

RS-22-047

10 CFR 50.46

April 8, 2022

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

Braidwood Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and 50-457

Byron Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and 50-455

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

- Reference:
- 1) Letter from P. Simpson (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission (NRC), "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors," dated October 22, 2021 (ML21295A214)
 - 2) Letter from D. Murray (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission (NRC), "Annual 10 CFR 50.46 Report of Emergency Core Cooling System Evaluation Model Changes and Errors," dated April 9, 2021 (ML21099A106)

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 Braidwood and Byron Stations, Units 1 and 2. A new Full Spectrum LOCA (FSLOCA) analysis is being implemented for Byron Unit 2 during the 2022 Spring outage in place of both the Small Break and Large Break LOCA analyses. This report includes the updated information and a separate 30 day report will not be submitted. The attachments describe the changes in the evaluations associated with the accumulated peak cladding temperature (PCT) since the previous reports submitted in the referenced letters.

There are no regulatory commitments contained in this submittal.

Should you have any questions concerning this letter, please contact Mr. Phillip Henderson at (630) 657-4727.

April 8, 2022
U.S. Nuclear Regulatory Commission
Page 2

Respectfully,

Kevin Lueshen
Sr. Manager – Licensing
Constellation Energy Generation, LLC

Attachments: 1) Braidwood Station, Units 1 and 2 – 10 CFR 50.46 Report
 2) Byron Station, Units 1 and 2 – 10 CFR 50.46 Report
 3) Braidwood and Byron Stations, Units 1 and 2 – 10 CFR 50.46 Report
 Assessment Notes

cc: NRC Regional Administrator, Region III
 NRC Senior Resident Inspector, Braidwood Station
 NRC Senior Resident Inspector, Byron Station
 NRR Project Manager, Braidwood and Byron Stations
 Illinois Emergency Management Agency – Division of Nuclear Safety

**Attachment 1
Braidwood Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Braidwood Station Unit 1
 ECCS EVALUATION MODEL: Full Spectrum LOCA EM Small Break
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 23

ANALYSIS OF RECORD (AOR)

Evaluation Model: FSLOCA
 Calculation: Westinghouse WCAP-18448-P, August 2019
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: 3.8-inch Break in the Cold Leg
 Reference Peak Cladding Temperature (PCT) PCT = 1181.0°F

MARGIN ALLOCATION

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

10 CFR 50.46 Report Dated April 9, 2021 (See Note 29)	$\Delta PCT = +20\text{ }^{\circ}\text{F}$
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NET PCT PCT = 1201.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

General Code Maintenance (See Note 32)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
Total PCT change from current assessments	$\sum \Delta PCT = 0\text{ }^{\circ}\text{F}$
Cumulative PCT change from current assessments	$\sum \Delta PCT = 0\text{ }^{\circ}\text{F}$

NET PCT PCT = 1201.0°F

**Attachment 1
Braidwood Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Braidwood Station Unit 1
 ECCS EVALUATION MODEL: Full Spectrum LOCA EM Large Break
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 23

AOR

Evaluation Model: FSLOCA
 Calculation: Westinghouse WCAP-18448-P, August 2019
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: Guillotine break in the Cold Leg
 Reference PCT PCT = 1643.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 Report Dated April 9, 2021 (See Note 29)	ΔPCT = 0 °F
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NET PCT **PCT = 1643.0°F**

B. CURRENT LOCA MODEL ASSESSMENTS

General Code Maintenance (See Note 32)	ΔPCT = 0 °F
Total PCT change from current assessments	∑ ΔPCT = 0 °F
Cumulative PCT change from current assessments	∑ ΔPCT = 0 °F

NET PCT **PCT = 1643.0°F**

**Attachment 1
Braidwood Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Braidwood Station Unit 2
 ECCS EVALUATION MODEL: Small Break Loss of Coolant Accident (SBLOCA)
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 22

AOR

Evaluation Model: NOTRUMP
 Calculation: Westinghouse CN-LIS-00-208, December 2000
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: 2-inch Break in the Bottom of the Cold Leg
 Reference PCT PCT = 1627.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 report dated June 11, 2001 (Note 1)	ΔPCT = +3 °F
10 CFR 50.46 report dated April 18, 2002 (Note 2)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 14, 2003 (Note 3)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 14, 2004 (Note 4)	ΔPCT = +35 °F
10 CFR 50.46 report dated April 14, 2005 (Note 5)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 14, 2006 (Note 6)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 13, 2007 (Note 7)	ΔPCT = 0 °F
30-Day 10 CFR 50.46 report dated June 22, 2007 (Note 9)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 11, 2008 (Note 11)	ΔPCT = +90 °F
10 CFR 50.46 report dated April 9, 2009 (Note 12)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 8, 2010 (Note 13)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 6, 2011 (Note 15)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 6, 2012 (Note 17)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 5, 2013 (Note 19)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 7, 2014 (Note 21)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 7, 2015 (Note 22)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 7, 2016 (Note 23)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 7, 2017 (Note 24)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 9, 2018 (Note 25)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 9, 2019 (Note 26)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 9, 2020 (Note 27)	ΔPCT = 0 °F
10 CFR 50.46 report dated April 9, 2021 (Note 28)	ΔPCT = 0 °F

NET PCT

PCT = 1755.0°F

**Attachment 1
Braidwood Station, Units 1 and 2
10 CFR 50.46 Report**

B. CURRENT LOCA MODEL ASSESSMENTS

Barrel/Baffle Gap Flow Area Impact to NOTRUMP (See Note 31)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
General Code Maintenance (See Note 32)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
Total PCT change from current assessments	$\sum \Delta PCT = 0 \text{ } ^\circ\text{F}$
Cumulative PCT change from current assessments	$\sum \Delta PCT = 0 \text{ } ^\circ\text{F}$

NET PCT

PCT = 1755.0°F

**Attachment 1
Braidwood Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Braidwood Station Unit 2
 ECCS EVALUATION MODEL: Large Break Loss of Coolant Accident (LBLOCA)
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 22

AOR

Evaluation Model: ASTRUM (2004)
 Calculation: Westinghouse WCAP-16841-P, November 2007
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: Guillotine break in the Cold Leg
 Reference PCT PCT = 2041.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

30-Day 10 CFR 50.46 report dated March 15, 2011 (Note 14)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 6, 2011 (Note 15)	Δ PCT = 0 °F
30-Day 10 CFR 50.46 report dated March 19, 2012 (Note 16)	Δ PCT = -42 °F
10 CFR 50.46 report dated April 6, 2012 (Note 17)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 5, 2013 (Note 19)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 7, 2014 (Note 21)	Δ PCT = +46 °F
10 CFR 50.46 report dated April 7, 2015 (Note 22)	Δ PCT = +2 °F
10 CFR 50.46 report dated April 7, 2016 (Note 23)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 7, 2017 (Note 24)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 9, 2018 (Note 25)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 9, 2019 (Note 26)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 9, 2020 (Note 27)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 9, 2021 (Note 28)	Δ PCT = 0 °F

NET PCT

PCT = 2047.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

General Code Maintenance (See Note 32)	Δ PCT = 0 °F
Total PCT change from current assessments	$\sum \Delta$ PCT = 0 °F
Cumulative PCT change from current assessments	$\sum \Delta$ PCT = 0 °F

NET PCT

PCT = 2047.0°F

**Attachment 1
Braidwood Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Braidwood Station Unit 2
 ECCS EVALUATION MODEL: Full Spectrum LOCA EM Small Break
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 23

ANALYSIS OF RECORD (AOR)

Evaluation Model: FSLOCA
 Calculation: Westinghouse WCAP-18449-P, August 2019
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: 3.7-inch Break in the Cold Leg
 Reference Peak Cladding Temperature (PCT) PCT = 1169.0°F

MARGIN ALLOCATION

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

30-Day 10 CFR 50.46 report dated October 22, 2021 (Note 29)	Δ PCT = +20 °F
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NET PCT PCT = 1189.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

General Code Maintenance (See Note 32)	Δ PCT = 0 °F
Total PCT change from current assessments	$\sum \Delta$ PCT = 0 °F
Cumulative PCT change from current assessments	$\sum \Delta$ PCT = 0 °F

NET PCT PCT = 1189.0°F

**Attachment 1
Braidwood Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Braidwood Station Unit 2
 ECCS EVALUATION MODEL: Full Spectrum LOCA EM Large Break
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 23

AOR

Evaluation Model: FSLOCA
 Calculation: Westinghouse WCAP-18449-P, August 2019
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: Guillotine break in the Cold Leg
 Reference PCT PCT = 1752.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

30-Day 10 CFR 50.46 report dated October 22, 2021 (Note 29)	ΔPCT = 0 °F
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NET PCT **PCT = 1752.0°F**

B. CURRENT LOCA MODEL ASSESSMENTS

General Code Maintenance (See Note 32)	ΔPCT = 0 °F
Total PCT change from current assessments	∑ ΔPCT = 0 °F
Cumulative PCT change from current assessments	∑ ΔPCT = 0 °F

NET PCT **PCT = 1752.0°F**

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Byron Station Unit 1
 ECCS EVALUATION MODEL: Small Break Loss of Coolant Accident (SBLOCA)
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 24

ANALYSIS OF RECORD (AOR)

Evaluation Model: NOTRUMP
 Calculation: Westinghouse CN-LIS-00-208, December 2000
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: 2-inch Break in the Bottom of the Cold Leg
 Reference Peak Cladding Temperature (PCT) PCT = 1624.0°F

MARGIN ALLOCATION

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

10 CFR 50.46 report dated June 11, 2001 (Note 1)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 18, 2002 (Note 2)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 14, 2003 (Note 3)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 14, 2004 (Note 4)	$\Delta PCT = +35\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 14, 2005 (Note 5)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 14, 2006 (Note 6)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 13, 2007 (Note 7)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
30-Day 10 CFR 50.46 report dated June 22, 2007 (Note 9)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 11, 2008 (Note 11)	$\Delta PCT = +90\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2009 (Note 12)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 8, 2010 (Note 13)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 6, 2011 (Note 15)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 6, 2012 (Note 17)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 5, 2013 (Note 19)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2014 (Note 21)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2015 (Note 22)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2016 (Note 23)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2017 (Note 24)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2018 (Note 25)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2019 (Note 26)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2020 (Note 27)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2021 (Note 28)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$

NET PCT

PCT = 1749.0°F

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

B. CURRENT LOCA MODEL ASSESSMENTS

Barrel/Baffle Gap Flow Area Impact to NOTRUMP (See Note 31)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
General Code Maintenance (See Note 32)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
Total PCT change from current assessments	$\sum \Delta PCT = 0 \text{ } ^\circ\text{F}$
Cumulative PCT change from current assessments	$\sum \Delta PCT = 0 \text{ } ^\circ\text{F}$

NET PCT

PCT = 1749.0°F

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Byron Station Unit 1
 ECCS EVALUATION MODEL: Large Break Loss of Coolant Accident (LBLOCA)
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 24

AOR

Evaluation Model: ASTRUM (2004)
 Calculation: Westinghouse WCAP-16841-P, November 2007
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: Guillotine break in the Cold Leg
 Reference PCT PCT = 1913.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

30-Day 10 CFR 50.46 report dated March 15, 2011 (Note 14)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 6, 2011 (Note 15)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 6, 2012 (Note 17)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
30-Day 10 CFR 50.46 report dated May 21, 2012 (Note 18)	$\Delta PCT = +44\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 5, 2013 (Note 19)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
30-Day 10 CFR 50.46 report dated February 27, 2014 (Note 20)	$\Delta PCT = +66\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2014 (Note 21)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2015 (Note 22)	$\Delta PCT = +2\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2016 (Note 23)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2017 (Note 24)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2018 (Note 25)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2019 (Note 26)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2020 (Note 27)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2021 (Note 28)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$

NET PCT

PCT = 2025.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

General Code Maintenance (See Note 32)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
Total PCT change from current assessments	$\sum \Delta PCT = 0\text{ }^{\circ}\text{F}$
Cumulative PCT change from current assessments	$\sum \Delta PCT = 0\text{ }^{\circ}\text{F}$

NET PCT

PCT = 2025.0°F

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Byron Station Unit 1
 ECCS EVALUATION MODEL: Full Spectrum LOCA EM Small Break
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 25

ANALYSIS OF RECORD (AOR)

Evaluation Model: FSLOCA
 Calculation: Westinghouse WCAP-18448-P, August 2019
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: 3.8-inch Break in the Cold Leg
 Reference Peak Cladding Temperature (PCT) PCT = 1181.0°F

MARGIN ALLOCATION

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

30-Day 10 CFR 50.46 report dated October 22, 2021 (Note 29)	ΔPCT = +20 °F
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NET PCT **PCT = 1201.0°F**

B. CURRENT LOCA MODEL ASSESSMENTS

General Code Maintenance (See Note 32)	ΔPCT = 0 °F
Total PCT change from current assessments	∑ ΔPCT = 0 °F
Cumulative PCT change from current assessments	∑ ΔPCT = 0 °F

NET PCT **PCT = 1201.0°F**

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Byron Station Unit 1
 ECCS EVALUATION MODEL: Full Spectrum LOCA EM Large Break
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 25

AOR

Evaluation Model: FSLOCA
 Calculation: Westinghouse WCAP-18448-P, August 2019
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: Guillotine break in the Cold Leg
 Reference PCT PCT = 1643.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

30-Day 10 CFR 50.46 report dated October 22, 2021 (Note 29)	ΔPCT = 0 °F
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NET PCT **PCT = 1643.0°F**

B. CURRENT LOCA MODEL ASSESSMENTS

General Code Maintenance (See Note 32)	ΔPCT = 0 °F
Total PCT change from current assessments	∑ ΔPCT = 0 °F
Cumulative PCT change from current assessments	∑ ΔPCT = 0 °F

NET PCT **PCT = 1643.0°F**

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Byron Station Unit 2
 ECCS EVALUATION MODEL: Small Break Loss of Coolant Accident (SBLOCA)
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 23

AOR

Evaluation Model: NOTRUMP
 Calculation: Westinghouse CN-LIS-00-208, December 2000
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: 2-inch Break in the Bottom of the Cold Leg
 Reference PCT PCT = 1627.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 report dated June 11, 2001 (Note 1)	Δ PCT = +3 °F
10 CFR 50.46 report dated April 18, 2002 (Note 2)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 14, 2003 (Note 3)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 14, 2004 (Note 4)	Δ PCT = +35 °F
10 CFR 50.46 report dated April 14, 2005 (Note 5)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 14, 2006 (Note 6)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 13, 2007 (Note 7)	Δ PCT = 0 °F
30-Day 10 CFR 50.46 report dated May 10, 2007 (Note 8)	Δ PCT = +90 °F
30-Day 10 CFR 50.46 report dated June 22, 2007 (Note 9)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 11, 2008 (Note 11)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 9, 2009 (Note 12)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 8, 2010 (Note 13)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 6, 2011 (Note 15)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 6, 2012 (Note 17)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 5, 2013 (Note 19)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 7, 2014 (Note 21)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 7, 2015 (Note 22)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 7, 2016 (Note 23)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 7, 2017 (Note 24)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 9, 2018 (Note 25)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 9, 2019 (Note 26)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 9, 2020 (Note 27)	Δ PCT = 0 °F
10 CFR 50.46 report dated April 9, 2021 (Note 28)	Δ PCT = 0 °F

NET PCT

PCT = 1755.0°F

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

B. CURRENT LOCA MODEL ASSESSMENTS

Barrel/Baffle Gap Flow Area Impact to NOTRUMP (See Note 31)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
General Code Maintenance (See Note 32)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
Total PCT change from current assessments	$\sum \Delta PCT = 0 \text{ } ^\circ\text{F}$
Cumulative PCT change from current assessments	$\sum \Delta PCT = 0 \text{ } ^\circ\text{F}$

NET PCT

PCT = 1755.0°F

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Byron Station Unit 2
 ECCS EVALUATION MODEL: Large Break Loss of Coolant Accident (LBLOCA)
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 23

AOR

Evaluation Model: ASTRUM (2004)
 Calculation: Westinghouse WCAP-16841-P, November 2007
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: Guillotine break in the Cold Leg
 Reference PCT PCT = 2041.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

30-Day 10 CFR 50.46 report dated March 15, 2011 (Note 14)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 6, 2011 (Note 15)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
30-Day 10 CFR 50.46 report dated March 19, 2012 (Note 16)	$\Delta PCT = -42\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 6, 2012 (Note 17)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 5, 2013 (Note 19)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2014 (Note 21)	$\Delta PCT = +46\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2015 (Note 22)	$\Delta PCT = +2\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2016 (Note 23)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 7, 2017 (Note 24)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2018 (Note 25)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2019 (Note 26)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2020 (Note 27)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
10 CFR 50.46 report dated April 9, 2021 (Note 28)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$

NET PCT

PCT = 2047.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

General Code Maintenance (See Note 32)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
Total PCT change from current assessments	$\sum \Delta PCT = 0\text{ }^{\circ}\text{F}$
Cumulative PCT change from current assessments	$\sum \Delta PCT = 0\text{ }^{\circ}\text{F}$

NET PCT

PCT = 2047.0°F

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Byron Station Unit 2
 ECCS EVALUATION MODEL: Full Spectrum LOCA EM Small Break
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 24

ANALYSIS OF RECORD (AOR)

Evaluation Model: FSLOCA
 Calculation: Westinghouse WCAP-18449-P, August 2019
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: 3.7-inch Break in the Cold Leg
 Reference Peak Cladding Temperature (PCT) PCT = 1169.0°F

MARGIN ALLOCATION

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

None	ΔPCT = 0 °F
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NET PCT PCT = 1169.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

New LOCA Model (See Note 30)	ΔPCT = 0 °F
ECCS Line Void Evaluation (See Note 30)	ΔPCT = +20 °F
General Code Maintenance (See Note 32)	ΔPCT = 0 °F
Lucifer Kinetics and Decay Heat Model (See Note 30)	ΔPCT = 0 °F
Total PCT change from current assessments	∑ ΔPCT = +20 °F
Cumulative PCT change from current assessments	∑ ΔPCT = 20 °F

NET PCT PCT = 1189.0°F

**Attachment 2
Byron Station, Units 1 and 2
10 CFR 50.46 Report**

PLANT NAME: Byron Station Unit 2
 ECCS EVALUATION MODEL: Full Spectrum LOCA EM Large Break
 REPORT REVISION DATE: 04/08/2022
 CURRENT OPERATING CYCLE: 24

AOR

Evaluation Model: FSLOCA
 Calculation: Westinghouse WCAP-18449-P, August 2019
 Fuel: VANTAGE+ 17 x 17
 Limiting Fuel Type: VANTAGE+ 17 x 17
 Limiting Single Failure: Loss of one train of ECCS flow
 Limiting Break Size and Location: Guillotine break in the Cold Leg
 Reference PCT PCT = 1752.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

None	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
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NET PCT **PCT = 1752.0°F**

B. CURRENT LOCA MODEL ASSESSMENTS

New LOCA Model (See Note 30)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
General Code Maintenance (See Note 32)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
Lucifer Kinetics and Decay Heat Model (See Note 30)	$\Delta PCT = 0\text{ }^{\circ}\text{F}$
Total PCT change from current assessments	$\sum \Delta PCT = 0\text{ }^{\circ}\text{F}$
Cumulative PCT change from current assessments	$\sum \Delta PCT = 0\text{ }^{\circ}\text{F}$

NET PCT **PCT = 1752.0°F**

Attachment 3
Braidwood and Byron Stations, Units 1 and 2
10 CFR 50.46 Report Assessment Notes

1. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated June 11, 2001 reported new small break loss of coolant accident (SBLOCA) analyses to support operations at uprated power conditions. The same report assessed the impact from annular axial blankets on SBLOCA analysis, which determined a 0°F PCT penalty for Units 1 and a 3°F PCT penalty for Units 2. Evaluations for plant conditions and SBLOCA model changes which resulted in 0°F PCT change were reported.

2. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 18, 2002 reported evaluations for SBLOCA model changes which resulted in 0°F PCT change.

3. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 14, 2003 reported evaluations for SBLOCA model changes which resulted in 0°F PCT change.

4. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 14, 2004 reported evaluations for a SBLOCA assessment related to NOTRUMP bubble rise/drift flux model inconsistency corrections, which resulted in 35°F PCT assessment.

5. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 14, 2005 reported evaluations for SBLOCA model changes which resulted in 0°F PCT change for Byron and Braidwood Unit 1 and Unit 2. The Braidwood Station, Unit 1 assembly N10S was reconstituted with two stainless steel filler rods during Braidwood Unit 1 Refueling Outage 11. This assembly is reloaded into the core and is in use during Braidwood Unit 1 Cycle 12 operation. The introduction of up to five stainless steel filler rods has been evaluated and shown to have no impact on SBLOCA analysis. The estimated PCT effect is 0°F for Braidwood Unit 1. This assembly was discharged during Reload 12.

6. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 14, 2006 reported evaluations for SBLOCA NOTRUMP general code maintenance which resulted in 0°F change.

7. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 13, 2007 reported evaluations for SBLOCA model changes and errors. The report documented general code maintenance for NOTRUMP, AXIOM lead test assembly evaluation and NOTRUMP refined break spectrum, which resulted in 0°F PCT impact.

Attachment 3
Braidwood and Byron Stations, Units 1 and 2
10 CFR 50.46 Report Assessment Notes

8. Prior LOCA Model Assessment

The 30-day 10 CFR 50.46 report dated May 10, 2007 applicable to Byron Unit 2 reported an assessment of the Emergency Core Cooling System (ECCS), which evaluated changes in ECCS flow during the recirculation phase due to Generic Safety Issue (GSI) -191 related safety injection (SI) throttle valve replacements. The evaluation of recirculation phase ECCS flow changes relative to impact on the current Analysis of Record (AOR) was performed for the SBLOCA. Based on the NOTRUMP and SBLOCA calculations performed for Byron Unit 2, a conservative, bounding PCT assessment of +90°F was applied to the current Byron Unit 2 SBLOCA PCT.

9. Prior LOCA Model Assessment

The 30-day 10 CFR 50.46 report dated June 22, 2007 applicable to Byron Units 1 and 2 and Braidwood Units 1 and 2 reported an error in the HOT SPOT Code which did not impact the SBLOCA analysis. The 30-day report also reported minor errors with the reactor vessel data collections that potentially affected the vessel inlet and outlet fluid volume, metal mass and surface area. The corrected values were evaluated for impact, and a 0°F penalty was assessed for Byron Units 1 and 2, and Braidwood Units 1 and 2, SBLOCA analysis.

10. Prior LOCA Model Assessment

The 30-day 10 CFR 50.46 report dated November 19, 2007 applicable to Braidwood Unit 1 reported an assessment of the Emergency Core Cooling System (ECCS), which evaluated changes in ECCS flow during the recirculation phase due to GSI-191 related SI throttle valve replacements. The evaluation of recirculation phase ECCS flow changes relative to impact on the current Analysis of Record (AOR) was performed for the small break loss of coolant accident (SBLOCA). Based on the NOTRUMP and SBLOCA calculations performed for Braidwood Unit 1, a conservative, bounding PCT assessment of +90°F was applied to the Braidwood Unit 1 SBLOCA PCT.

11. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 11, 2008 reported evaluations for LOCA model changes and errors. Applicable to Braidwood Unit 2 and Byron Unit 1, the ECCS assessment evaluated changes in ECCS flow during the recirculation phase due to GSI-191 related safety injection SI throttle valve replacements. A conservative, bounding PCT assessment of +90°F was applied to the Braidwood Unit 2 and Byron Unit 1 SBLOCA PCTs. The report also documented general code maintenance for SBLOCA and evaluation for pump weir resistance modeling for SBLOCA analyses, which resulted in 0°F PCT impact.

12. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 9, 2009 reported evaluations for LOCA model changes and errors. The report documents general code maintenance for SBLOCA, errors in reactor vessel lower plenum surface area calculations, discrepancies in metal mass from drawings, and an evaluation of AREVA LUAs. All of which have a 0°F PCT penalty associated with them.

Attachment 3
Braidwood and Byron Stations, Units 1 and 2
10 CFR 50.46 Report Assessment Notes

13. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 8, 2010 reported no evaluations for SBLOCA model changes which resulted in 0°F PCT change.

14. Prior LOCA Model Assessment

The 30-day 10 CFR 50.46 report dated March 15, 2011 reported a new large break BELOCA (ASTRUM) analysis to support operations for Byron and Braidwood Stations Units 1 and 2. The same report assessed the impact from several errors, issues, and code enhancements. Each of these errors/issues/code enhancements had a 0°F PCT impact with a net 0°F PCT impact.

15. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 6, 2011 reported no evaluations for the LBLOCA model. For the SBLOCA model, the following errors, changes, corrections or enhancements were reported. Two errors relating to uranium-gadolinia pellet thermal conductivity calculation, two errors relating to pellet crack and dish volume calculation, a discrepancy involving the treatment of vessel average temperature uncertainty, and general code maintenance were reported for the SBLOCA model. All of these issues were determined to have an estimated impact of 0°F.

16. Prior LOCA Model Assessment

The 30-day 10 CFR 50.46 report dated March 19, 2012 applicable to Braidwood Unit 2 and Byron Unit 2 reported an assessment of Thermal Conductivity Degradation (TCD) with an associated peaking factor burndown and a design input change consisting of a reduction in upper bound steam generator tube plugging, a reduction in nominal upper bound nominal vessel average temperature, and an increase in the assumed containment pressure boundary condition. As a result, the estimated effect of the TCD with burndown was determined to be +148°F and the estimated effect of the design input changes was determined to be -190°F. These two assessments are coupled together via their evaluations of burnup effects which include thermal conductivity degradation, peaking factor burndown and design input changes. Therefore, the combined effect of these two changes results in a net change in the reported LBLOCA PCT for Braidwood Unit 2 and Byron Unit 2 of -42°F.

17. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 6, 2012 reported evaluations for LOCA model changes and errors. The report documents general code maintenance for both SBLOCA & LBLOCA, errors in Radiation Heat Transfer Logic for SBLOCA, and an error in the Maximum Fuel Rod Time Step Logic for SBLOCA. All of which have a 0°F PCT penalty associated with them.

18. Prior LOCA Model Assessment

The 30-day 10 CFR 50.46 report dated May 21, 2012 applicable to Braidwood Unit 1 and Byron Unit 1 reported an assessment of Thermal Conductivity Degradation (TCD) with an

Attachment 3
Braidwood and Byron Stations, Units 1 and 2
10 CFR 50.46 Report Assessment Notes

associated peaking factor burndown an analysis input change consisting of a reduction in conservatism in analyzed FQ values and an increase in the assumed containment pressure boundary condition. As a result, the estimated effect of the TCD with burndown was determined to be +110°F and the estimated effect of the analysis input changes was determined to be -66°F. These two assessments are coupled together via their evaluations of burnup effects which include thermal conductivity degradation, peaking factor burndown and analysis input changes. Therefore, the combined effect of these two changes results in a net change in the reported LBLOCA PCT for Braidwood Unit 1 and Byron Unit 1 of +44°F.

19. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 5, 2013 reported evaluations for LBLOCA model changes, and HOTSPOT and WCOBRA/TRAC code corrections. For SBLOCA, thermal conductivity degradation (TCD) was evaluated with NOTRUMP to estimate the effect on the limiting cladding temperature model. All evaluations led to PCT impact of 0°F.

20. Prior LOCA Model Assessment

The 30-day 10 CFR 50.46 report dated February 27, 2014 applicable to Braidwood Unit 1 and Byron Unit 1 reported evaluations for LBLOCA model changes and code corrections. For Braidwood Unit 2 and Byron Unit 2 a net change of 46°F PCT impact did not require inclusion in the 30-day report and is reported herein. Revised heat transfer multiplier distributions, changes to grid blockage ratio and porosity and HOTSPOT burst strain error corrections was determined to be 5°F, 24°F, and 37°F PCT impact, respectively for Braidwood Unit 1 and Byron Unit 1. Other model changes and code corrections sum to 0°F PCT impact. Therefore, the combined effect of the changes resulted in a net change of 66°F PCT impact for Braidwood Unit 1 and Byron Unit 1.

21. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 7, 2014 applicable to Braidwood Unit 2 and Byron Unit 2 reported evaluations for LBLOCA model changes and code corrections. For Braidwood Unit 1 and Byron Unit 1 a net change of 66°F PCT impact required a 30-day report sent on February 27, 2014 (Note 20). Revised heat transfer multiplier distributions, changes to grid blockage ratio and porosity and HOTSPOT burst strain error corrections was determined to be 7°F, 24°F, and 15°F PCT impact, respectively for Braidwood Unit 2 and Byron Unit 2. Other model changes and code corrections sum to 0°F PCT impact. Therefore, the combined effect of the changes resulted in a net change of 46°F PCT impact for Braidwood Unit 2 and Byron Unit 2 LBLOCA. SBLOCA cladding strain requirement for fuel rod burst resulted in a 0°F PCT impact to Byron and Braidwood Unit 1 and 2 SBLOCA.

22. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 7, 2015 reported general code maintenance and a change to Safety Injection and Core Spray flow rates for LBLOCA & SBLOCA. The report also reported an error in the decay group uncertainty factor for LBLOCA, errors in the fuel rod gap conductance, radiation heat transfer model and pre-DNB cladding surface heat transfer coefficient and an evaluation to increased Auxiliary feedwater switchover delay for SBLOCA. With the exception of 2°F PCT impact to LBLOCA due to the change to Safety Injection and Core Spray flows, all other changes reported an impact of 0°F PCT.

Attachment 3
Braidwood and Byron Stations, Units 1 and 2
10 CFR 50.46 Report Assessment Notes

23. 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. There were no impacts to LBLOCA.

24. 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. Lastly there was one evaluation to the LBLOCA analysis where non-conservative methods were used in modeling the effect of containment purge on the containment pressure response. This evaluation using a more appropriate/conservative method was estimated to have an impact of 0°F for 10 CFR 50.46. There were no impacts to SBLOCA.

25. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 9, 2018 reported general code maintenance to enhance the usability of codes and to streamline future analyses which led to an estimated PCT impact of 0°F.

There was one error assessed to the SBLOCA analysis. An error was found in the fluid volume calculation in the upper plenum where the support column outer diameter was being used instead of the inner diameter. This error resulted in an estimated PCT impact of 0°F for 10 CFR 50.46.

There were three evaluations assessed to the LBLOCA analysis. The first evaluation involved a numerical ramp which was used to account for the disappearance of the entrained liquid phase was applied to the entrained liquid / vapor interfacial drag coefficient. The second evaluation involved the WCOBRA/TRAC routine which evaluates the mass and energy residual error of the time step solution, the transverse liquid mass flow is reset as the liquid phase disappears. The third evaluation concerned how the ASTRUM steady-state fuel pellet temperature calibration method involves solving for the hot gap width (AGFACT) to calibrate the fuel temperature for each fuel rod. All three evaluations resulted in estimated PCT impact of 0°F was assigned for 10 CFR 50.46 reporting purposes.

26. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 9, 2019 reported one error assessed applying to the SBLOCA analyses. A typographical error was discovered in the implementation of the UO₂ fuel pellet heat capacity for fuel rod heat-up calculations within the Appendix K SBLOCA evaluation models. The erroneous formulation results in an over-prediction of heat capacity that increases with fuel temperature. The corrected formulation results in a maximum decrease in heat capacity on the order of 1.2% for existing analyses of record. The small

Attachment 3
Braidwood and Byron Stations, Units 1 and 2
10 CFR 50.46 Report Assessment Notes

over-prediction in UO₂ fuel pellet heat capacity has been evaluated to have a negligible effect on existing SBLOCA analysis results due to the small magnitude of the change, leading to an estimated PCT impact of 0°F.

An error was assessed for the LBLOCA analysis. In the W/COBRA/TRAC and WCOBRA/TRAC-TF2 codes, when the vapor temperature is greater than the wall temperature, and several other conditions are met, the vapor temperature is reset to the saturation temperature for heat transfer calculations. It was discovered that this vapor temperature resetting logic results in an inconsistency between the conduction solution and the hydraulic solution, such that energy is not conserved between the two solutions. Engineering judgement supported by sensitivity calculations showed that correcting this error had minimal impact on LOCA transient calculations, leading to an estimated PCT impact of 0°F.

27. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 9, 2020 reported one error along with general code maintenance applying to the LBLOCA analyses for all four units. The general code maintenance of the LBLOCA analysis was to enhance the usability of codes and to streamline future analyses which led to an estimated PCT impact of 0°F. For the one error assessed to the LBLOCA analyses, there was an error found in the implementation of the vessel interfacial heat transfer limit which effectively negates the application of the limit. The error was corrected by removing the vessel interfacial heat transfer limit from the WCOBRA/TRAC code (as opposed to a direct correction of the error). Since the WCOBRA/TRAC code validation and sensitivity studies associated with the model from WCAP-12945-PA all contained the error, the removal of the limit preserves the existing validation basis and sensitivity study conclusions that were presented in the topical report. Based on the validation and RAI responses therein, it was concluded that the as-coded interfacial heat transfer models and condensation behavior was acceptable, leading to an estimated PCT impact of 0°F.

28. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated April 9, 2021 reported no impacts, errors, or changes to NOTRUMP SBLOCA analyses or the ASTRUM LBLOCA analyses.

29. Prior LOCA Model Assessment

FSLOCA has been implemented previously for Braidwood Unit 1, Braidwood Unit 2, and Byron Unit 1. Those implementations were previously reported in the previous annual report dated April 9, 2021 (for Braidwood Unit 1) and the 30-day report dated October 22, 2021 (for Braidwood Unit 2 and Byron Unit 1).

A new Full Spectrum LOCA (FSLOCA) analysis was implemented for Braidwood Unit 1 in place of both the Small Break and Large Break LOCA analyses at the start of Cycle 23. This analysis creates new analyses of record Peak Clad Temperature (PCT) of 1181°F for the small break region and 1643°F for the large break region. With these new analyses were one assessment to the small break region and two changes to the large break region along with their impacts.

Attachment 3
Braidwood and Byron Stations, Units 1 and 2
10 CFR 50.46 Report Assessment Notes

A new Full Spectrum LOCA (FSLOCA) analysis was implemented for Braidwood Unit 2 in place of both the Small Break and Large Break LOCA analyses at the start of Cycle 23. This analysis creates new analyses of record Peak Clad Temperature (PCT) of 1169°F for the small break region and 1752°F for the large break region. With these new analyses were one assessment to the small break region and two changes to the large break region along with their impacts.

A new Full Spectrum LOCA (FSLOCA) analysis was implemented for Byron Unit 1 in place of both the Small Break and Large Break LOCA analyses at the start of Cycle 25. This analysis creates new analyses of record Peak Clad Temperature (PCT) of 1181°F for the small break region and 1643°F for the large break region. With these new analyses were one assessment to the small break region and two changes to the large break region along with their impacts.

The assessment to the small break region was an ECCS Line Void Evaluation that was included in the licensing amendment request for FSLOCA approval at Braidwood and Byron Units 1 and 2. That evaluation had a limit PCT impact of +20°F.

The first change to the large break region involved general code maintenance. Various changes have been made to enhance the usability of codes and to streamline future analyses which represent Discretionary Changes and had an estimated peak cladding temperature impact of 0°F.

The second change to the large break region involved an impact to the lucifer kinetics and decay heat model. The WCOBRA/TRAC-TF2 code is the thermal-hydraulic system code licensed as part of the FULL SPECTRUM LOCA evaluation model. The kinetics and decay heat models in the code are described in Section 9 of WCAP-16996-P-A, Revision 1. The nuclear physics data supporting the code models was generated using the ARK depletion program, which evolved from the LEOPARD and CINDER codes as described in the response to Request for Additional Information (RAI) #25 on the FSLOCA EM. Since the approval of the FSLOCA EM, the kinetics and decay heat model in the WCOBRA/TRAC-TF2 code was updated to support the analysis of higher burnup fuel as described in Section 4.6 of WCAP-18446-P. The updated nuclear physics data is based on the NRC-approved PARAGON code (WCAP-16045-P-A). While the primary purpose of this update is for the analysis of higher burnup fuel, the change will impact licensing basis analysis calculations with the FSLOCA EM even under the existing burnup limits imposed via Limitation and Condition (L&C) #5 on the FSLOCA EM. This change to the WCOBRA/TRAC-TF2 code represents a Discretionary Change and will be implemented on a forward-fit basis. Therefore, this effort has no impact on the current FSLOCA evaluation model.

30. Current LOCA Model Assessment

A new Full Spectrum LOCA (FSLOCA) analysis is being implemented for Byron Unit 2 in place of both the Small Break and Large Break LOCA analyses at the start of Cycle 24. This analysis creates new analyses of record Peak Clad Temperature (PCT) of 1169°F for the small break region and 1752°F for the large break region. With these new analyses were one assessment to the small break region and two changes to the large break region along with their impacts.

Attachment 3
Braidwood and Byron Stations, Units 1 and 2
10 CFR 50.46 Report Assessment Notes

The assessment to the small break region was an ECCS Line Void Evaluation that was included in the FSLOCA licensing amendment request, which was approved on December 28, 2020 (Reference ADAMS Accession No. ML20317A001). That evaluation had a limit PCT impact of +20°F.

The first change to the large break region involved general code maintenance. Various changes have been made to enhance the usability of codes and to streamline future analyses which represent Discretionary Changes and had an estimated peak cladding temperature impact of 0°F.

The second change to the large break region involved an impact to the lucifer kinetics and decay heat model. The WCOBRA/TRAC-TF2 code is the thermal-hydraulic system code licensed as part of the FULL SPECTRUM LOCA Evaluation Model (EM). The kinetics and decay heat models in the code are described in Section 9 of WCAP-16996-P-A, Revision 1. The nuclear physics data supporting the code models was generated using the ARK depletion program, which evolved from the LEOPARD and CINDER codes as described in the response to Request for Additional Information (RAI) number 25 on the FSLOCA EM. Since the approval of the FSLOCA EM, the kinetics and decay heat model in the WCOBRA/TRAC-TF2 code was updated to support the analysis of higher burnup fuel as described in Section 4.6 of WCAP-18446-P. The updated nuclear physics data is based on the NRC-approved PARAGON code (WCAP-16045-P-A). While the primary purpose of this update is for the analysis of higher burnup fuel, the change will impact licensing basis analysis calculations with the FSLOCA EM even under the existing burnup limits imposed via Limitation and Condition (L&C) number 5 on the FSLOCA EM. This change to the WCOBRA/TRAC-TF2 code represents a Discretionary Change and will be implemented on a forward-fit basis. Therefore, this effort has no impact on the current FSLOCA EM.

31. Current LOCA Model Assessment

An error was noted impacting the prior LOCA model due to reduction in flow area to the bottom of the barrel/baffle region. For plants without holes in the edge of the lower core plate, the flow area from the bottom of the core to the barrel/baffle region has historically been modeled as the gap between the baffle plate and the lower core plate, and this flow area did not consider the reduced flow area due to the presence of the bottom nozzle flow skirt. The impact of reducing the flow area between the core and barrel baffle region due to including the bottom nozzle flow skirt has been qualitatively evaluated. This item represents a Non-Discretionary Change in accordance with Section 4.1.2 of WCAP-13451. The affected Evaluation Model(s) were associated with the prior analyses: 1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP. The evaluation determined that considering a reduced flow area from the bottom of the core to the barrel/baffle region when considering the bottom nozzle flow skirt has a negligible effect on the SBLOCA analysis results, leading to an estimated peak cladding temperature (PCT) impact of 0°F.

32. Current LOCA Model Assessment

The current report noted the following areas of General Code Maintenance. Various changes have been made to enhance the usability of codes and to streamline future analyses. Examples of these changes include improving the input diagnostic checks; enhancing the code output; optimizing active coding; and eliminating inactive coding. These

Attachment 3
Braidwood and Byron Stations, Units 1 and 2
10 CFR 50.46 Report Assessment Notes

changes represent Discretionary Changes that will be implemented on a forward-fit basis in accordance with Section 4.1.1 of WCAP-13451.

Affected Evaluation Model(s)

1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

2016 Westinghouse FULL SPECTRUM™ LOCA Evaluation Model

The nature of these changes leads to an estimated peak cladding temperature impact of 0°F.