

10 CFR 50.46

NMP1L3126

January 27, 2017

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

Nine Mile Point Nuclear Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-63 and NPF-69
NRC Docket Nos. 50-220 and 50-410

Subject: 10 CFR 50.46 Annual Report

- References:
- 1) Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 29, 2016.
 - 2) Letter from GE Hitachi Nuclear Energy (GEH) to Exelon, "10 CFR 50.46 Notification Letter 2016-01, Nine Mile Point Nuclear Station (Unit 2)," dated March 14, 2016.

The purpose of this letter is to submit the 10 CFR 50.46 annual reporting information for Nine Mile Point Nuclear Station (NMP). Subsequent to the issuance of Reference 1, GE Hitachi Nuclear Energy (GEH) issued an error notice in Notification Letter 2016-01 (Reference 2) to NMP Unit 2. Reference 2 identifies that an incorrect steam dryer pressure drop was used to adjust the initial vessel water level used by the MELLLA+ ECCS-LOCA analysis for GE14 fuel. Correction of that error had no impact on the GE14 Licensing Basis Peak Cladding Temperature (PCT). Notification Letter 2016-01 is added to Attachment 3, Note 7, and the current LOCA model assessments in Attachment 2 is updated accordingly.

Three attachments are included with this letter that provide the current NMP 10 CFR 50.46 status. Attachments 1 and 2 provide the PCT and the rack-up sheets for the NMP1 and NMP2 LOCA analyses, respectively. Attachment 3, "Assessment Notes," contains a detailed description of each change/error reported.

There are no commitments contained in this letter. If you have any questions, please contact Ron Reynolds at 610-765-5247.

Respectfully,

A handwritten signature in black ink, appearing to read "James Barstow", is written over a horizontal line.

James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Attachments: 1) Peak Cladding Temperature Rack-Up Sheet for NMP1
2) Peak Cladding Temperature Rack-Up Sheet for NMP2
3) Assessment Notes, NMP

cc: USNRC Administrator, Region I
USNRC Senior Project Manager, NMP
USNRC Senior Resident Inspector, NMP

ATTACHMENT 1

10 CFR 50.46

**"Acceptance criteria for emergency core cooling systems
for light-water nuclear power reactors"**

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

Assessments as of January 27, 2017

Peak Cladding Temperature Rack-Up Sheet for NMP1

Nine Mile Point Nuclear Station, Unit 1

PLANT NAME: Nine Mile Point Nuclear Station, Unit 1
ECCS EVALUATION MODEL: SAFER/GESTR-LOCA(PRIME)/CORCL
REPORT REVISION DATE: 1/27/2017
CURRENT OPERATING CYCLE: 22

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-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.
3. 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.
4. NEDC-30996P-A, "SAFER Model for Evaluation of Loss-of-Coolant Accidents for Jet Pump and Non-jet Pump Plants, Volume II, SAFER Application Methodology," October 1987.
5. NEDO-33173 Supplement 4-A Rev. 1, "Implementation of PRIME Models and Data Downstream Methods," November 2012.

Calculations:

1. NEDC-31446P, Supplement 5, "Nine Mile Point Unit 1 Supplemental Loss-of-Coolant Accident Analysis For Small Break and revised DBA LOCA," January 2001.
2. 0000-0108-3371-SRLR Rev. 1, "Supplemental Reload Licensing Report for Nine Mile Point 1 Reload 21 Cycle 20," May 2011.
3. 0000-0098-3457-R2 000N1093-R0, "Nine Mile Point Nuclear Station Unit 1 GNF2 ECCS-LOCA Evaluation," January 2014.
4. 002N8720-R0, "Nine Mile Point Nuclear Station Unit 1 GNF2 ECCS-LOCA Evaluation 4-Loop, 1-Loop Isolated Operation at 100% Power," December 2015.
5. 002N2884-SRLR Rev. 0, "Supplemental Reload Licensing Report for Nine Mile Point 1 Reload 23 Cycle 22," November 2014.

Fuel: GE11, GNF2
Limiting Fuel Type: GE11
Limiting Single Failure: ADS Valve
Limiting Break Size and Location: 5.4615 ft² Double-Ended Guillotine in a Recirculation
Discharge Pipe (5.446 ft²) + Bottom Head Drain Line (0.0155 ft²)
Reference Peak Cladding Temperature (PCT): GE11 = 2150°F, GNF2 = 2150°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated January 30, 2014 (Note 1)	GE11: $\Delta PCT = N/A$ GNF2: $\Delta PCT = N/A$
10 CFR 50.46 30-Day Report dated December 12, 2014 (Note 2)	GE11: $\Delta PCT = +15^{\circ}F$ GNF2: $\Delta PCT = N/A$
10 CFR 50.46 Report dated January 30, 2015 (Notes 3 and 4)	GE11: $\Delta PCT = N/A$ GNF2: $\Delta PCT = N/A$
10 CFR 50.46 Report dated January 29, 2016 (Note 4)	GE11: $\Delta PCT = N/A$ GNF2: $\Delta PCT = N/A$
NET PCT	GE11: 2165°F GNF2: 2150°F

B. CURRENT LOCA MODEL ASSESSMENTS

Total PCT change from current assessments (Note 5)	GE11: $\sum \Delta PCT = N/A$ GNF2: $\sum \Delta PCT = N/A$
Cumulative PCT change from current assessments	GE11: $\sum \Delta PCT = N/A$ GNF2: $\sum \Delta PCT = N/A$
NET PCT	GE11: 2165°F GNF2: 2150°F

ATTACHMENT 2

10 CFR 50.46

**"Acceptance criteria for emergency core cooling systems
for light-water nuclear power reactors"**

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

Assessments as of January 27, 2017

Peak Cladding Temperature Rack-Up Sheet for NMP2

Nine Mile Point Nuclear Station, Unit 2

PLANT NAME: Nine Mile Point Nuclear Station, Unit 2
ECCS EVALUATION MODEL: SAFER/PRIME-LOCA
REPORT REVISION DATE: 1/27/2017
CURRENT OPERATING CYCLE: 16

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-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.
3. 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.
4. NEDC-30996P-A, "SAFER Model for Evaluation of Loss-of-Coolant Accidents for Jet Pump and Non-jet Pump Plants, Volume II, SAFER Application Methodology," October 1987.
5. NEDO-33173 Supplement 4-A Rev. 1, "Implementation of PRIME Models and Data in Downstream Methods," November 2012.

Calculations:

1. 0000-0162-4214-R0 Rev. 0, "Supplemental Project Task Report Constellation Energy Nuclear Group Nine Mile Point Nuclear Station Unit 2 MELLLA+ Task T0407: ECCS-LOCA SAFER/PRIME," August 2013.
2. 002N4205-R0, "Nine Mile Point Unit 2 GNF2 ECCS-LOCA Evaluation," December 2015

Fuel: GE14, GNF2
Limiting Fuel Type: GNF2
Limiting Single Failure: High Pressure Core Spray – Diesel Generator
Limiting Break Size and Location: 0.07 ft² Recirculation Suction Line Break
Reference Peak Cladding Temperature (PCT): GE14 = 1580°F, GNF2 = 1690°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated January 29, 2016 (Note 6)	GE14:	$\Delta PCT = +20^{\circ}\text{F}$
NET PCT	GE14:	1600°F

B. CURRENT LOCA MODEL ASSESSMENTS

Total PCT change from current assessments (Note 7)	GE14:	$\sum \Delta PCT = +0^{\circ}\text{F}$
	GNF2:	$\sum \Delta PCT = \text{N/A}$
Cumulative PCT change from current assessments	GE14:	$\sum \Delta PCT = 0^{\circ}\text{F}$
	GNF2:	$\sum \Delta PCT = \text{N/A}$
NET PCT	GE14:	1600°F
	GNF2	1690°F

ATTACHMENT 3

10 CFR 50.46

**"Acceptance criteria for emergency core cooling systems
for light-water nuclear power reactors"**

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

Assessments as of January 27, 2017

Assessment Notes, NMP

Nine Mile Point Nuclear Station

1) Prior LOCA Assessment (Unit 1)

Updated LOCA/MAPLHGR analyses were performed for GE11 fuel (Cycle 20) and GNF2 fuel (Cycle 21). These analyses maintained the reference PCT at 2150°F, and they superseded all prior LOCA assessments. These analyses incorporated all ECCS-LOCA methodology errors and changes known at those times.

[Reference: Letter from Paul M. Swift (Constellation Energy Nuclear Group) to the U.S. Nuclear Regulatory Commission, "10 CFR 50.46 ECCS Evaluation Model Annual Reports for 2013," dated January 30, 2014.]

2) Prior LOCA Model Assessment (Unit 1)

Subsequent to the 2014 10 CFR 50.46 Report (Note 1), four vendor notifications were received.

- The first notification addressed several accumulated updates to the SAFER04A model. These code maintenance changes resulted in a PCT change of +10°F for GE11 fuel.
- The second notification corrected a logic error that was isolated, occurring with an indication that the expected system mass diverged from the calculated actual mass. This error affected the ECCS flow credited as reaching the core. Correction of this error resulted in a -30°F PCT change to GE11 fuel.
- The third notification addressed an error with the imposed minimum pressure differential (Δp) for droplet flow above a two-phase level in the core. This error could offer an inappropriate steam cooling benefit above the core two phase level. To correct this error, an explicit core Δp calculation was applied without regard to droplet condition resulting in a PCT change of +15°F to GE11 fuel.
- The forth notification addressed an incorrect pressure head representation when defining the counter current flow limitation (CCFL). Correction of this error resulted in a +20°F PCT change to GE11 fuel.

[Reference: Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Nine Mile Point Nuclear Station Unit 1 Renewed Facility Operating License No. DPR-63 NRC Docket No. 50-220, 10 CFR 50.46 30-Day Report," dated December 12, 2014.]

3) Prior LOCA Model Assessment (Unit 1)

Subsequent to the 10 CFR 50.46 30-Day Report (Note 2), four vendor notifications were received.

- The first notification addressed several accumulated updates to the SAFER04A model. These code maintenance changes resulted in a PCT change of 0°F for GNF2 fuel.
- The second notification corrected a logic error that was isolated, occurring with an indication that the expected system mass diverged from the calculated actual mass. This error affected the ECCS flow credited as reaching the core. Correction of this error resulted in a -5°F PCT change to GNF2 fuel.

- The third notification addressed an error with the imposed minimum pressure differential (Δp) for droplet flow above a two-phase level in the core. This error could offer an inappropriate steam cooling benefit above the core two phase level. To correct this error, an explicit core Δp calculation was applied without regard to droplet condition resulting in a PCT change of +40°F to GNF2 fuel.
- The forth notification addressed an incorrect pressure head representation when defining the counter current flow limitation (CCFL). Correction of this error resulted in a -5°F PCT change to GNF2 fuel.

[Reference: Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Nine Mile Point Nuclear Station, Units 1 and 2 Renewed Facility Operating License Nos. DPR-63 and NPF-69 NRC Docket Nos. 50-220 and 50-410," dated January 30, 2015.]

4) Prior LOCA Model Assessment (Unit 1)

No evaluation model changes or errors were reported against GE11 fuel since the previous 10 CFR 50.46 Report (Note 3).

Subsequent to the previous 10 CFR 50.46 annual report (Note 3), updated LOCA/MAPLHGR analyses were performed for GNF2 fuel. The re-analyses incorporated all known ECCS-LOCA methodology errors and changes (Note 3). Consequently, the GNF2 reference PCT returned to 2150°F, and the prior GNF2 errors and change were eliminated.

The existing GNF2 analysis of record limited reactor power to 92.3% rated during 4-loop operation with one loop isolated. The NMP1 Technical Specifications permit operation at 100% rated power with this condition. To eliminate the LOCA-imposed operational restriction, a supplemental LOCA evaluation was performed and added as a calculation.

[Reference: Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 29, 2016.]

5) Current LOCA Model Assessment (Unit 1)

No evaluation model changes or errors were reported against GE11 fuel since the previous 10 CFR 50.46 Report (Note 4).

No evaluation model changes or errors were reported against GNF2 fuel since the previous 10 CFR 50.46 Report (Note 4).

6) Prior LOCA Model Assessment (Unit 2)

During 2015, Unit 2 implemented a new GE14 LOCA analysis for MELLLA+. All prior GE14 error notifications were incorporated into the new analysis.

Subsequently, a new 10 CFR 50.46 notification was received from the vendor. This notification addressed an error whereby the ECCS-LOCA evaluation applied the method's default feedwater coast-down time rather than the customer-supplied value. Correction of this error was estimated to increase the GE14 licensing basis PCT by 20°F.

[Reference: Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 29, 2016.]

7) Current LOCA Model Assessment (Unit 2)

Subsequent to the previous 10 CFR 50.46 report (Note 6), one 10 CFR 50.46 notification was received. Notification 2016-01 identified that an incorrect steam dryer pressure drop was used to adjust the initial vessel water level used by the MELLLA+ ECCS-LOCA analysis for GE14 fuel. Correction of that error was estimated to have no impact upon the GE14 Licensing Basis PCT.

Subsequent to the previous 10 CFR 50.46 report (Note 6), GNF2 fuel was inserted into the Unit 2 reactor core. The GNF2 ECCS-LOCA analysis of record is shown as Reference 1. There are no evaluation model changes or errors reported against the GNF2 analysis since its introduction into Unit 2.

[Reference 1: 002N4205-R0, "Nine Mile Point Unit 2 GNF2 ECCS-LOCA Evaluation," December 2015.]