

August 24, 2007

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:** Response to Request for Additional Information  
License Amendment Request  
Proposed Changes to Emergency Diesel Generator Testing Requirements

- REFERENCES:** (1) Letter from P. B. Cowan, Exelon Generation Company, LLC, to U. S. Nuclear Regulatory Commission, License Amendment Request, "License Amendment Request; Proposed Changes to Emergency Diesel Generator Testing Requirements," dated November 27, 2006.
- (2) Letter from P. Bamford, U. S. Nuclear Regulatory Commission, to C. M. Crane, Exelon Generation Company, LLC, "Limerick Generating Station Unit Nos.1 and 2 - Request for Additional Information Regarding Proposed Emergency Diesel Generator Technical Specification Testing Changes (TAC Nos. MD3710 and MD3711)," dated July 27, 2007.

In Reference 1, Exelon Generation Company, LLC (Exelon) requested changes to the Technical Specifications (TS), Appendix A of Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (LGS), Units 1 and 2, respectively. The proposed changes would modify the TS testing requirements for emergency diesel generators (EDGs) with the objective of improving EDG reliability by reducing potential equipment degradation due to excessive testing requirements.

In Reference 2, the NRC requested additional information concerning the LGS License Amendment Request (LAR). In particular, the NRC requested Exelon to provide a detailed technical justification for relaxing the acceptance criteria currently contained in the LGS TS for the EDG load rejection test. The attachment to this letter restates the NRC question, and provides Exelon's response.

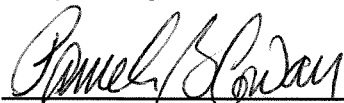
Response to Request for Additional Information  
License Amendment Request  
Emergency Diesel Generator Testing Requirements  
Docket Nos. 50-352 and 50-353  
August 24, 2007  
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Exelon has concluded that the information provided in this response does not impact the conclusions of the: (1) Technical Analysis, (2) No Significant Hazards Consideration under the standards set forth in 10 CFR 50.92(c), or (3) Environmental Consideration as provided in the original submittal (Reference 1).

There are no regulatory commitments contained within this letter. If you have any questions or require additional information, please contact Glenn Stewart at 610-765-5529.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 24th day of August, 2007.

Respectfully,

*PBC*  \_\_\_\_\_

Pamela B. Cowan  
Director, Licensing & Regulatory Affairs  
Exelon Generation Company, LLC

Attachment: Response to Request for Additional Information

cc:	Regional Administrator - NRC Region I	w/ attachment
	NRC Senior Resident Inspector - Limerick Generating Station	"
	NRC Project Manager, NRR - Limerick Generating Station	"
	Director, Bureau of Radiation Protection - Pennsylvania Department of Environmental Protection	"

**ATTACHMENT  
LICENSE AMENDMENT REQUEST  
DOCKET NOS. 50-352 AND 50-353  
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

In Reference 1, Exelon Generation Company, LLC (Exelon) requested changes to the Technical Specifications (TS), Appendix A of Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (LGS), Units 1 and 2, respectively. The proposed changes would modify the TS testing requirements for emergency diesel generators (EDGs) with the objective of improving EDG reliability by reducing potential equipment degradation due to excessive testing requirements.

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**Question**

By letter dated November 27, 2006, Agencywide Documents Access and Management System Accession No. ML063310230, Exelon Generation Company, LLC submitted a license amendment request regarding the technical specifications (TSs) for Limerick Generating Station (LGS), Units 1 and 2. The proposed changes would modify the TS testing requirements for the emergency diesel generators (EDGs). Based on the review of the information provided by the licensee, the Nuclear Regulatory Commission staff has the following additional question.

Page 9 of Attachment 1 of the November 27, 2006, submittal states the following:

“Consistent with RG [Regulatory Guide] 1.9, the 1.8 seconds specified is equal to 60% of the 3-second load sequence interval associated with sequencing the next load following the RHR [residual heat removal] pumps in response to an undervoltage on the electrical bus concurrent with a LOCA [loss of coolant accident]. The change is acceptable because, based on RG 1.9 recommendations, it provides assurance that EDG [emergency diesel generator] frequency does not exceed predetermined limits and that frequency stability is sufficient to support proper load sequencing following a rejection of the largest single load.”

Furthermore, page 13 of Attachment 1 of the November 27, 2006, submittal lists RG 1.9, Revision 2 as a reference.

Is it your intent to fully commit to RG 1.9, Revision 2? If so, clearly indicate your intent in writing. If not, provide a detailed technical justification for relaxing the acceptance criteria currently contained in your technical specifications for the EDG load rejection test.

Response

It is not Exelon's intent to fully commit to Regulatory Guide 1.9, Revision 2 (Reference 3). Therefore, a detailed technical justification for relaxing the acceptance criteria currently contained in the LGS TS for the EDG load rejection test is provided below. The additional information below supplements the information originally provided on page 9 of Attachment 1 of our November 27, 2006 (Reference 1) submittal.

The EDG and its connected loads constitute a stored energy system which cannot respond instantaneously to an input or perturbation, such as that which occurs during the shedding of the Residual Heat Removal (RHR) pump, which constitutes the largest single post-accident load on the EDG. Because of the relatively small magnitude of the inertial loading of the RHR pump compared to the EDG, the voltage and frequency transient response often satisfies the existing TS acceptance criteria of maintaining voltage between  $4285 \pm 420$  Volts and frequency between  $60 \pm 1.2$  Hz throughout the transient. However, on occasion the frequency exceeds the existing  $+1.2$  Hz criteria by a small amount. When the existing criteria are not satisfied, the plant must make small adjustments to the EDG governor system. Momentarily exceeding the  $+1.2$  Hz limit by a small amount has no effect on the overall ability of the EDG to perform its safety function; however, adjustments must be completed in order to meet the existing TS criteria. Depending on the actual adjustments made to the governor, the plant must enter into a post maintenance testing evolution that consists of multiple starts on the EDG accompanied by rapid sequential loading. This testing evolution is adverse to the long-term reliability of the EDG as it is imposing excessive testing and unnecessary stressors on the system.

The subject License Amendment Request proposes to change the EDG single largest load rejection test acceptance criteria to introduce a settling time of 1.8 seconds during which the EDG frequency would be allowed to exceed the 1.2 Hz limit. The voltage remains within  $4285 \pm 420$  Volts throughout the 1.8 second settling time. The maximum permitted frequency overshoot during the proposed 1.8-second period would be 66.5 Hz, which retains a 25% margin to the lowest potential overspeed trip setpoint of the EDG. The Limerick EDGs operate at nominally 900 rpm and the minimum EDG overspeed trip setpoint is 1030 rpm. The 66.5 Hz frequency limit correlates to 997.5 rpm engine speed, which is below the engine speed limit provided by the EDG manufacturer. Further, each generator has been proof-tested to 125% of the nominal 900 rpm operating speed (1125 rpm) for one minute during factory testing. Therefore, the imposition of the 66.5 Hz maximum frequency overshoot limit for the proposed settling time of 1.8 seconds ensures that no damage will occur to either the engine or the generator.

LGS performs this test with the EDG carrying its associated 4kV bus in the isochronous mode. Therefore, the safety loads that are on the bus will be exposed to the transient. There are several categories of loads that need to be examined for their exposure to frequencies in excess of the standard (continuous) design range of  $\pm 5\%$ . Resistive loads, such as incandescent lighting and heating elements, are insignificantly affected by frequency fluctuations of this magnitude. The front end of instrument power supplies are typically rectifier assemblies. Fluctuations of frequency up to 66.5 Hz would not have a significant effect on the response of the rectifiers. As there is no variation outside of the  $\pm 10\%$  value in the voltage, there would be no effect on instruments and their power supplies. The over-excitation of transformers, either in instrument power supplies, bus potential transformers, control power

transformers, or power transformers relates to an increase in the Volts-to-Hertz (V/Hz) ratio of the excitation. Hysteresis and eddy-current losses increase rapidly at V/Hz ratios above 110%, or at excessively high frequencies. Since the voltage is maintained at less than 110%, any increase in frequency only goes to reduce the V/Hz ratio to less than 110%. At 66.5 Hz for 1.8 seconds, the effect of increased losses would be insignificant. The same V/Hz argument can be made for motors. Additionally, motors would be momentarily exposed to a frequency higher than normal causing their speed to want to increase proportionately. As the period of exposure ( $\leq 1.8$  seconds) is small in comparison to the inertia of the motor, there will be no significant changes felt by the running motors, or their connected loads. Furthermore, experience has shown that performance of this test introduces no adverse perturbations into the plant that could challenge safety systems or plant operations.

The proposed change is consistent with the theme of a reduction in excessive EDG testing that is advocated in Generic Letter 93-05 (Reference 4) and NUREG-1366 (Reference 5), conforms to the industry standard guidance as documented in Position C.4 of NRC Regulatory Guide 1.9, Rev. 2 (Reference 3), conforms to the current LGS licensing basis as stated in Section 8.1.6.1.2 of the LGS Updated Final Safety Analysis Report (Reference 6), and is consistent with the improved Standard Technical Specifications as documented in Revision 3.1 of NUREG-1433 (Reference 7).

**References:**

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- (3) NRC Regulatory Guide 1.9, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants," Rev. 2, December 1979.
- (4) Generic Letter 93-05, "Line-Item Technical Specifications Improvement to Reduce Surveillance Requirements for Testing During Power Operation," dated September 27, 1993.
- (5) NUREG-1366, "Improvements to Technical Specifications Surveillance Requirements," dated December 1992.
- (6) Limerick Generating Station Updated Final Safety Analysis Report, Section 8.1.6.1.2.
- (7) NUREG-1433, Vol. 1, Rev. 3.1, "Standard Technical Specifications General Electric Plants, BWR/4," published December 2005.