Exelon Generation®

200 Exelon Way
Kennett Square, PA 19348

www.exeloncorp.com

10 CFR 50.46

NMP1L2994

January 30, 2015

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 Paul M. Swift (Constellation Energy Nuclear Group) to U.S. Nuclear Regulatory Commission, 10 CFR 50.46 ECCS Evaluation Model Annual Reports for 2013, dated January 30, 2014.

2) Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, 10 CFR 50.46 30-Day Report, dated December 12, 2014.

3) Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-01, Nine Mile Point Nuclear Station (Unit 2)," dated May 21, 2014.

4) Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-02, Nine Mile Point Nuclear Station (Unit 2)," dated May 21, 2014.

5) Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-03, Nine Mile Point Nuclear Station (Unit 2)," dated May 21, 2014.

6) Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-04, Nine Mile Point Nuclear Station (Unit 2)," dated May 21, 2014.

7) Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-01, Rev 1, Nine Mile Point Nuclear Station (Unit 1)," dated January 20, 2015.

8) Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-02, Rev 1, Nine Mile Point Nuclear Station (Unit 1)," dated January 20, 2015.

9) Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-03, Rev 1, Nine Mile Point Nuclear Station (Unit 1)," dated January 20, 2015.

10) Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-04, Rev 1, Nine Mile Point Nuclear Station (Unit 1)," dated January 20, 2015.

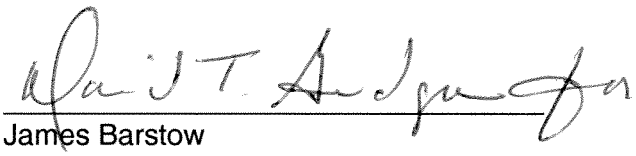
The purpose of this letter is to submit the 10 CFR 50.46 annual reporting information for Nine Mile Point Nuclear Station (NMP). The most recent annual 10 CFR 50.46 Report for NMP (Reference 1) provided the cumulative Peak Cladding Temperature (PCT) errors. The most recent 30-day report for NMP, Unit 1 (Reference 2), provided the PCT errors for GE11 fuel.

Subsequent to the issuance of References 1 and 2, four vendor notifications of Emergency Core Cooling System (ECCS) model error/changes that are applicable to NMP2 (References 3 through 6) and four vendor notifications of ECCS model error/changes that are applicable to NMP1 (References 7 through 10) have been issued. No ECCS-related changes or modifications have occurred at NMP that affect the assumptions of the ECCS analyses.

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,



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 30, 2015

Peak Cladding Temperature Rack-Up Sheet for NMP1

Nine Mile Point Nuclear Station, Unit 1

PLANT NAME: Nine Mile Point Unit 1
ECCS EVALUATION MODEL: SAFER/GESTR-LOCA(PRIME)/CORCL
REPORT REVISION DATE: 1/30/2015
CURRENT OPERATING CYCLE: 21

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

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. 0000-0098-3457-R2, "Nine Mile Point Nuclear Station Unit 1 GNF2 ECCS-LOCA Evaluation," January 2014.

3. 0000-0144-8266-SRLR, Rev. 1, "Supplemental Reload Licensing Report for Nine Mile Point 1 Reload 22 Cycle 21," March 2013.

Fuel: GE11, GNF2
Limiting Fuel Type: GNF2
Limiting Single Failure: ADS Valve
Limiting Break Size and Location: 5.4615 ft^2 Double-Ended Guillotine in a Recirculation Discharge Pipe (5.446 ft^2) + Bottom Head Drain Line (0.0155 ft^2)
Reference Peak Cladding Temperature (PCT): 2150°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated January 30, 2014 (Note 1)	GE11: ΔPCT = 0°F GNF2: ΔPCT = 0°F
10 CFR 50.46 30-Day Report dated December 12, 2014 (Note 2)	GE11: ΔPCT = 15°F GNF2: ΔPCT = N/A
NET PCT	**GE11: 2165°F** **GNF2: 2150°F**

B. CURRENT LOCA MODEL ASSESSMENTS

Notification 2014-01 (See Note 3)	GE11: ΔPCT = N/A GNF2: ΔPCT = 0°F
Notification 2014-02 (See Note 3)	GE11: ΔPCT = N/A GNF2: ΔPCT = -5°F
Notification 2014-03 (See Note 3)	GE11: ΔPCT = N/A GNF2: ΔPCT = +40°F
Notification 2014-04 (See Note 3)	GE11: ΔPCT = N/A GNF2: ΔPCT = -5°F
Total PCT Change from Current Assessments	GE11: ∑ΔPCT = N/A GNF2: ∑ΔPCT = +30°F
Cumulative PCT Change from Current Assessments	GE11: ∑|ΔPCT| = N/A GNF2: ∑|ΔPCT| = 50°F
NET PCT	**GE11: 2165°F** **GNF2: 2180°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 30, 2015

Peak Cladding Temperature Rack-Up Sheet for NMP2

Nine Mile Point Nuclear Station, Unit 2

PLANT NAME: Nine Mile Point Unit 2
ECCS EVALUATION MODEL: SAFER/GESTR-LOCA
REPORT REVISION DATE: 1/30/2015
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-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.

Calculation:

1. 0000-0080-7568-R1, "Nine Mile Point Nuclear Station Unit 2 Extended Power Uprate Task T0407: ECCS-LOCA SAFER/GESTR," February 2009.

Fuel: GE14
Limiting Fuel Type: GE14
Limiting Single Failure: High Pressure Core Spray – Diesel Generator
Limiting Break Size and Location: 0.07 ft^2 Recirculation Suction Line Break
Reference Peak Cladding Temperature (PCT): 1540°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated January 31, 2012 (Note 4)	GE14: ΔPCT = 25°F
10 CFR 50.46 Report dated January 31, 2013 (Note 5)	GE14: ΔPCT = 0°F
10 CFR 50.46 Report dated January 30, 2014 (Note 6)	GE14: ΔPCT = 0°F
NET PCT	**GE14: 1565°F**

B. CURRENT LOCA MODEL ASSESSMENTS

Notification 2014-01 (See Note 7)	GE14: ΔPCT = 0°F
Notification 2014-02 (See Note 7)	GE14: ΔPCT = 0°F
Notification 2014-03 (See Note 7)	GE14: ΔPCT = -10°F
Notification 2014-04 (See Note 7)	GE14: ΔPCT = +5°F
Total PCT Change from Current Assessments	GE14: $\sum\Delta PCT$ = -5°F
Cumulative PCT Change from Current Assessments	GE14: $\sum\lvert\Delta PCT\rvert$ = 15°F
NET PCT	**GE14: 1560°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 30, 2015

Assessment Notes, NMP

Nine Mile Point Nuclear Station

1) Prior LOCA Assessment (Unit 1)

Updated LOCA/MAPLHGR analyses were performed for both GE11 and GNF2 fuel in support of operating Cycle 21. These analyses maintained the calculated PCT at 2150°F and superseded all prior LOCA assessments. These analyses incorporated all ECCS/LOCA methodology errors and changes known/resolved at that time (as of March 2013).

[Reference: Letter from Paul M. Swift (Constellation Energy Nuclear Group) to 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 Annual 50.46 report (see 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 fourth 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, 10 CFR 50.46 30-Day Report, dated December 12, 2014.]

3) Current LOCA Model Assessment (Unit 1)

Subsequent to the previous 10 CFR 50.46 report (see Note 2), four vendor notifications were received. The first notification (Reference 1) addresses several accumulated updates to the SAFER04A model. These code maintenance changes result in a PCT change of 0°F for GNF2 fuel. The second notification (Reference 2) corrected a logic error that has been isolated, occurring with an indication that the expected system mass diverges from the calculated actual mass. This error affects the ECCS flow credited as reaching the core. Correction of this error results in a -5°F PCT change to GNF2 fuel. The third notification (Reference 3) addresses an error with the imposed minimum pressure differential (Δp) for droplet flow above a two-phase level in the core. This error can offer an inappropriate steam cooling benefit above the core two phase level. To correct this error, an explicit core Δp calculation is applied without regard to

droplet condition resulting in a PCT change of +40°F to GNF2 fuel. The fourth notification (Reference 4) addresses an incorrect pressure head representation when defining the counter current flow limitation (CCFL). Correction of this error results in a -5°F PCT change to GNF2 fuel.

[Reference 1: Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-01, Rev 1, Nine Mile Point Nuclear Station (Unit 1)," dated January 20, 2015]

[Reference 2: Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-02, Rev 1, Nine Mile Point Nuclear Station (Unit 1)," dated January 20, 2015]

[Reference 3: Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-03, Rev 1, Nine Mile Point Nuclear Station (Unit 1)," dated January 20, 2015]

[Reference 4: Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-04, Rev 1, Nine Mile Point Nuclear Station (Unit 1)," dated January 20, 2015]

4) Prior LOCA Model Assessment (Unit 2)

The 10 CFR 50.46 Report dated January 31, 2012 included discussion regarding two errors that impacted the PCT of NMP2. The first notification identified that the input coefficients used to direct the deposition of gamma radiation energy produced by fuel were over predicting the heat to the fuel channel (post scram) and under predicting the heat to the fuel. The error impacted the GE14 fuel with a PCT effect of +30°F. The second notification identified that within the ECCS/Loss of Coolant Accident model, the input formulation for the SAFER code was found to have minimized the gamma heat deposition to the channel wall. The error impacted the GE14 fuel with a PCT effect of -5°F.

[Reference: Letter from Paul M. Swift (Constellation Energy) to U.S. Nuclear Regulatory Commission, 10 CFR 50.46 ECCS Evaluation Model Annual Reports for 2011, dated January 31, 2012.]

5) Prior LOCA Model Assessment (Unit 2)

In June 2012, NMP2 implemented a new LOCA analysis as the result of EPU. The error notifications discussed in Note 4 were not incorporated in the new analysis and must be applied to the new licensing basis PCT as shown by Reference 1.

Subsequently, a 10 CFR 50.46 notification was received documenting the PRIME fuel Properties Implementation for Fuel Rod Thermal-Mechanical Performance, Replacing GESTR Fuel Properties. GESTR-LOCA was considered to be an integral part of the approved GEH ECCS Evaluation Model, with SAFER, for compliance to 10 CFR 50.46. NRC Information Notice (IN) 2011-21 addressed inaccuracies in fuel pellet thermal conductivity as a function of exposure. PRIME fuel rod thermal-mechanical (T-M) performance addresses these concerns. This 10 CFR 50.46 notification estimates the magnitude of the change in PCT due to the change in fuel properties from GESTR to PRIME. Applying this estimated change in Licensing Basis PCT constitutes interim implementation of the PRIME fuel properties as it pertains to the analysis basis Evaluation Model for the plant, pending a plant ECCS-LOCA re-analysis explicitly using PRIME. There was no impact to GE14 PCT as a result of this notification.

[Reference: Letter from Paul M. Swift (Constellation Energy) to U.S. Nuclear Regulatory Commission, 10 CFR 50.46 ECCS Evaluation Model Annual Reports for 2012, dated January 31, 2013.]

6) Prior LOCA Model Assessment (Unit 2)

The referenced report provided the annual 10 CFR 50.46 report for Units 1 and 2. There were no errors reported for NMP2 GE14 fuel for the reporting period.

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

7) Current LOCA Model Assessment (Unit 2)

Subsequent to the previous 10 CFR 50.46 report (see Note 6), four vendor notifications were received. The first notification (Reference 1) addresses several accumulated updates to the SAFER04A model. These code maintenance changes result in a PCT change of 0°F for GE14 fuel. The second notification (Reference 2) corrected a logic error that has been isolated, occurring with an indication that the expected system mass diverges from the calculated actual mass. This error affects the ECCS flow credited as reaching the core. Correction of this error results in a 0°F PCT change to GE14 fuel. The third notification (Reference 3) addresses an error with the imposed minimum pressure differential (Δp) for droplet flow above a two-phase level in the core. This error can offer an inappropriate steam cooling benefit above the core two phase level. To correct this error, an explicit core Δp calculation is applied without regard to droplet condition resulting in a PCT change of -10°F to GE14 fuel. The fourth notification (Reference 4) addresses an incorrect pressure head representation when defining the counter current flow limitation (CCFL). Correction of this error results in a +5°F PCT change to GE14 fuel.

[Reference 1: Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-01, Nine Mile Point Nuclear Station (Unit 2)," dated May 21, 2014]

[Reference 2: Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-02, Nine Mile Point Nuclear Station (Unit 2)," dated May 21, 2014]

[Reference 3: Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-03, Nine Mile Point Nuclear Station (Unit 2)," dated May 21, 2014]

[Reference 4: Letter from GE Hitachi Nuclear Energy (GEH) to Constellation, "10 CFR 50.46 Notification Letter 2014-04, Nine Mile Point Nuclear Station (Unit 2)," dated May 21, 2014]