

10 CFR 50.46

NMP1L3499

January 27, 2023

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

Reference: 1) Letter from D. Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2022.

The purpose of this letter is to submit the 10 CFR 50.46 annual reporting information for Nine Mile Point Nuclear Station (NMP). Since the submittal of Reference 1, vendor notification 2022-01 was issued against NMP Unit 1 and no new Notifications were issued against NMP Unit 2. The notification is included in this report. Although there is no new vendor notification for NMP Unit 2, a change to the SAFER ECCS Evaluation Model for decay heat input that occurred in 2011 was recently identified and is documented in the Corrective Action Program. This change is included in Attachments 2 and 4 to this report.

Four attachments are included with this letter that provide the current NMP 10 CFR 50.46 status. Attachment 1 provides the Peak Cladding Temperature and the rack-up sheets for the NMP Unit 1. Attachments 2 and 3 provide the Peak Cladding Temperature and the rack-up sheets for NMP Unit 2 LOCA analyses for GNF2 and GNF3 fuel types, respectively. Attachment 4, "Assessment Notes, NMP," 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 ronnie.reynolds@constellation.com.

Respectfully,

David T. Gudger

David T. Gudger
Senior Manager - Licensing
Constellation Energy Generation, LLC

Attachments: 1) Peak Cladding Temperature Rack-Up Sheet for NMP Unit 1
 2) Peak Cladding Temperature Rack-Up Sheet for NMP Unit 2
 GNF2 Fuel
 3) Peak Cladding Temperature Rack-Up Sheet for NMP Unit 2
 GNF3 Fuel
 4) Assessment Notes, NMP

cc: USNRC Administrator, Region I
 USNRC Senior Project Manager, NMP
 USNRC Senior Resident Inspector, NMP
 A. L. Peterson, NYSERDA

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, 2023

Peak Cladding Temperature Rack-Up Sheet for NMP Unit 1

Nine Mile Point Nuclear Station, Unit 1

PLANT NAME: Nine Mile Point Nuclear Station, Unit 1
 ECCS EVALUATION MODEL: TRACG-LOCA
 REPORT REVISION DATE: 1/27/2023
 CURRENT OPERATING CYCLE: 25

ANALYSIS OF RECORD

- 002N3714, Revision 0, Nine Mile Point Nuclear Station Unit 1 TRACG-LOCA Loss-of-Coolant Accident Analysis for GNF2 Fuel, March 2017

Fuel Analyzed in Calculations and in Operation: GNF2
 Limiting Fuel Type: GNF2
 Limiting Single Failure: 1 Diesel Generator
 Limiting Break Size and Location: Recirculation Discharge 200% (7.233 ft²) split break at 100% power and flow
 Reference Peak Cladding Temperature (PCT): GNF2 = 2105°F

MARGIN ALLOCATION

B. A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated January 27, 2017 (Note 1)	$\Delta PCT = N/A$
10 CFR 50.46 Report dated January 26, 2018 (Note 2)	$\Delta PCT = -8^{\circ}F$
10 CFR 50.46 Report dated January 25, 2019 (Note 3)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 Report dated January 27, 2020 (Note 4)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 Report dated January 27, 2021 (Note 5)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 Report dated January 27, 2022 (Note 6)	$\Delta PCT = 0^{\circ}F$
NET PCT	2097°F

C. CURRENT LOCA MODEL ASSESSMENTS

Notification 2022-01 (Note 7)	$\Delta PCT = 0^{\circ}F$
Total PCT change from current assessments	$\Sigma \Delta PCT = 0^{\circ}F$
Cumulative PCT change from current assessments	$\Sigma \Delta PCT = 0^{\circ}F$
NET PCT	2097°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, 2023

Peak Cladding Temperature Rack-Up Sheet for NMP Unit 2 GNF2 Fuel

Nine Mile Point Nuclear Station, Unit 2

PLANT NAME: Nine Mile Point Nuclear Station, Unit 2
 ECCS EVALUATION MODEL: SAFER/PRIME
 REPORT REVISION DATE: 1/27/2023
 CURRENT OPERATING CYCLE: 19

ANALYSIS OF RECORD

- 002N4205-R0, "Nine Mile Point Unit 2 GNF2 ECCS-LOCA Evaluation," December 2015

Fuel Analyzed in Calculations and in Operation: 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): GNF2 = 1690°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated January 27, 2017 (Note 8)	$\Delta\text{PCT} = \text{N/A}$
10 CFR 50.46 Report dated January 26, 2018 (Note 9)	$\Delta\text{PCT} = 0^\circ\text{F}$
10 CFR 50.46 Report dated January 25, 2019 (Note 10)	$\Delta\text{PCT} = \text{N/A}$
10 CFR 50.46 Report dated January 27, 2020 (Note 11)	$\Delta\text{PCT} = 0^\circ\text{F}$
10 CFR 50.46 Report dated January 27, 2021 (Note 12)	$\Delta\text{PCT} = 0^\circ\text{F}$
10 CFR 50.46 Report dated January 27, 2022 (Note 13)	$\Delta\text{PCT} = 0^\circ\text{F}$
NET PCT	1690°F

B. CURRENT LOCA MODEL ASSESSMENTS

Total PCT change from current assessments (Note 14)	$\sum\Delta\text{PCT} = 0^\circ\text{F}$
Cumulative PCT change from current assessments	$\sum \Delta\text{PCT} = 0^\circ\text{F}$
NET PCT	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, 2023

Peak Cladding Temperature Rack-Up Sheet for NMP Unit 2 GNF3 Fuel

Nine Mile Point Nuclear Station, Unit 2

PLANT NAME: Nine Mile Point Nuclear Station, Unit 2
 ECCS EVALUATION MODEL: SAFER/PRIME
 REPORT REVISION DATE: 01/27/2023
 CURRENT OPERATING CYCLE: 19

ANALYSIS OF RECORD

- 006N3094-R0, "Nine Mile Point Unit 2 GNF3 ECCS-LOCA Evaluation,"
 November 2021

Fuel Analyzed in Calculations and in Operation: GNF3
 Limiting Fuel Type: GNF3
 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): GNF3 = 1,690 °F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

No prior LOCA Model Assessments have been provided as this is the first time the reference Analysis of Record is being reported (Note 15)	$\Delta PCT = N/A$
NET PCT	1690°F

B. CURRENT LOCA MODEL ASSESSMENTS

Total PCT change from current assessments	$\sum \Delta PCT = N/A$
Cumulative PCT change from current assessments	$\sum \Delta PCT = N/A$
NET PCT	1690°F

ATTACHMENT 4

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, 2023

Assessment Notes, NMP

Nine Mile Point Nuclear Station

1) Prior LOCA Assessments (Unit 1)

NMP Unit 1 replaced its existing SAFER/CORECOOL/PRIME analysis with a new TRACG-LOCA analysis [Reference 2]. The TRACG-LOCA analysis was implemented concurrent with the start of fuel Cycle 23. Because all GE11 fuel was discharged prior to Cycle 23, Cycle 23 contains a full core of GNF2 fuel, and the TRACG-LOCA analysis is applicable to GNF2 fuel only. No SAFER/CORECOOL/PRIME notifications were received between the Reference 1 10 CFR 50.46 annual report and the start of Cycle 23.

[Reference 1: Letter from J. Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2017]

[Reference 2: 002N3714, Revision 0, Nine Mile Point Nuclear Station Unit 1 TRACG-LOCA Loss-of-Coolant Accident Analysis for GNF2 Fuel, March 2017]

2) Prior LOCA Model Assessments (Unit 1)

Notification 2017-03 describes a counter-current flow limitation coefficient that was incorrectly applied within the bypass region. The PCT impact was estimated to be -8°F.

[Reference: Letter from J. Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 26, 2018]

3) Prior LOCA Model Assessments (Unit 1)

Notification 2018-01 describes that, for some uncertainties, standard deviations were used that are inconsistent with the values approved by TRACG-LOCA Licensing Topical Report. An analysis was performed using the approved standard deviations, and the results showed that the effect was not statistically significant. The PCT impact was estimated to be 0°F.

[Reference: Letter from J. Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 25, 2019]

4) Prior LOCA Model Assessment (Unit 1)

Notification 2019-01 describes that channel inlet subcooling was found to be incorrect in TRACG when multiple unheated nodes were modeled. Notification 2019-02 describes that the radiation heat transfer was found to be incorrect in TRACG due to a memory overwrite in the computer software. For each error, the PCT impact was estimated to be 0°F.

[Reference: Letter from D. Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2020]

5) Prior LOCA Model Assessments (Unit 1)

Notification 2020-01 identifies errors in the PRIME fuel rod code for Zircaloy irradiation growth after breakaway neutron fluence, incorrect Zircaloy thermal conductivity applied to the Zr barrier for cladding temperature drop and gap conductance during pellet-cladding gap closure. The notification shows 0°F PCT impact.

[Reference: Letter from D. Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2021]

6) Prior LOCA Model Assessments (Unit 1)

Notification 2021-02 identified inconsistencies in the inner cladding surface roughness used in PRIME fuel rod code and as an input to the SAFER and TRACG calculations. The difference affects the pellet-cladding contact heat transfer and gap conductance, and the inconsistency is small. The notification shows 0°F PCT impact. Notification 2021-04 identified a coding error in TRACG04P which, under certain circumstances, miscalculates the amount of non-condensable gas flowing through a side branch of a component resulting in a mass error accumulation over time in the analysis. An error impact evaluation showed negligible effect on calculated PCT. The notification shows 0°F PCT impact. Notification 2021-09 was made for a recompilation of the TRACG04P code, updating it to version 4.2.76.1. Any specific changes to the code reportable under 10 CFR 50.46 have previously been reported. The notification shows 0°F PCT impact.

[Reference: Letter from David Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2022]

7) Current LOCA Model Assessments (Unit 1)

Subsequent to the previous 10CFR50.46 report, Notification 2022-01 identifies an update made to NMP1 basedeck with the inputs corresponding to the NMP1 scram curve and a conservative delay between LOCA signal and CRD motion, which results in the core power level being slightly elevated for a short period of time. The notification shows 0°F PCT impact.

8) Prior LOCA Model Assessments (Unit 2)

GNF2 fuel was inserted into the Unit 2 reactor core [Reference 1]. The GNF2 ECCS-LOCA analysis of record is shown as Reference 2. There are no evaluation model changes or errors reported against the GNF2 analysis since its introduction into Unit 2.

[Reference 1: Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2017 (NMP1L3126)]

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

9) Prior LOCA Model Assessments (Unit 2)

Notification 2017-01 describes an incorrect assumption of lower tie plate leakage with an estimated PCT impact of 0°F for GNF2 fuel. Notification 2017-02 describes a change in the fuel rod upper plenum modeling with an estimated PCT impact of 0°F for GNF2 fuel.

[Reference: Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 26, 2018 (NMP1L3197)]

10) Prior LOCA Model Assessments (Unit 2)

Subsequent to the previous 10 CFR 50.46 report (Note 9), no notifications were received.

[Reference: Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 25, 2019

11) Prior LOCA Model Assessments (Unit 2)

Notification 2019-05 describes that the driving differential pressure for forward and backward bypass leakage is limited with an upper and lower limit in SAFER, and that all the limits were implemented correctly on all nine leakage paths except for one, the lower limit for the control rod guide tube to control rod drive housing interface backward leakage path. The estimated PCT impact of 0°F for GNF2 fuel.

[Reference: Letter from David Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2020

12) Prior LOCA Model Assessments (Unit 2)

Notification 2020-01 identifies errors in the PRIME fuel rod code for Zircaloy irradiation growth after breakaway neutron fluence, incorrect Zircaloy thermal conductivity applied to the Zr barrier for cladding temperature drop and gap conductance during pellet-cladding gap closure. The notification shows 0°F PCT impact.

[Reference: Letter from David Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2021

13) Prior LOCA Model Assessments (Unit 2)

Notification 2021-01 identified an error in the value of fuel pellet to plenum spring conductance affecting the fuel rod stress and perforation model in ECCS LOCA calculations. The error only affects the temperature and plenum gas pressure calculation in the plenum region, outside of the active fuel region. The error has an insignificant effect on the rod internal pressure calculation because the heat capacity of the spring is much smaller when compared to the fuel stored energy and decay heat. The notification shows 0°F PCT impact. Notification 2021-02 identified inconsistencies in the inner cladding surface roughness used in PRIME fuel rod code and as an input to the SAFER and TRACG calculations. The difference affects the pellet-cladding contact heat transfer and gap conductance, and the inconsistency is small. The notification shows 0°F PCT impact.

[Reference: Letter from David Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2022

14) Current LOCA Model Assessments (Unit 2 – GNF2 Only)

The last NMP 50.46 annual report submitted to U.S. NRC was on January 27, 2022. No additional notification letters were received during calendar year 2022 impacting GNF2 fuel at NMP2.

It was recently discovered that a change in 2011 was made to the decay heat input used in nominal calculations for the SAFER evaluation model. The updated DH model is a best

estimate decay heat curve based on the 1979 ANS 5.1 standard and considers SIL 636. This change was discovered during review of the GNF3 New Fuel Introduction and additional vendor assessments estimated an impact of 0°F upon the GNF2 PCT.

[Reference: Letter from David Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2022 (NMP1L3444)]

15) Current LOCA Model Assessments (Unit 2 – GNF3 Only)

The last NMP 50.46 annual report submitted to U.S. NRC was on January 27, 2022 (Reference 1). For GNF3 fuel, no net PCT, Licensing Basis PCT, or PCT adder were provided in Reference 1 since neither NMP unit had GNF3 fuel in operation at that time. Beginning with NMP2 Cycle 19, GNF3 fuel was introduced into the core in addition to GNF2 fuel. All existing change/error notification letters related to GNF3 were incorporated into the initial GNF3 analysis of record (Reference 2) including the change regarding decay heat input impacting SAFER evaluation model described in Note 14. No new notification letters were received for GNF3 fuel and therefore, there is no change to the NMP2 licensing basis PCT for GNF3 fuel.

[Reference 1: Letter from David Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Annual Report," dated January 27, 2022 (NMP1L3444)]

[Reference 2: 006N3094-R0, "Nine Mile Point Unit 2 GNF3 ECCS-LOCA Evaluation," November 2021]