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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 C. G. Pardee (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 3, 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 additional information provided in this submittal does not affect the bases for concluding that

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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 29th day of June 2010.

Respectfully,

Michael D. Jesse
Manager, Licensing – Power Uprate

Attachment: Response to Request for Additional Information

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

ATTACHMENT
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

NRC Request 1

Section 3.4, "Flow Induced Vibration," of NEDC-33484P and NEDO-33484, notes, in part, that main steam (MS) and feedwater (FW) piping will experience about a 4% increase in vibration levels due to increased flow velocities for Thermal Power Optimization (TPO) uprate conditions, and asserts that: "...the MS and FW lines vibration will remain within acceptable limits during TPO." The reports do not document the implementation of a vibration surveillance program during TPO to confirm this assertion.

In the application dated March 25, 2010, Exelon states that the effects of the uprate request have been evaluated using an approach developed by GE-Hitachi and documented in NEDC32938P-A, "Licensing Topical Report / Generic Guidelines and Evaluations for General Electric Boiling Water Reactor Thermal Power Optimization," Revision 2, May 2003. A non-proprietary version of this report (NEDO-32938, same title) is available at ADAMS Accession No. ML023170607. Appendix K, "Methods and Assumptions for Piping Evaluation of TPO Uprate," of NEDC-32938P-A and NEDO-32938 notes, in part, that: "[f]or plants whose licensing basis includes the results of main steam line and/or FW line vibration measurements taken during startup testing, the effects of power uprate on vibratory displacements will also be included." Further, the NRC staff notes that Table 3.9-7, "Non-NSSS [nuclear steam supply system] Piping Systems Power Ascension Testing," of the LGS Updated Final Safety Analysis Report documents both dynamic transient and steady-state vibration tests for the MS and FW piping systems during plant startup. Please indicate how the assessment of the effects of power uprate on the vibratory displacements of the MS and FW lines has been performed and if the predicted vibratory displacements will be validated after the new TPO full power level is reached. If validation after startup is not planned, please discuss why it is not needed.

Response

The evaluation for MS and FW piping vibration was performed by extrapolating the startup test vibration displacement data at original licensed thermal power to the TPO condition (101.7% of current licensed thermal power). The vibrations are assumed to increase in proportion to the fluid density (ρ) and fluid velocity (V) squared, or ρV^2. The piping vibrations at TPO conditions are expected to be roughly four percent higher than current vibration levels based on the extrapolated flow rates. For MS piping, the extrapolated vibrations were then compared against the original vibration acceptance criteria to show acceptability. For FW piping, the extrapolated vibrations were compared against the ASME OMa-S/G-1990 Standard Part 3 Appendix D Screening Velocity Criteria to show acceptability. This evaluation shows that there is greater than 50% margin (with one exception) and 47% margin remaining for MS and FW flow induced vibration, respectively.

For one "A" main steam line (MSL) data point on LGS Unit 2, in the "X" direction only, the original startup data was discounted for the following reasons. First, this data point is not consistent with the data for the other three MSLs at a similar location. Second, based on the sensor location, which is in a straight pipe section solidly anchored at the containment penetration, vibratory motion in this "X" direction measurement towards an anchor point is judged to be not credible. The absence of vibration issues with MS piping at LGS during its operating history at both OLTP and stretch power levels (105% of OLTP), along with industry

experience with vibration measurement also support the conclusion that this particular data point is not representative of actual vibration levels at that location.

Specific validation of predicted vibration levels at TPO uprate conditions is not planned for the following reasons. The expected increase in vibration levels has been shown to be small (about four percent higher than current vibrations levels based on the extrapolated flow rates). The initial plant startup vibration testing of MS and FW piping showed that the vibration levels were within acceptance criteria and the analytical results discussed above show that they will remain within the acceptance criteria with significant margin. In addition, there are no existing vibration problems with LGS MS and FW lines.

NRC Request 2

Section 3.5.2, "Balance-of-Plant Piping Evaluation," of NEDC-33484P and NEDO-33484 notes, in part, that "[f]or the MS system piping outside containment, the turbine stop valve (TSV) closure transient was reviewed against conditions that bound operations under TPO." Please indicate how the TSV closure transient has been reviewed for the TPO, and if this review considered the results of any testing of the TSV closure transient conducted during original plant startup.

Response

For the previous five percent uprate, approved by the NRC in Reference 1, pipe stress and support load margins were reviewed for fluid transient loading. Loads were evaluated at 102% of the current licensed thermal power (i.e., 102% of 105% of original licensed thermal power). Scaling factors were developed to bound limiting changes under uprated conditions for material properties, internal pressure, operating temperatures, and fluid transient loading. These conservative scaling factors were then applied considering appropriate load combinations, with values of 15% applied to pipe stress and 18% applied to fluid transient loads. All piping and supports were determined to have design margin to accommodate this increase in applied stress and load. This approach and the development of the scaling factors were reviewed for the TPO evaluation and found to be appropriate and bounding, specifically for the TSV closure transient and design of MS piping and supports.

The TSV closure load definition is based upon measured pressure responses in the LGS Unit 1 piping. These responses are based on recorded data from TSV testing early in the operating life of the station. This load was used in analysis of both Unit 1 and Unit 2 MS piping.

NRC Request 3

Section 6.7, of NEDC-33484P and NEDO-33484, "Fire Protection," states that "...There is no change in the physical plant configuration and the potential for minor changes to combustible loading as result of TPO uprate... " The staff requests the licensee to summarize any changes to the combustible loading, however minor, and discuss the impact of these changes on the plant's compliance with the fire protection program licensing basis, Title 10 of the *Code of Federal Regulations* Part 50 (10 CFR 50.48), or applicable portions of 10 CFR 50, Appendix R.

Response

The Leading Edge Flow Meter (LEFM) modification installed for the TPO uprate added a small amount of flame retardant control and power cable to five Limerick plant areas. These areas are as follows.

Turbine Enclosure Elevation 200' Room 438 (Fire Area 88A)

Turbine Enclosure Elevation 269' Room 548 (Fire Area 98A)

Turbine Enclosure Elevation 269' Room 543 (Fire Area 114)

Control Enclosure Elevation 254' Room 452 (Fire Area 20)

Control Enclosure Elevation 269' Room 533 (Fire Area 24A)

The LGS Fire Protection Evaluation Report (FPER), Table 9A-1, currently lists cable insulation as a fire hazard in all five affected fire areas, and therefore the LEFM installation does not introduce a new fire hazard in these areas.

The LGS FPER, Table 9A-1, lists the combustible loading as "low" for Fire Areas 88A, 98A, 114 and 24A, and "moderate" for Fire Area 20. The increased combustible load introduced by the LEFM modification installation does not change the fire severity classification for the five affected fire areas. Section 9A.4.2 of the LGS FPER defines and describes the fire area severity computation, methodology and area classification criteria.

The following information from the LGS combustible loading calculations indicates that the affected areas remain below the administrative limits for fire severity classification.

1. Unit 1 LEFM

   For Fire Area 88A, installation of the LEFM added less than 1 BTU/ft^2 of combustible load. The current total fire loading following installation of the LEFM is 49,469 BTU/ft^2. The fire zone loading remains below the administrative limit of 60,000 BTU/ft^2 for a "low" fire severity classification. Therefore the fire severity classification of "low" for this fire zone is maintained.

   For Fire Area 98A, installation of the LEFM added less than 45 BTU/ft^2 of combustible load. The current total fire loading following installation of the LEFM is 33,148 BTU/ft^2. The fire zone loading remains below the administrative limit of 60,000 BTU/ft^2 for a "low" fire severity classification. Therefore the fire severity classification of "low" for this fire zone is maintained.

   For Fire Area 114, installation of the LEFM added less than 2 BTU/ft^2 of combustible load. The current total fire loading following installation of the LEFM is 4,375 BTU/ft^2. The fire zone loading remains below the administrative limit of 60,000 BTU/ft^2 for a "low" fire severity classification. Therefore the fire severity classification of "low" for this fire zone is maintained.

For Fire Area 20, installation of the LEFM added less than 35 BTU/ft^2 of combustible load. The current total fire loading following installation of the LEFM is 102,303 BTU/ft^2. The fire zone loading remains below the administrative limit of 140,000 BTU/ft^2 for a "moderate" fire severity classification. Therefore the fire severity classification of "moderate" for this fire zone is maintained.

For Fire Area 24A, installation of the LEFM added less than 18 BTU/ft^2 of combustible load. The current total fire loading following installation of the LEFM is 28,830 BTU/ft^2. The fire zone loading remains below the administrative limit of 60,000 BTU/ft^2 for a "low" fire severity classification. Therefore the fire severity classification of "low" for this fire zone is maintained.

2. Unit 2 LEFM

   The LGS Unit 2 LEFM modification is in its design phase and to the extent practical will be identical to the Limerick Unit 1 modification installation. There is adequate margin to administrative limits in the combustible loading for the affected areas to accommodate a similar LEFM modification on Unit 2.

NRC Request 4

Section 6.7, of NEDC-33484P and NEDO-33484, "Fire Protection," states that "...The fire safe-shutdown analysis includes consideration of equipment needed to achieve and maintain hot shutdown, fire barriers, operator manual actions, personnel resources, and repair activities credited to achieve and maintain cold shutdown..." The staff requests the licensee to verify that (1) the measurement uncertainty recapture (MUR) power uprate will not require any new operator actions; (2) any effects from additional heat in the plant environment from the increased power will not prevent required post fire operator manual actions, as identified in the LGS, Units 1 and 2, fire protection program, from being performed at and within their designated time; and (3) procedures and resources necessary for systems required to achieve and maintain safe-shutdown will not change and are adequate for the MUR power uprate.

Response

The existing LGS fire safe shutdown evaluation is based on a core thermal power of 3622 MWt, which bounds the requested TPO power level of 3515 MWt. Thus, the existing fire safe shutdown evaluation is unaffected by the TPO uprate, and there are no new operator actions required for fire safe shutdown. Additional heat in the plant environment from the increased power will not prevent required post fire operator manual actions from being performed at and within their designated time. There is no impact on the procedures and resources necessary to achieve and maintain safe shutdown, which remain adequate for the TPO uprate.

NRC Request 5

Some plants credit aspects of their fire protection system for other than fire protection activities (e. g., utilizing the fire water pumps and water supply as backup cooling or inventory for non-primary reactor systems). If LGS, Units 1 and 2, credit the fire protection system in this way, the

MUR power uprate LAR should identify the specific situations and discuss to what extent, if any, the MUR power uprate affects these "non-fire-protection" aspects of the plant fire protection system. If LGS, Units 1 and 2, do not take such credit, the staff requests that the licensee verify this as well.

Response

There are no design basis accidents or transients (other than fire) that credit the use of the fire protection (FP) system at LGS. However, there are situations beyond the design basis in which LGS would use the FP system as an alternate water source in Emergency Operating Procedures (EOPs) and other procedures for situations in which the design basis sources of water are unavailable. As described below, the TPO uprate has no impact on the use of the FP system in these situations.

- LGS Transient Response Implementation Plan procedure, T-225, "Startup and Shutdown of Suppression Pool and Drywell Spray Operation," provides guidance to line up and spray the suppression pool or drywell from the FP system as an alternate, if design basis spray systems are not available. T-244, "Alternate Injection from the Fire System," provides guidance to line up and inject water from the FP system to the reactor pressure vessel if design basis injection sources are not available. The basis for supplying fire protection system water to containment under these non-design basis conditions is not power dependent, but is based on the ability to provide a minimum flow rate considering fire pump capability, piping/hose losses, and peak drywell pressure during a recirculation line break. Since the peak drywell pressure of 44.0 psig is bounding for TPO conditions, the capability to deliver the previously determined quantity of fire water to containment is unaffected by the TPO uprate.

- LGS Technical Support Guideline (TSG) 4.1, "Operational Contingency Guidelines," provides guidance for several methods to provide water from the FP system to fill the spent fuel pool and/or reactor cavity when reactor building access is restricted due to events beyond the current design basis, such as some security events. The beyond design basis scenarios addressed by TSG 4.1 in which water from the FP system could be utilized are unaffected by the TPO uprate, since FP use in TSG 4.1 is to mitigate in-plant damage, and the scenarios are non-power dependent.

REFERENCES

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

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