

10 CFR 50.46

April 8, 2021

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

R.E. Ginna Nuclear Power Plant  
Renewed Facility Operating License No. DPR-18  
NRC Docket No. 50-244

Subject: 2021 10 CFR 50.46 Annual Report

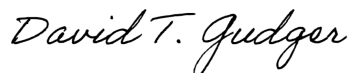
Reference: 1. Letter from D. Gudger (Exelon Generation Company, LLC) to  
U.S. Nuclear Regulatory Commission, "2020 10 CFR 50.46 Annual  
Report," dated April 8, 2020

The purpose of this letter is to submit the 10 CFR 50.46 annual reporting information for R.E. Ginna Nuclear Power Plant. The referenced letter is the most recent annual 10 CFR 50.46 Report submitted to the U.S. Nuclear Regulatory Commission.

Two attachments are included with this letter that provide the current Ginna 10 CFR 50.46 status. Attachment 1 provides the Peak Cladding Temperature (PCT) "rack-up" sheets. Attachment 2, "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,



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David T. Gudger  
Senior Manager - Licensing  
Exelon Generation Company, LLC

Attachments: 1) Peak Cladding Temperature Rack-Up Sheets for R.E. Ginna Nuclear  
Power Plant  
2) Assessment Notes

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cc: U.S. NRC Administrator, Region I  
U.S. NRC Project Manager, Ginna  
U.S. NRC Senior Resident Inspector, Ginna

**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 April 8, 2021**

**Peak Cladding Temperature Rack-Up Sheets for**

**R.E. Ginna Nuclear Power Plant**

PLANT NAME: Ginna  
ECCS EVALUATION MODEL: Small Break Loss of Coolant Accident (SBLOCA)  
REPORT REVISION DATE: 4/8/2021  
CURRENT OPERATING CYCLE: 42

## ANALYSIS OF RECORD

Evaluation Model: NOTRUMP  
Calculation: Westinghouse CN-LIS-04-206, April 2005  
Fuel: 422 Vantage+  
Limiting Fuel Type: 422 Vantage+  
Limiting Single Failure: Diesel Generator Failure to Start  
Limiting Break Size and Location: 2-inch Equivalent High T<sub>avg</sub> Cold Leg Break  
Reference Peak Cladding Temperature (PCT) PCT = 1167.0°F

## MARGIN ALLOCATION

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

10 CFR 50.46 report dated April 30, 2007 (Note 1)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated February 10, 2009 (Note 3)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated March 4, 2011 (Note 5)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated March 27, 2012 (Note 6)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 1, 2013 (Note 8)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 9, 2014 (Note 9)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 9, 2015 (Note 10)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 7, 2016 (Note 11)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 6, 2018 (Note 13)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 8, 2019 (Note 14)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 8, 2020 (Note 15)	$\Delta PCT = 0^{\circ}F$
<b>NET PCT</b>	<b>PCT = 1167.0°F</b>

### B. CURRENT LOCA MODEL ASSESSMENTS

None	$\Delta PCT = 0^{\circ}F$
Total PCT change from current assessments	$\sum \Delta PCT = 0^{\circ}F$
Cumulative PCT change from current assessments	$\sum  \Delta PCT  = 0^{\circ}F$
<b>NET PCT</b>	<b>PCT = 1167.0°F</b>

PLANT NAME: Ginna  
ECCS EVALUATION MODEL: Large Break Loss of Coolant Accident (LBLOCA)  
REPORT REVISION DATE: 4/8/2021  
CURRENT OPERATING CYCLE: 42

## ANALYSIS OF RECORD

Evaluation Model: ASTRUM (2004)  
Calculation: Westinghouse CN-LIS-05-11, April 2005  
Fuel: 422 Vantage+  
Limiting Fuel Type: 422 Vantage+  
Limiting Single Failure: Loss of one train of ECCS flow  
Limiting Break Size and Location: Cold Leg Split Break  
Reference PCT

PCT = 1870.0°F

## MARGIN ALLOCATION

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

10 CFR 50.46 report dated April 30, 2007 (Note 1)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated May 4, 2008 (Note 2)	$\Delta PCT = +37^{\circ}F$
10 CFR 50.46 report dated February 10, 2009 (Note 3)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated March 26, 2010 (Note 4)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated March 4, 2011 (Note 5)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated March 27, 2012 (Note 6)	$\Delta PCT = 0^{\circ}F$
30-Day 10 CFR 50.46 report dated August 16, 2012 (Note 7)	$\Delta PCT = +134^{\circ}F$
10 CFR 50.46 report dated April 1, 2013 (Note 8)	$\Delta PCT = +75^{\circ}F$
10 CFR 50.46 report dated April 9, 2014 (Note 9)	$\Delta PCT = +2^{\circ}F$
10 CFR 50.46 report dated April 9, 2015 (Note 10)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 7, 2016 (Note 11)	$\Delta PCT = +1^{\circ}F$
10 CFR 50.46 report dated April 7, 2017 (Note 12)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 6, 2018 (Note 13)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 8, 2019 (Note 14)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated April 8, 2020 (Note 15)	$\Delta PCT = 0^{\circ}F$
<b>NET PCT</b>	<b>PCT = 2119.0°F</b>

### B. CURRENT LOCA MODEL ASSESSMENTS

Error In Support Column Metal Thickness (Note 16)	$\Delta PCT = 0^{\circ}F$
Errors In Unheated Conductor Noding (Note 16)	$\Delta PCT = 0^{\circ}F$
Total PCT change from current assessments	$\sum \Delta PCT = 0^{\circ}F$
Cumulative PCT change from current assessments	$\sum  \Delta PCT  = 0^{\circ}F$
<b>NET PCT</b>	<b>PCT = 2119.0°F</b>

**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 April 8, 2021**

**Assessment Notes**

**R.E. Ginna Nuclear Power Plant**

1. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 30, 2007, reported new licensing basis peak cladding temperature (PCT) for small break loss of coolant accident (SBLOCA) and large break loss of coolant accident (LBLOCA) analyses to support fuel assembly transition from OFA to 422 Vantage+ and extended power uprate. The new licensing basis PCT reported for SBLOCA and LBLOCA are 1167°F and 1870°F, respectively.

2. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated May 4, 2008, reported an evaluation for LBLOCA related to HOTSPOT fuel relocation error which resulted in a 37°F PCT assessment.

3. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated February 10, 2009, reported evaluations for SBLOCA and LBLOCA model changes which resulted in 0°F PCT change.

4. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated March 26, 2010, reported evaluations for LBLOCA model changes which resulted in 0°F PCT change.

5. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated March 4, 2011, reported evaluations for SBLOCA and LBLOCA model changes which resulted in 0°F PCT change.

6. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated March 27, 2012, reported evaluations for SBLOCA and LBLOCA model changes which resulted in 0°F PCT change.

7. Prior LOCA Model Assessment

The 30-day 10 CFR 50.46 report dated August 16, 2012, reported evaluations for fuel pellet thermal conductivity degradation (TCD) and peaking factor burndown, and design input change assessments which resulted in a 134°F PCT impact for LBLOCA.

8. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 1, 2013, reported evaluations for SBLOCA model changes which resulted in 0°F PCT impact. A LBLOCA assessment for the evaluation of an elevated initial containment and accumulator temperature was submitted in a License Amendment Request for NRC review and approval. The assessment resulted in a 75°F PCT impact. This increase in temperature was approved in an NRC Safety Evaluation Report (SER) (ML14232A331) dated August 21, 2014. The SER (ML14232A331) evaluated the 10 CFR 50.46 reporting criteria explicitly.

9. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 9, 2014, reported evaluations for SBLOCA model changes which resulted in 0°F PCT impact. A LBLOCA assessment was reported related to revised heat transfer multiplier distribution which resulted in a 2°F PCT assessment.

10. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 9, 2015, reported general code maintenance for both LBLOCA and SBLOCA. An error in Decay Group Uncertainty Factors against the LBLOCA model was reported. Additionally, it reported errors in Fuel Rod Gap Conductance, Radiation Heat Transfer Model, and SBLOCA Pre-DNB Cladding Surface Heat Transfer Coefficient Calculation for the SBLOCA model. All changes resulted in 0°F PCT impact.

11. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 7, 2016, reported General Code Maintenance for the SBLOCA which led to a PCT impact of 0°F. Additionally, Ginna began inserting reconstituted fuel with 5 stainless steel filler rods starting in Cycle 39. The effects to SBLOCA are 0°F and the effects to LBLOCA are 1°F for as long as reconstituted fuel with 5 stainless steel filler rods remain in the core.

12. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 7, 2017, reported General Code Maintenance for the LBLOCA to enhance the usability of codes and to streamline future analyses which led to a PCT impact of 0°F. There were two errors assessed to the LBLOCA analysis related to the calculation of high temperature oxidation within a realistic LBLOCA calculation and to the use of the American Society of Mechanical Engineers (ASME) steam tables to calculate the steady-state upper head liquid temperature as a function of the pressure and specific enthalpy in the ASTRUM software program. Both errors each resulted in an estimated PCT impact of 0°F for 10 CFR 50.46. There were no impacts or assessments to SBLOCA.

13. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 6, 2018, reported General Code Maintenance for the SBLOCA and LBLOCA which each led to a PCT impact of 0°F. The SBLOCA also reported one error pertained to the upper plenum fluid volume calculation with an estimated PCT impact of 0°F. The LBLOCA reported three assessments with the first involving an evaluation of inconsistent application of numerical ramp applied to the entrained liquid / vapor interfacial drag coefficient, the second involving an evaluation of inappropriate resetting of transverse liquid mass flow, and the third involving an evaluation of steady-state fuel temperature calibration method. All three errors each resulted in an estimated PCT impact of 0°F for 10 CFR 50.46.



#### 14. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 8, 2019 reported one error pertaining to fuel rod heat-up calculations for the SBLOCA which led to a PCT impact of 0°F. The LBLOCA also reported two errors, one pertaining to the CCTF model used in the WCOBRA/TRAC calculation and the second involved the modeling of vapor temperature in the WCOBRA/TRAC codes. upper plenum fluid volume calculation with an estimated PCT impact of 0°F. Both errors each resulted in an estimated PCT impact of 0°F for 10 CFR 50.46.

#### 15. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 8, 2020 reported one change pertaining to main steam safety valve (MSSV) setpoint pressure tolerance for the SBLOCA which led to a PCT impact of 0°F. The LBLOCA also reported three errors or changes, one pertaining to the general code maintenance, one concerning the vessel interfacial heat transfer implementation and validation basis for modeling upper plenum injection (UPI) phenomena. Each error or change resulted in an estimated PCT impact of 0°F for 10 CFR 50.46.

#### 16. Current LOCA Model Assessment

For the current LBLOCA and SBLOCA analyses, there was no error assessed to the SBLOCA analysis and two errors assessed for the LBLOCA.

An error was identified in the calculation of the support column metal thickness in the R. E. Ginna WCOBRA/TRAC vessel model. The total metal mass and surface area of the support columns was modeled correctly, just the thickness was incorrect. An evaluation was completed to estimate the effect of this modeling error on the large break LOCA (LBLOCA) analysis with the Automated Statistical Treatment of Uncertainty Method (ASTRUM). The correction of this error represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451 and was determined to have a negligible effect. Therefore, there is an estimated PCT impact of 0°F.

The second error was a discrepancy identified whereby some unheated conductors used node sizes that are inconsistent with the analysis input guidelines in the WCOBRA/TRAC vessel model for some two-loop plants. An evaluation was completed to estimate the effect of this modeling error on the affected two-loop large break LOCA (LBLOCA) analyses with the Automated Statistical Treatment of Uncertainty Method (ASTRUM). The correction of this error represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451 and was determined to have a negligible effect. Therefore, there is an estimated PCT impact of 0°F.