

RS-23-037

10 CFR 50.46

February 22, 2023

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

LaSalle County Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

Subject: Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation
Model Changes and Errors for LaSalle County Station

References: 1. Letter from Kevin Lueshen (Constellation Energy Generation, LLC) to U.S.
Nuclear Regulatory Commission, "Annual 10 CFR 50.46 Report of
Emergency Core Cooling System Evaluation Model Changes and Errors for
LaSalle County Station," dated February 22, 2022

In accordance with 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," paragraph (a)(3)(ii), Constellation Energy Generation, LLC (CEG) is submitting the attached information to fulfill the annual reporting requirements for LaSalle County Station (LSCS), Units 1 and 2. The attachments describe the changes in accumulated peak cladding temperature (PCT) since the previous annual report submitted in Reference 1.

There are no regulatory commitments contained in this submittal. Should you have any questions concerning this letter, please contact Mr. Jason Taken at (630) 657-3660.

Respectfully,

Kevin Lueshen
Senior Manager - Licensing
Constellation Energy Generation, LLC

Attachments:

- 1) LaSalle County Station, Units 1 and 2 – 10 CFR 50.46 Report
- 2) LaSalle County Station, Units 1 and 2 – 10 CFR 50.46 Report Assessment Notes

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cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector, LaSalle County Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT 1
 LaSalle County Station, Units 1 and 2 – 10 CFR 50.46 Report

Plant Name: LaSalle County Station (LSCS), Units 1 & 2

ECCS Evaluation Model: SAFER/PRIME LOCA

50.46 Report Revision Date: January 28, 2023

Current Operating Cycles: L1C20 and L2C19

Analyses of Record:

1. General Electric-Hitachi Document No. 0000-0121-8990-R0, Revision 0, "LaSalle County Station GNF2 ECCS-LOCA Evaluation," GEH Nuclear Energy, January 2012.
2. GE Hitachi Document Number 005N5629, Revision 1 "LaSalle County Station GNF3 ECCS-LOCA Evaluation," November 2020.

Fuel Types: GNF2 (Operating in Unit 1 & Unit 2)
 GNF3 (Operating in Unit 1 & Unit 2)

Limiting Single Failure: GNF2: High Pressure Core Spray Diesel Generator Failure
 GNF3: High Pressure Core Spray Diesel Generator Failure

Limiting Break Size & Location: GNF2: Recirc. Pump Suction Line Break (0.08 ft² in small break)
 GNF3: Recirc. Pump Suction Line Break (0.07 ft² in small break)

Reference Peak Cladding Temperature: GNF2: 1540°F
 GNF3: 1570°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report dated March 7, 2012 (Note 1)	GNF2:	ΔPCT = 0°F
10 CFR 50.46 Report dated March 7, 2013 (Note 2)	GNF2:	ΔPCT = 0°F
10 CFR 50.46 Report dated March 7, 2014 (Note 3)	GNF2:	ΔPCT = 0°F
10 CFR 50.46 Report dated March 6, 2015 (Note 4)	GNF2:	ΔPCT = -5°F
10 CFR 50.46 Report dated March 7, 2016 (Note 5)	GNF2:	ΔPCT = 0°F
10 CFR 50.46 Report dated March 7, 2017 (Note 6)	GNF2:	ΔPCT = 0°F
10 CFR 50.46 Report dated March 7, 2018 (Note 7)	GNF2:	ΔPCT = 0°F
10 CFR 50.46 Report dated March 7, 2019 (Note 8)	GNF2:	ΔPCT = 0°F
10 CFR 50.46 Report dated March 9, 2020 (Note 9)	GNF2:	ΔPCT = 0°F
10 CFR 50.46 Report dated February 19, 2021 (Note 10)	GNF2:	ΔPCT = 25°F
10 CFR 50.46 Report dated February 22, 2022 (Note 11)	GNF2:	ΔPCT = 0°F
	GNF3:	ΔPCT = 0°F
Net PCT	GNF2:	1560°F
	GNF3:	1570°F

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B. CURRENT LOCA MODEL ASSESSMENTS

SAFER Decay Heat Model (See Assessment Note 12)	GNF2: $\Delta PCT = 0^{\circ}F$
	GNF3: N/A
Total PCT Change from Current Assessments (See Assessment Note 12)	GNF2: $\Sigma \Delta PCT = 0^{\circ}F$
	GNF3: $\Sigma \Delta PCT = 0^{\circ}F$
Cumulative PCT Change from Current Assessments	GNF2: $\Sigma \Delta PCT = 0^{\circ}F$
	GNF3: $\Sigma \Delta PCT = 0^{\circ}F$
Net PCT	GNF2: 1560°F
	GNF3: 1570°F

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LaSalle County Station, Units 1 and 2 – 10 CFR 50.46 Report Assessment Notes

ASSESSMENT NOTES

1. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2012 reporting period. The referenced letter reported the introduction of GNF2 fuel into the LSCS, Unit 1, core. A new LOCA analysis of record for GNF2 fuel was performed by GE Hitachi Nuclear Energy (GEH). No Emergency Core Cooling System (ECCS) related changes or modifications occurred at LSCS that affected the assumptions in the GEH GNF2 LOCA analysis.

[Reference: Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Plant Specific ECCS Evaluation Changes —10 CFR 50.46 Report," dated March 7, 2012]

2. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2013 reporting period. The referenced letter reported the introduction of GNF2 fuel into the LSCS, Unit 2, core. The referenced letter also reported no vendor notifications of ECCS model errors/changes applicable to the GNF2 fuel in LSCS, Units 1 and 2, and reported that no ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH GNF2 LOCA analysis for the GNF2 fuel in LSCS, Units 1 and 2.

[Reference: Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station," dated March 7, 2013]

3. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2014 reporting period. The referenced letter reported no vendor notifications of ECCS model errors/changes applicable to the GNF2 fuel in LSCS, Units 1 and 2, and reported that no ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH GNF2 LOCA analysis for the GNF2 fuel in LSCS, Units 1 and 2.

[Reference: Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station," dated March 7, 2014]

4. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2015 reporting period. The referenced letter reported four vendor notifications, Notifications 2014-01 through 2014-04, of ECCS model error/changes. The first notification addressed several code maintenance changes to the SAFER04A model, which resulted in a PCT change of 0°F for GNF2. The second notification corrected a logic error, which affects the ECCS flow credited as reaching the core. Correction of this error resulted in a 0°F PCT change for GNF2. The third notification addressed an error with the imposed minimum pressure differential (Δp) for droplet flow above a two-phase

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level in the core. This error can offer an inappropriate steam cooling benefit above the core two phase level. Correction of this error resulted in a PCT change of -10°F for GNF2. The fourth 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 for GNF2.

The referenced letter also reported that no ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH LOCA analysis for the GNF2 fuel in LSCS, Units 1 and 2.

Four (4) GNF3 Lead Use Assemblies (LUAs) were loaded into LSCS, Unit 2, during the LSCS, Unit 2 Reload 15 outage (L2R15). Notifications 2014-01 through 2014-04 were included in the determination of the licensing basis PCT for the GNF3 LUAs. The GNF3 LUAs were discharged in February 2021.

[Reference: Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station," dated March 6, 2015]

5. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2016 reporting period. The referenced letter reported no vendor notifications of ECCS model errors/changes applicable to the GNF2 fuel in LSCS, Units 1 and 2, and reported that no ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH GNF2 LOCA analysis of record for the GNF2 fuel in LSCS, Units 1 and 2.

The referenced letter reported no vendor notifications of ECCS model errors/changes applicable to the GNF3 Lead Use Assembly (LUA) fuel in LSCS, Unit 2, and that no ECCS related changes or modifications occurred at LSCS, Unit 2, that affected the assumptions in the GEH GNF3 LUA LOCA analysis of record for the GNF3 LUAs in LSCS, Unit 2. The GNF3 LUAs were discharged in February 2021. All ATRIUM-10 fuel was removed from LSCS, Unit 1, during the LSCS, Unit 1 Reload 16 (L1 R16) outage prior to startup of LSCS, Unit 1 Cycle 17 (L1 C17).

[Reference: Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station," dated March 7, 2016]

6. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2017 reporting period. The referenced letter reported no vendor notification of the ECCS model errors/changes applicable to the GNF2 or GNF3 Lead Use Assembly (LUA) fuel in LSCS Units 1 and 2 and reported that no ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH LOCA analyses for GNF2 or GNF3 LUA fuel at LSCS Units 1 and 2. The GNF3 LUAs were discharged in February 2021. The letter also noted that all ATRIUM-10 fuel was removed from LSCS, Unit 2, prior to the start of LSCS, Unit 2 Cycle 17 (L2C17).

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[Reference: Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station," dated March 7, 2017]

7. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2018 reporting period. The referenced letter reported two vendor notifications were produced, 2017-01 and 2017-02. Notification 2017-01 describes corrections made to the GNF2 lower tie plate modeling and Notification 2017-02 describes corrections made to the fuel rod upper plenum thermal model. Neither of these corrections resulted in a change in PCT for either GNF2 or GNF3 LUA fuel. The GNF3 LUAs were discharged in February 2021.

[Reference: Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station," dated March 7, 2018]

8. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2019 reporting period. The referenced letter reported no vendor notification of the ECCS model errors/changes applicable to the GNF2 or GNF3 LUA fuel in LSCS Units 1 and 2 and reported that no ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH LOCA analyses for GNF2 or GNF3 LUA fuel at LSCS Units 1 and 2. The GNF3 LUAs were discharged in February 2021.

[Reference: RS-19-020, Letter from David M. Gullott (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station" dated March 7, 2019]

9. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2020 reporting period. The referenced letter reported one vendor notification (Notification Letter 2019-05) of ECCS model error/change applicable to the GNF2 fuel in LaSalle Units 1 and 2 and the GNF3 LUAs in LaSalle Unit 2. The driving differential pressure for the lower limit for the control rod guide tube to control rod driving housing interface backward leakage path was found to be incorrect in SAFER. A SAFER version correcting this error was executed on representative plants and confirmed the software code and error had no impact on the plant ECCS LOCA evaluations, and reported a 0° F impact of PCT.

The referenced letter reported there were no ECCS related changes or modifications that occurred at LSCS that affected the assumptions in the GEH GNF2 LOCA analysis of record for the GNF2 fuel in LSCS, Units 1 and 2. Additionally, no ECCS related changes or modifications occurred at LSCS, Unit 2, that affected the assumptions in the

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GEH GNF3 LUA LOCA analysis of record for the GNF3 LUA fuel in LSCS, Unit 2. The GNF3 LUAs were discharged in February 2021.

[Reference: RS-20-024, Letter from Dwi Murray (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, “Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station” dated March 9, 2020]

10. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2021 reporting period. The referenced letter reported two vendor notifications of ECCS model errors/changes applicable to the GNF2 fuel in LaSalle Units 1 and 2 (Notifications 2020-01 and 2020-02). Notification 2020-01 noted errors in the Zircaloy irradiation growth model, Zircaloy thermal conductivity for the Zr barrier, and gap conductance model in the PRIME code. The estimated PCT impact for this notification was 0°F. Notification 2020-02 noted an updated impact evaluation for one of the issues reported in Notification 2014-01. That update was involved the SAFER code error regarding the subcooled water level in the downcomer region, more specifically for small break LOCA scenarios where a two-phase level is established in that region. The estimated PCT impact for that notification was 25°F.

The referenced letter reported one vendor notification of ECCS model errors/changes applicable to the GNF3 LUAs in LaSalle Unit 2. The estimated GNF2 impact of 25°F was conservatively included for the GNF3 LUAs. The GNF3 LUAs were discharged in February 2021.

No ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH GNF2 LOCA analysis of record for the GNF2 fuel in LSCS, Units 1 and 2. No ECCS related changes or modifications occurred at LSCS, Unit 2, that affected the assumptions in the GEH GNF3 LOCA analysis of record for the GNF3 fuel in LSCS, Unit 2.

[RS-21-020, Letter from Dwi Murray (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, “Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station” dated February 19, 2021]

11. Prior LOCA Assessment

The referenced letter provided the annual 10 CFR 50.46 report for LSCS, Units 1 and 2, for the 2022 reporting period. The referenced letter reported that LaSalle County Station (LSCS) has discharged all GNF3 Lead Use Assemblies (LUA) from Unit 2 and as a result, all references to GNF3 LUAs were removed from the evaluation. During L2R18, the first batch of GNF3 fuel (**NOT** LUAs) was installed on Unit 2. This was the first reporting period for the introduction of this fuel type at LSCS.

The referenced letter reported two new vendor notifications issued by GNF, both against the GNF2 fuel type. No Notification Letters had been issued against the GNF3 fuel type at LSCS.

Notification Letter 2021-01 documented that the fuel pellet to plenum spring conductance input to the fuel rod stress and perforation model in ECCS LOCA

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calculations contained an error stemming from an incorrect conversion from SI units in preparing the input for SAFER analyses. The error only affects the temperature and plenum gas pressure calculation in the plenum region, outside of the active fuel region. GNF concluded through their assessment that the impact to the Peak Cladding Temperature (PCT) was insignificant for the affected fuel types and assessed no (0°F) change to the reference PCT.

Notification 2021-02 documented that the roughness value used for inner cladding surface roughness, which is an input to the gap conductance model, contained an inconsistency between that used for PRIME and the input to the SAFER and TRACG calculations. The difference stems from a recent change in the way the PRIME model evaluations the nominal value from the distribution uncertainty. The inner cladding surface roughness affects the pellet-cladding contact heat transfer and therefore, the gap conductance. GNF concluded through their assessment that the impact to the Peak Cladding Temperature (PCT) was insignificant for the affected fuel types and assessed no (0°F) change to the reference PCT.

No ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH GNF2 LOCA analysis of record for the GNF2 fuel in LSCS, Units 1 and 2. No ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH GNF3 LOCA analysis of record for the GNF3 fuel in LSCS, Unit 2. GNF3 was not currently installed at LSCS, Unit 1.

[RS-22-018, Letter from Kevin Lueshen (Constellation Energy Generation, LLC) to U.S. Nuclear Regulatory Commission, "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors for LaSalle County Station" dated February 22, 2022.]

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12. Current LOCA Assessment

During L1R19, the first batch of GNF3 fuel was installed in Unit 1. This was the first reporting period for the introduction of this fuel type at LSCS Unit 1. GNF3 fuel was previously introduced at Unit 2 and discussed in the previous 10 CFR50.46 report (Reference in Assessment Note 11).

Since the previous 10 CFR 50.46 report (Reference in Assessment Note 11) there has been one change. It was recently discovered that a change in 2011 was made to the decay heat (DH) 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. This change was already incorporated into the initial GNF3 LOCA evaluation and therefore has no impact on the GNF3 LOCA analysis of record.

No ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH GNF2 LOCA analysis of record for the GNF2 fuel in LSCS, Units 1 and 2. No ECCS related changes or modifications occurred at LSCS that affected the assumptions in the GEH GNF3 LOCA analysis of record for the GNF3 fuel in LSCS, Unit 2.