Exelon Generation®

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10 CFR 50.46

November 9, 2012

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 10 CFR 50.46 Annual Report

References: 1) Letter from Michael D. Jesse (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated November 23, 2011

The purpose of this letter is to submit the 10 CFR 50.46 reporting information for Limerick Generating Station (LGS), Units 1 and 2. The most recent annual 50.46 Report for LGS, Units 1 and 2, (Reference 1) provided the cumulative Peak Cladding Temperature (PCT) errors for the most recent fuel designs through November 23, 2011.

Since the referenced report was issued, no vendor notifications of an Emergency Core Cooling System (ECCS) model error/change applicable to LGS, Units 1 and 2, have been issued. Also, no ECCS-related changes or modifications have occurred at LGS, Units 1 and 2, that affect the assumptions of the ECCS analyses. It should also be noted that since the last annual report (Reference 1), the GNF2 fuel design has been introduced into the LGS, Unit 1 core. All 50.46 errors that applied to the GNF2 fuel in the Unit 2 core also apply to the Unit 1 core since the analysis is generic to each unit.

Three attachments are included with this letter that provide the current LGS, Units 1 and 2, 10 CFR 50.46 status. Attachments 1 and 2 ("Peak Cladding Temperature Rack-Up Sheet")

provide updated information regarding the PCT for the limiting Loss of Coolant Accident (LOCA) analysis evaluations for LGS, Units 1 and 2, respectively. Attachment 3, "Assessment Notes," contains a detailed description for each change or error reported.

If you have any questions, please contact Tom Loomis at 610-765-5510.

Respectfully,

Michael D. Jesse
Director - Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Attachments: 1) Peak Cladding Temperature Rack-Up Sheet (Limerick Generating Station, Unit 1)
2) Peak Cladding Temperature Rack-Up Sheet (Limerick Generating Station, Unit 2)
3) Assessment Notes (Limerick Generating Station, Units 1 and 2)

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

ATTACHMENT 1

10 CFR 50.46
"Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors"

Report of the Emergency Core Cooling System Evaluation Model Changes and Errors

Assessments as of November 9, 2012

Peak Cladding Temperature Rack-Up Sheet

Limerick Generating Station, Unit 1

PLANT NAME: Limerick Unit 1
ECCS EVALUATION MODEL: SAFER/GESTR-LOCA
REPORT REVISION DATE: 11/9/12
CURRENT OPERATING CYCLE: 15

ANALYSIS OF RECORD

Evaluation Model:

1. NEDC-23785-1-PA Rev. 1, “The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-Of-Coolant Accident Volume II, SAFER – Long Term Inventory Model for BWR Loss-Of-Coolant Analysis,” October 1984.

2. NEDC-30996P-A, “SAFER Model for Evaluation of Loss-of-Coolant Accidents for Jet Pump and Non-jet Pump Plants, Volume I, SAFER – Long Term Inventory Model for BWR Loss-of-Coolant Analysis,” October 1987.

3. NEDC-32950P, “Compilation of Improvements to GENE’s SAFER ECCS-LOCA Evaluation Model,” January 2000.

4. NEDC-23785-1-PA Rev. 1, “The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-Of-Coolant Accident Volume III, SAFER/GESTR Application Methodology,” October 1984. (Jet Pump Plant – SAFER)

Calculations:

1. "Limerick Generating Station, Units 1 and 2 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis,” NEDC-32170P, Rev. 2, May 1995.

2. "Limerick Generating Station Units 1 and 2 ECCS-LOCA Evaluation for GE14," GE-NE-J1103793-09-01P, March 2001.

3. “Limerick Generating Station Units 1 and 2 GNF2 ECCS-LOCA Evaluation,” 0000-0111-9078-R0, February 2011

Fuels Analyzed in Calculations and in Operation: GE14 and GNF2
Limiting Fuel Type: GNF2
Limiting Single Failure (GE14/GNF2): Battery Failure
Limiting Break Size and Location (GE14/GNF2): Double-Ended Guillotine in a Recirculation Suction Pipe

Reference Peak Cladding Temperature (PCT) – GE14: 1670°F
Reference Peak Cladding Temperature (PCT) – GNF2: 1880°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated December 18, 2002 (See Note 1)	GE14 ΔPCT = 10°F
10 CFR 50.46 Report dated December 16, 2003 (See Note 2)	GE14 ΔPCT = -5°F
10 CFR 50.46 Report dated December 3, 2004 (See Note 3)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated December 1, 2005 (See Note 4)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated December 1, 2006 (See Note 5)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 30, 2007 (See Note 6)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 24, 2008 (See Note 7)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 24, 2009 (See Note 8)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 24, 2010 (See Note 9)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 23, 2011 (See Note 10)	GE14 ΔPCT = 50°F GNF2 ΔPCT = 50°F
Net PCT (GE14)	**1725°F**
Net PCT (GNF2)	**1930°F**

B. CURRENT LOCA MODEL ASSESSMENTS

None (See Note 11)	GE14 ΔPCT = 0°F GNF2 ΔPCT = 0°F
Total PCT change from current assessments (GE14)	∑ΔPCT = 0 °F
Total PCT change from current assessments (GNF2)	∑ΔPCT = 0 °F
Cumulative PCT change from current assessments (GE14)	∑ |ΔPCT| = 0 °F
Cumulative PCT change from current assessments (GNF2)	∑ |ΔPCT| = 0 °F
Net PCT (GE14)	**1725°F**
Net PCT (GNF2)	**1930°F**

ATTACHMENT 2

10 CFR 50.46
"Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors"

Report of the Emergency Core Cooling System Evaluation Model Changes and Errors

Assessments as of November 9, 2012

Peak Cladding Temperature Rack-Up Sheet

Limerick Generating Station, Unit 2

PLANT NAME: Limerick Unit 2
ECCS EVALUATION MODEL: SAFER/GESTR-LOCA
REPORT REVISION DATE: 11/9/12
CURRENT OPERATING CYCLE: 12

ANALYSIS OF RECORD

Evaluation Model:

1. NEDC-23785-1-PA Rev. 1, “The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-Of-Coolant Accident Volume II, SAFER – Long Term Inventory Model for BWR Loss-Of-Coolant Analysis,” October 1984.

2. NEDC-30996P-A, “SAFER Model for Evaluation of Loss-of-Coolant Accidents for Jet Pump and Non-jet Pump Plants, Volume I, SAFER – Long Term Inventory Model for BWR Loss-of-Coolant Analysis,” October 1987.

3. NEDC-32950P, “Compilation of Improvements to GENE’s SAFER ECCS-LOCA Evaluation Model,” January 2000.

4. NEDC-23785-1-PA Rev. 1, “The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-Of-Coolant Accident Volume III, SAFER/GESTR Application Methodology,” October 1984. (Jet Pump Plant – SAFER)

Calculations:

1. "Limerick Generating Station, Units 1 and 2 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis,” NEDC-32170P, Rev. 2, May 1995.

2. "Limerick Generating Station Units 1 and 2 ECCS-LOCA Evaluation for GE14," GE-NE-J1103793-09-01P, March 2001.

3. “Limerick Generating Station Units 1 and 2 GNF2 ECCS-LOCA Evaluation,” 0000-0111-9078-R0, February 2011.

Fuels Analyzed in Calculations and in Operation: GE14 and GNF2
Limiting Fuel Type: GNF2
Limiting Single Failure (GE14/GNF2): Battery Failure
Limiting Break Size and Location (GE14/GNF2): Double-Ended Guillotine in a Recirculation Suction Pipe

Reference Peak Cladding Temperature (PCT) – GE14: 1670°F
Reference Peak Cladding Temperature (PCT) – GNF2: 1880°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated December 18, 2002 (See Note 1)	GE14 ΔPCT = 10°F
10 CFR 50.46 Report dated December 16, 2003 (See Note 2)	GE14 ΔPCT = -5°F
10 CFR 50.46 Report dated December 3, 2004 (See Note 3)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated December 1, 2005 (See Note 4)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated December 1, 2006 (See Note 5)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 30, 2007 (See Note 6)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 24, 2008 (See Note 7)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 24, 2009 (See Note 8)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 24, 2010 (See Note 9)	GE14 ΔPCT = 0°F
10 CFR 50.46 Report dated November 23, 2011 (See Note 10)	GE14 ΔPCT = 50°F GNF2 ΔPCT = 50°F
Net PCT (GE14)	**1725°F**
Net PCT (GNF2)	**1930°F**

B. CURRENT LOCA MODEL ASSESSMENTS

None (See Note 11)	GE14 ΔPCT = 0°F GNF2 ΔPCT = 0°F
Total PCT change from current assessments (GE14)	∑ΔPCT = 0 °F
Total PCT change from current assessments (GNF2)	∑ΔPCT = 0 °F
Cumulative PCT change from current assessments (GE14)	$\sum \lvert \Delta PCT \rvert$ = 0 °F
Cumulative PCT change from current assessments (GNF2)	$\sum \lvert \Delta PCT \rvert$ = 0 °F
Net PCT (GE14)	**1725°F**
Net PCT (GNF2)	**1930°F**

Attachment 3

10 CFR 50.46
"Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors"

Report of the Emergency Core Cooling System Evaluation Model Changes and Errors

Assessment Notes

Limerick Generating Station, Units 1 and 2

1. Prior LOCA Assessment

   The referenced letter provided an annual 50.46 report for Units 1 and 2. This letter reported GE LOCA errors related to a SAFER core spray sparger elevation error and a SAFER bulk water level error. The PCT impact for the new errors was determined to be 15°F and -5°F, respectively, for GE14 fuel. The total PCT impact of these errors was determined to be 10°F for GE14 fuel.

   [Reference: Letter from Michael P. Gallagher (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Reporting Requirements," dated December 18, 2002.]

2. Prior LOCA Assessment

   The referenced letter provided an annual 50.46 report for Units 1 and 2. This letter reported a GE LOCA error related to a SAFER Level/Volume Table error. The PCT impact for the new error was determined to be -5°F for GE14 fuel.

   [Reference: Letter from Michael P. Gallagher (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Reporting Requirements," dated December 16, 2003.]

3. Prior LOCA Assessment

   The referenced letter provided an annual 50.46 report for Units 1 and 2. This letter reported GE LOCA errors related to a GESTR file interpolation error, a SAFER computer platform change, a WEVOL S1 volume error, a SAFER separator pressure drop error and a new heat source. The PCT impact for the new errors was determined to be 0°F for each error. The total PCT impact of these errors on GE14 fuel was determined to be 0°F.

   [Reference: Letter from Michael P. Gallagher (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated December 3, 2004.]

4. Prior LOCA Assessment

   The referenced letter provided an annual 50.46 report for Units 1 and 2. There were no errors reported for the 2005 reporting period.

   [Reference: Letter from Pamela B. Cowan (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated December 1, 2005.]

5. Prior LOCA Assessment

   The referenced letter provided an annual 50.46 report for Units 1 and 2. This letter reported a newly discovered sensitivity to the assumed axial power shape for small break LOCA cases. This sensitivity may result in higher calculated PCT values for top-peaked axial power shapes. Due to this sensitivity, the calculated small break PCT for Limerick was higher than the previously calculated value. However, the Licensing Basis PCT

(based on large break) remained the same. Therefore the PCT impact of the new power shape sensitivity was determined to be 0°F for GE14 fuel.

[Reference: Letter from David P. Helker (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated December 1, 2006.]

6. Prior LOCA Assessment

The referenced letter provided an annual 50.46 report for Units 1 and 2. There were no errors reported for the 2007 reporting period.

[Reference: Letter from David P. Helker (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated November 30, 2007.]

7. Prior LOCA Assessment

The referenced letter provided an annual 50.46 report for Units 1 and 2. There were no errors reported for the 2008 reporting period.

[Reference: Letter from David P. Helker (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated November 24, 2008.]

8. Prior LOCA Assessment

The referenced letter provided an annual 50.46 report for Units 1 and 2. There were no errors reported for the 2009 reporting period.

[Reference: Letter from David P. Helker (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated November 24, 2009.]

9. Prior LOCA Assessment

The referenced letter provided an annual 50.46 report for Units 1 and 2. There were no errors reported for the 2010 reporting period.

[Reference: Letter from David P. Helker (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated November 24, 2010.]

10. Prior LOCA Assessment

The referenced letter provided an annual 50.46 report for Units 1 and 2. The referenced letter discussed the introduction of the GNF2 fuel design to the Limerick Unit 2 core. The assessment notes above (Notes 1-9) are not applicable to GNF2 fuel. Subsequent to the referenced letter, the GNF2 fuel design was introduced to the Unit 1 core and the errors discussed in this note also apply to Unit 1 (See Note 11).

Also discussed in the referenced letter are two vendor notifications of Emergency Core Cooling System (ECCS) model error/changes for GE14 and GNF2 fuel applicable to Limerick. The errors/changes are summarized below.

The first error involved the way input coefficients were used to direct the deposition of gamma radiation energy produced by the fuel. Correction of this error resulted in a PCT increase of 45°F for both the GE14 fuel and GNF2 fuel.

The second error involved the contribution of heat from gamma ray absorption by the channel. The gamma ray absorption by the channel was found to have been minimized. Correction of this error resulted in a PCT increase of 5°F for both the GE14 fuel and GNF2 fuel.

[Reference: Letter from Michael D. Jesse (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated November 23, 2011.]

11. Current LOCA Assessment

Since the last 10 CFR 50.46 report (see Note 10), GNF2 fuel was introduced into the Unit 1 core during Reload 14 (Cycle 15) outage. The ECCS model error/changes discussed in Note 10 are applied to Unit 1 as Prior LOCA Model Assessments.

No vendor notifications of Emergency Core Cooling System (ECCS) model errors/changes applicable to Limerick have been issued since the last 10 CFR 50.46 report (see Note 10). No ECCS related changes or modifications have occurred at Limerick that affect the assumptions in the Limerick Generating Station LOCA analysis of record.