respectfully,

Michael D. Jesse
Manager, Licensing – Power Uprate
Exelon Generation Company, LLC

Attachments:
1. Response to Request for Additional Information
2. Revised Technical Requirements Manual Markup
3. Exelon Generation Company, LLC Calculation LE-0113, Rev. 1, "Reactor Core Thermal Power Uncertainty Calculation Unit 1"

cc: USNRC Region I, Regional Administrator
USNRC Senior Resident Inspector, LGS
USNRC Project Manager, LGS
R. R. Janati, Bureau of Radiation Protection

ATTACHMENT 1
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

NRC Request 1

Attachment 1 to the application letter dated March 25, 2010, states that the scope and content of the evaluations performed and described in the LAR [license amendment request] are consistent with the guidance of NRC Regulatory Issue Summary (RIS) 2002-03, "Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications." RIS 2002-03, Attachment I, Section I, Item D.1 asks licensees to discuss maintenance and calibration procedures for the LEFM CheckPlus™ system. Please provide a brief discussion regarding how the LEFM CheckPlus™ will be incorporated into the LGS preventive maintenance program.

Response

The preventative maintenance program for the LEFM system will be developed in accordance with vendor guidance and the Exelon preventative maintenance template currently under development for the LEFM system. Activities performed during each refueling outage include power supply checks, pressure transmitter checks, and clock verifications. These preventative maintenance activities are being implemented via the associated plant modification package and in conjunction with the development of Exelon preventative maintenance template for LEFMs.

NRC Request 2

RIS 2002-03, Attachment I, Section I, Item F asks that licensees provide information related to calibration and maintenance procedures that affect the power calorimetric calculation. Please provide a brief discussion related to how LGS will control the hardware and software configuration of the Cameron LEFM CheckPlus™ equipment.

Response

After installation, the LEFM CheckPlus system software configuration will be maintained using existing procedures and processes. The plant computer software configuration is maintained in accordance with the Exelon Nuclear change control process, which includes verification and validation of changes to software configuration. Configuration of the hardware associated with the LEFM CheckPlus system and the calorimetric process instrumentation will be maintained in accordance with Exelon Nuclear configuration control processes.

NRC Request 3

A 72-hour Allowable Outage Time (AOT) has been requested for LGS, Units 1 and 2, to remain above the current licensed thermal power (i.e., 3458 MWt) up to the requested uprated power (i.e., 3515 MWt) in the event that the Cameron LEFM CheckPlus™ is declared non-operational. In support of this request, please provide information on the following:

a. Please provide a description of what level of degradation or system alert would render the Cameron LEFM CheckPlus™ to be declared non-operational at LGS, Units 1 and 2.

b. If the power level is below the current licensed thermal power at the time the Cameron LEFM CheckPlus™ is declared non-operational or if the power level drops below the current licensed thermal power during the AOT, will power be raised above the current licensed thermal power prior to the Cameron LEFM CheckPlus™ becoming operational? If so, please provide justification. If not, please identify how these scenarios would be operationally controlled.

c. Has there been any recent evidence of feedwater nozzle fouling at either LGS unit?

d. Are there plant-specific feedwater flow nozzle measurement drift data for the LGS units? If so, is this data consistent with the measurement drift errors cited from Caldon Topical Report ER-80P, "Improving Thermal Power Accuracy and Plant Safety While Increasing Operating Power Level Using the LEFM √™ System," Rev. 0, dated March 1997?

Response

a. The LEFM system performs on-line self-diagnostics to verify that system operation is within design basis uncertainty limits. Any out-of-specification condition will result in a self-diagnostic alarm condition, either for "alert" status (i.e., increased flow measurement uncertainty) or "failure" status. In either of these cases, the LEFM will be considered non-operational and the proposed Technical Requirements Manual (TRM) actions will be applied. Additionally, if the communication link between the LEFM system and the plant computer is failed, (i.e., LEFM CPU Link A and B Failed), the LEFM will be considered non-operational and the proposed TRM actions will be applied.

b. If the core power level is below the current licensed core thermal power at the time the LEFM is declared non-operational or if the power level drops below the current licensed core thermal power during the AOT, power may not be raised above 3458 MWt prior to the LEFM returning to operational status. The LGS TRM, Section 3/4.0, "Applicability," states that the requirements of Technical Specifications (TS) 3.0.4 are applicable to the TRM. TS 3.0.4 prohibits entering a mode or condition specified in the applicability when a limiting condition for operation is not met, except when either (a), the associated actions permit operation in that condition for an unlimited period of time, or (b) upon performance of a risk assessment, or (c) if specifically stated in the specification. Exception (a) cannot be used for the LEFM, since the applicability for proposed LEFM limiting condition for operation applies to core thermal power levels greater than 3458 MWt and the TRM actions only permit operation above 3458 MWt for 72 hours with an inoperable LEFM. Regarding exception (b), the LGS TRM will be revised to include the statement that TS 3.0.4.b does not apply to the LEFM. A revised markup of this TRM is included in Attachment 2. Exception (c) is not provided for in the TRM section for the LEFM. Thus, the application of TS 3.0.4 to the proposed TRM section for the LEFM would prohibit raising power above 3458 MWt without the LEFM being operational.

c. There has been no evidence of recent increases or decreases in feedwater venturi fouling for either LGS Unit. This is validated through performance of a bi-weekly routine test which monitors indicated feedwater flow against other balance of plant parameters in order to identify long term trends.

In the past, fouling/defouling has been observed on the feedwater venturis at LGS. In response, Venturi flow coefficients have been implemented and adjusted at LGS based on Sodium 24 tracer testing in order to account for the long term fouling conditions. In addition, temporary venturi fouling has been observed during coast down/startup from outages due to the changing conditions. This fouling condition temporarily produces a higher calculated thermal power than actual, which gradually returns to normal levels after a short time period. Adjustments during these instances have not been made since the fouling has a conservative impact on core thermal power calculation and is temporary in nature.

Because the degree of fouling of the LGS venturis has been stable for approximately four years, a defouling event during the 72-hour AOT is considered unlikely. As discussed in the LAR, Attachment 1, Section 3.2.4, "Disposition of NRC Criteria for Use of LEFM Topical Reports," significant sudden defouling would be detected by a change in secondary plant parameters.

d. The feedwater flow venturi measurement is made using Rosemount 1151 differential pressure transmitters. The feedwater flow measurement is a non-safety related application; therefore, formal drift analysis has not been performed. However, based on available calibration records for these specific instruments, LGS drift data is consistent with the measurement drift errors cited in Caldon Topical Report ER-80P.

NRC Request 4

The LAR, Attachment 1, Section 3.4.4 states that the LGS setpoint methodology, as documented in CC-MA-103-2001, is "consistent" with NEDC-31336P-A, "General Electric Instrument Setpoint Methodology," dated September 1996. Has CC-MA-103-2001 been previously reviewed by the NRC? If so, please provide a reference for that review. If not, please summarize the technical differences and deviations (if any) between CC-MA-103-2001 and NEDC-31336P-A.

Response

The LGS setpoint methodology documented in CC-MA-103-2001 has not been separately reviewed as a setpoint methodology by the NRC. It has been used as the basis for setpoint change license amendment request submittals to support implementation of Improved Technical Specifications at Peach Bottom Atomic Power Station (Reference 1) and to support previous power uprates at both Peach Bottom Atomic Power Station (References 2 and 3) and Limerick Generating Station (References 4 and 5). Use of this methodology in support of the referenced amendment requests was approved by the NRC.

The methodology utilized in CC-MA-103-2001 (Revision 1) is essentially the same as the methodology approved in NEDC-31336P-A as discussed below:

In the CC-MA-103-2001 methodology, the Nominal Trip Setpoint (NTSP) is determined by the relationship:

$$NTSP = DL +/- 1.645/N(LA^2+LD^2+PMA^2+PEA^2+CA^2)^{1/2} +/- \text{bias} +/- \text{dependent uncertainties},$$

where,

1.645 = the standard deviation corresponding to a 95% confidence level for a one-sided normal distribution
N = the number of standard deviations corresponding to the confidence level of the information used in the formula
DL = design limit (for Limiting Safety System Settings this is the analytical limit)
LA = loop accuracy (NEDC-31336 term is A_L)
LD = loop drift (NEDC-31336 term is D_L)
PMA = process measurement accuracy (NEDC-31336 term is the same)
PEA = primary element accuracy (NEDC-31336 term is the same)
CA = loop calibration accuracy (NEDC-31336 term is C_L)

The only difference between this equation and the NEDC-31336P-A methodology is the provision to include any dependent uncertainties if they apply.

In the CC-MA-103-2001 methodology, the Allowable Value (AV) is determined by the relationship:

$$AV = DL +/- 1.645/N(LA^2+PMA^2+PEA^2+CA^2)^{1/2} +/-\text{bias} +/- \text{dependent uncertainties},$$

where,

1.645 = the standard deviation corresponding to a 95% confidence level for a one-sided normal distribution.
N = the number of standard deviations corresponding to the confidence level of the information used in the formula.
NTSP = nominal trip setpoint
DL = design limit (for Limiting Safety System Settings this is the analytical limit)
LA = loop accuracy (NEDC-31336 term is A_L)
PMA = process measurement accuracy (NEDC-31336 term is the same)
PEA = primary element accuracy (NEDC-31336 term is the same)
CA = loop calibration accuracy (NEDC-31336 term is C_L)

Again, the only difference from the NEDC-31336P-A methodology is the provision to include any dependent uncertainties if they apply.

In addition, the NTSP and AV calculations, the CC-MA-103-2001 methodology also provides for the determination of an Actual Trip Setpoint (ATSP) which is more conservative than the NTSP as follows:

ATSP = NTSP + Margin (for decreasing process values)
ATSP = NTSP – Margin (for increasing process values)

Additional margin may not always be required. It is typically provided to support unique design, installation or calibration requirements for setpoints and TS AVs. When no additional margin is included the ATSP and NTSP are the same.

The Spurious Trip Avoidance and Spurious LER Avoidance tests performed by the NEDC-31336P-A methodology are not included in the CC-MA-103-2001 methodology. The CC-MA-103-2001 methodology includes guidance to provide reasonable margin between the AV and ATSP.

In summary, the CC-MA-103-2001 methodology is the same as the NEDC-31336P-A methodology, except for the specific provision to include dependent uncertainties, and to provide for a more conservative trip setpoint by adding additional margin if desired or required.

NRC Request 5

In LAR Attachment 11 (LE-0113, Revision 0), page 63, a 0.347% total reactor core thermal power uncertainty is calculated. Applying the 0.347% thermal power uncertainty to the proposed 3515 MWt licensed power level results in a maximum possible power level of 3527.197 MWt. This exceeds 102% of the current licensed thermal power level (3458 *1.02 = 3527.16 MWt) by a small amount. Please confirm that the new maximum possible power level, with uncertainties included, would remain bounded by the plant safety analyses, and provide the necessary documentation to support that conclusion.

Response

Calculation LE-0113, "Reactor Core Thermal Power Uncertainty Calculation Unit 1", Revision 0, determines the core thermal power uncertainty to be 11.99 MWt on page 63. This uncertainty applies to MUR conditions. When this uncertainty is added to the proposed power uprate of 3515 MWt, the maximum power is 3526.99 MWt, which is less than the 102% safety limit of 3527.16 MWt (1.02 * 3458 MWt = 3527.16 MWt).

The core thermal power uncertainty calculation LE-0113, Revision 1, has since been issued to incorporate an improved LEFM feedwater flow measurement uncertainty of 0.28%, based on calibration and test results, as stated in Section 3.2.3 (page 7) of the LAR. In addition, the revised calculation incorporates feedwater flow and other design inputs at MUR conditions. The resulting uncertainty is 10.914 MWt (approximately 0.31%). This is lower than the uncertainty provided in Revision 0 of the calculation. When the revised uncertainty (10.914 MWt) is added to the proposed power uprate of 3515 MWt, the maximum power including uncertainty is 3525.914 MWt. This value is less than the 102% safety limit of 3527.16 MWt (3458 MWt * 1.02 = 3527.16 MWt). Therefore, the proposed power uprate, including measurement uncertainty, is bounded by the plant safety analysis. Revision 1 of the calculation is provided in Attachment 3 to support the above conclusion.

NRC Request 6

In LAR Attachment 1, Section 3.2.3 points to Attachment 11 for the thermal power uncertainty calculation. However, Attachment 11 (LE-0113, Revision 0) only identifies itself as applicable to

Unit 1. Given the equivalent mass flow rate uncertainties provided for both units, are there any plant-specific features of Unit 2 that would result in a different total thermal power uncertainty calculation? Is it intended that the calculation in Attachment 11 be applicable to both Limerick units?

Response

The calculation in LAR Attachment 11 (LE-0113) was intended for both LGS units based on the same equivalent mass flow rate uncertainties provided for both units. LE-0114 was later created for LGS, Unit 2, because of the use of a different model reactor water cleanup system inlet flow differential pressure transmitter. However, both calculations result in the same value for total thermal power uncertainty and there are no other plant-specific features of Unit 2 that would result in a different total thermal power uncertainty calculation.

REFERENCES

1. Letter from NRC to G. A. Hunger (PECO Energy Company), "Issuance of Improved Technical Specifications," dated August 30, 1995

2. Letter from NRC to G. A. Hunger (Philadelphia Electric Company), "Revised Maximum Authorized Thermal Power Limit, Peach Bottom Atomic Power Station, Unit No. 2," dated October 18, 1994

3. Letter from NRC to G. A. Hunger (Philadelphia Electric Company), "Revised Maximum Authorized Thermal Power Limit, Peach Bottom Atomic Power Station, Unit No. 3," dated July 18, 1995

4. Letter from NRC to G. A. Hunger (Philadelphia Electric Company), "Revised Maximum Authorized Thermal Power Limit, Limerick Generating Station, Unit No. 1," dated January 24, 1996

5. Letter from NRC to G. A. Hunger (Philadelphia Electric Company), "Revised Maximum Authorized Thermal Power Limit, Limerick Generating Station, Unit No. 2," dated February 16, 1995

ATTACHMENT 2
REVISED TECHNICAL REQUIRMENTS MANUAL MARKUP

TRM - 3/4 3-97 (Units 1 and 2)

INSTRUMENTATION

FEEDWATER FLOW INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.7.10 The Leading Edge Flow Meter instrumentation system shall be OPERABLE:

APPLICABILITY: OPERATIONAL CONDITION 1, with THERMAL POWER > 3458 MWt.

ACTION:

a. With the Leading Edge Flow Meter system inoperable, restore the required instrumentation to OPERABLE status within 72 hours. Otherwise, reduce power to $\leq$ 3458 MWt within the next two hours.

b. The provisions of Specification 3.0.4.b are not applicable.

SURVEILLANCE REQUIREMENTS

4.3.7.10.1 The Leading Edge Flowmeter instrumentation system shall be demonstrated OPERABLE by performance of a CHANNEL CHECK at least once per shift.

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b. The provisions of Specification 3.0.4.b are not applicable.

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