

RS-11-131

10 CFR 50.46(a)(3)(ii)

August 10, 2011

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

Clinton Power Station, Unit 1  
Facility Operating License No. NPF-62  
NRC Docket No. 50-461

Subject: Plant Specific ECCS Evaluation Changes – 10 CFR 50.46 30-Day Report for Fuel Type GE14

References:

1. Letter from J. L. Hansen (Exelon Generation Company, LLC(EGC)) to U. S. NRC, "RS-10-162 - Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated October 29, 2010
2. Letter from GE Hitachi Nuclear Energy (GEH) to EGC, "10 CFR 50.46 Notification Letter 2011-02, Clinton Power Station," dated July 20, 2011
3. Letter from GEH to EGC, "10 CFR 50.46 Notification Letter 2011-03, Clinton Power Station," dated July 20, 2011

In accordance with 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," paragraph (a)(3)(ii), Exelon Generation Company, LLC (EGC), is submitting this letter and its attachment to notify the NRC of changes or errors discovered in the Clinton Power Station, Unit 1 (CPS), plant specific emergency core cooling system (ECCS) evaluation for Global Nuclear Fuel (GNF) GE14 fuel that have been determined to be significant. This submittal meets the requirements of 10 CFR 50.46(a)(3)(ii) for submittal of a report within 30 days.

In Reference 1, EGC provided the NRC with the annual 10 CFR 50.46 Report for CPS. On July 20, 2011, EGC received notification from GEH that errors had been discovered in the GEH methodology used to analyze the ECCS loss of coolant accident (LOCA) response for CPS. The errors are associated with the way the GEH methodology distributes gamma energy deposition within GNF fuel. The error reported in Reference 2 results in a 25 °F increase in the analyzed peak cladding temperature (PCT) for GE14 fuel. The error reported in Reference 3 results in a 40 °F decrease in the analyzed PCT for GE14 fuel. Since the current GE14 licensing basis PCT is 1601 °F for CPS, the revised licensing basis PCT, accounting for these

errors, is 1586 °F. The revised PCT remains within the 2200 °F acceptance criterion of 10 CFR 50.46; however, since the absolute magnitude of the errors is greater than 50 °F, this report must be submitted to the NRC within 30 days of the notification in accordance with the requirements of 10 CFR 50.46(a)(3)(ii).

The attachment to this letter provides updated information regarding the PCT value for the GE14 fuel in the CPS core. Note 13 of the attachment provides details related to errors discussed above.

There are no commitments contained in this letter. If there are any questions concerning this letter, please contact Mitchel Mathews at (630) 657-2819.

Respectfully,

A handwritten signature in black ink, appearing to read 'D M Gullott', with a long horizontal flourish extending to the right.

David M. Gullott  
Manager - Licensing

Attachment: Clinton Power Station, Unit 1 - 10 CFR 50.46 Report 30-Day Report for GE14 Fuel

cc: Regional Administrator – NRC Region III  
NRC Senior Resident Inspector – Clinton Power Station

**Attachment**

**Clinton Power Station, Unit 1**

**10 CFR 50.46(a)(3)(ii) 30-Day Report for GE14 Fuel**

**Attachment  
Clinton Power Station, Unit 1  
10 CFR 50.46 30-Day Report for GE14 Fuel**

**Page 1 of 6**

PLANT NAME: Clinton Power Station, Unit 1  
ECCS EVALUATION MODEL: SAFER/GESTR - LOCA  
REPORT REVISION DATE: 8/1/2011  
CURRENT OPERATING CYCLE: 13

**ANALYSIS OF RECORD**

Evaluation Model Methodology: The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident; Volume III, SAFER/GESTR Application Methodology, NEDC-23785-1-PA, Revision 1, General Electric Company, October 1984.

Calculation: Clinton Power Station, SAFER/GESTR-LOCA Analysis Basis Documentation, NEDC-32974P, GE Nuclear Energy, October 2000.

Fuel: GE 14

Limiting Fuel: GE 14

Limiting Single Failure: High Pressure Core Spray (HPCS) Diesel Generator

Limiting Break Size and Location: 1.0 Double Ended Guillotine of Recirculation Pump Suction Piping

**Reference Peak Cladding Temperature (PCT): 1550°F**

**Attachment**  
**Clinton Power Station, Unit 1**  
**10 CFR 50.46 30-Day Report for GE14 Fuel**

**Page 2 of 6**

**MARGIN ALLOCATION**

**A. PRIOR LOSS OF COOLANT ACCIDENT (LOCA) MODEL ASSESSMENTS**

10 CFR 50.46 report dated November 13, 2000 (See Note 1)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated November 08, 2001 (See Note 2)	$\Delta PCT = 5^{\circ}F$
10 CFR 50.46 report dated November 05, 2002 (See Note 3)	$\Delta PCT = 35^{\circ}F$
10 CFR 50.46 report dated November 05, 2003 (See Note 4)	$\Delta PCT = 5^{\circ}F$
10 CFR 50.46 report dated November 05, 2004 (See Note 5)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated November 04, 2005 (See Note 6)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated November 03, 2006 (See Note 7)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 19, 2007 (See Note 8)	$\Delta PCT = 6^{\circ}F$
10 CFR 50.46 report dated November 02, 2007 (See Note 9)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated October 31, 2008 (See Note 10)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated October 30, 2009 (See Note 11)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated October 29, 2010 (See Note 12)	$\Delta PCT = 0^{\circ}F$
<b>Net PCT</b>	<b>1601°F</b>

**B. CURRENT LOCA MODEL ASSESSMENTS**

Gamma energy deposition error 1 (See Note 13)	25°F
Gamma energy deposition error 2 (See Note 13)	-40°F
Total PCT change from current assessments	$\Sigma \Delta PCT = -15^{\circ}F$
Cumulative PCT change from current assessments	$\Sigma  \Delta PCT  = 65^{\circ}F$
<b>Net PCT</b>	<b>1586°F</b>

**Attachment  
Clinton Power Station, Unit 1  
10 CFR 50.46 30-Day Report for GE14 Fuel**

**Page 3 of 6**

**1. Prior LOCA Model Assessments**

The referenced letter reported a new analysis of record for Clinton Power Station (CPS).

[Reference: Letter from M. A. Reandeu (AmerGen Energy Company) to U.S. NRC, "Report of a Change to the ECCS Evaluation Model Used for Clinton Power Station (CPS)," dated November 13, 2000.]

**2. Prior LOCA Model Assessments**

An inconsistent core exit steam flow was used in the pressure calculation in the SAFER code when there is a change in the two-phase level. The incorrect calculated pressure may result in premature termination of ECCS condensation and will impact the second peak clad temperature (PCT). GE evaluated the impact of this error and determined that the impact is an increase of 5°F in the PCT. This error was reported to the NRC in the referenced letter.

[Reference: Letter from K. A. Ainger (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated November 8, 2001.]

**3. Prior LOCA Model Assessments**

In the referenced letter to the NRC, the impact of the Low Pressure Coolant Injection (LPCI) and Low Pressure Core Spray (LPCS) minimum flow valve flow diversion was reported and was found to have a 0°F impact. Also in the referenced letter GE LOCA errors were reported all of which had a 0°F PCT increase except for a SAFER Core Spray sparger injection elevation error that resulted in a 15°F increase in the PCT. The Extended Power Uprate (EPU) has resulted in an increase of 20°F in the PCT. The EPU was implemented in Cycle 9 Reload.

[Reference: Letter from Patrick R. Simpson (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated November 5, 2002.]

**4. Prior LOCA Model Assessments**

In the referenced letter to the NRC, the impact of an error found in the initial level/volume table for SAFER was reported. The level/volume tables were generated with incorrect initial water levels. This resulted in an incorrect volume split in the nodes above and below the water surface, and incorrect initial liquid mass. This error resulted in a 5°F increase in the PCT for all fuel types (i.e., GE 10 & GE14).

[Reference: Letter from Patrick R. Simpson (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated November 5, 2003.]

**Attachment  
Clinton Power Station, Unit 1  
10 CFR 50.46 30-Day Report for GE14 Fuel**

**Page 4 of 6**

**5. Prior LOCA Model Assessments**

In the referenced letter to the NRC, the impact of a GE postulated new heat source applicable to the LOCA event was reported. This heat source is due to recombination of hydrogen and excess oxygen drawn into the vessel from containment during core heatup. The PCT impact for all fuel types was 0°F and the effect on local oxidation was negligible.

[Reference: Letter from Patrick R. Simpson (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated November 5, 2004.]

**6. Prior LOCA Model Assessments**

In the referenced letter to the NRC, the impact of the 24-month cycle operation was reported. The evaluation determined that the LOCA analysis of record was performed with bounding assumptions and hence is not impacted with the 24-month cycle. A 0°F PCT impact was assigned.

[Reference: Letter from Patrick R. Simpson (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated November 4, 2005.]

**7. Prior LOCA Model Assessments**

In the referenced letter to the NRC, the impact of the top peak axial power shape on the small break LOCA was reported. The impact of the top peak axial power shape on the licensing basis PCT was 0°F for GE 14 Fuel for CPS.

[Reference: Letter from Kenneth M. Nicely (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated November 3, 2006.]

**8. Prior LOCA Model Assessments**

In the referenced letter, the impact of the core shroud repair on the PCT was reported to the NRC. The leakage flows through the repair holes result in slightly increased time to core recovery, following core uncovering. The effect has been conservatively assessed to increase the PCT for the limiting LOCA by less than 6 °F.

[Reference: Letter from Patrick R. Simpson (Exelon Generation Company) to U.S. NRC, "Updated Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated April 19, 2007.]

**Attachment  
Clinton Power Station, Unit 1  
10 CFR 50.46 30-Day Report for GE14 Fuel**

**Page 5 of 6**

**9. Prior LOCA Model Assessments**

In the referenced letter, Exelon submitted to the NRC the annual 10CFR 50.46 report for 2007. There was no LOCA model assessment for the Clinton LOCA analysis.

[Reference: Letter from Jeffrey L. Hansen (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated November 2, 2007.]

**10. Prior LOCA Model Assessments**

In the referenced letter, Exelon submitted to the NRC the annual 10CFR 50.46 report for 2008. There was no LOCA model assessment for the Clinton LOCA analysis.

[Reference: Letter from Jeffrey L. Hansen (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated October 31, 2008.]

**11. Prior LOCA Model Assessments**

In the referenced letter, Exelon submitted to the NRC the annual 10CFR 50.46 report for 2009. There was no LOCA model assessment for the Clinton LOCA analysis.

[Reference: Letter from Jeffrey L. Hansen (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated October 30, 2009.]

**12. Prior LOCA Model Assessments**

In the referenced letter, Exelon submitted to the NRC the annual 10CFR 50.46 report for 2010. Eight Isotope Test Assemblies (GE14i ITA) were loaded in to the cycle 13 core, all the GE14 10CFR50.46 errors are applicable to the GE14i ITA and the PCT for GE14 fuel remain applicable for GE14i ITAs.

[Reference: Letter from Jeffrey L. Hansen (Exelon Generation Company) to U.S. NRC, "Annual Report of Emergency Core Cooling System Evaluation Model Changes and Errors for Clinton Power Station," dated October 29, 2010.]



**Attachment  
Clinton Power Station, Unit 1  
10 CFR 50.46 30-Day Report for GE14 Fuel**

**Page 6 of 6**

**13. Current LOCA Model Assessment**

General Electric Hitachi Nuclear Energy (GEH) reported two errors in the LOCA methodology associated with the GE14 fuel in the Clinton Power Station core (i.e., References 1 and 2). In Reference 1, GEH reported an error related to the way input coefficients are used to direct the deposition of gamma radiation energy produced by the fuel. Accounting for this error results in a PCT increase of 25 °F. In Reference 2, GEH reported an error related to the contribution of heat from gamma ray absorption by the channel. The gamma ray absorption by the channel was found to have been minimized. Accounting for this error results in a PCT decrease of 40 °F. The cumulative impact of these errors results in a 15 °F decrease in the licensing basis PCT. When subtracted from the prior licensing basis PCT, the revised ECCS-LOCA licensing basis becomes 1586 °F, which is less than the 10 CFR 50.46 acceptance criterion of 2200 °F.

**References:**

1. Letter from General Electric Hitachi Nuclear Energy (GEH) to Exelon Generation Company, LLC (EGC), "10CFR50.46 Notification Letter 2011-02, Clinton Power Station," dated July 20, 2011
2. Letter from GEH to EGC, "10CFR50.46 Notification Letter 2011-03, Clinton Power Station," dated July 20, 2011