

May 15, 2008
5928-08-20103

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Three Mile Island, Unit 1
Facility Operating License No. DPR-50
NRC Docket No. 50-289

Subject: 10 CFR 50.46 Report

Reference: 1) Letter from David P. Helker (AmerGen Energy Company, LLC) to U. S. Nuclear Regulatory Commission, "Annual Report of the Emergency Core Cooling System Evaluation Model Changes and Errors Required by 10 CFR 50.46, 'Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors,' " dated May 16, 2007

The purpose of this letter is to submit the 10 CFR 50.46 reporting information for Three Mile Island (TMI), Unit 1. The most recent annual 50.46 Report for TMI, Unit 1 (Reference 1) provided the cumulative Peak Cladding Temperature (PCT) errors for the most recent fuel designs.

Two attachments are included with this letter that provide the current TMI, Unit 1, 10 CFR 50.46 status. Attachment 1 ("Peak Cladding Temperature Rack-Up Sheets") provides updated information regarding the PCT for the limiting Small Break Loss of Coolant Accident (SBLOCA) and Large Break Loss of Coolant Accident (LBLOCA) analysis. Attachment 2, "Assessment Notes," contains a detailed description for each change or error reported.

No new regulatory commitments are established in this submittal. If any additional information is needed, please contact Tom Loomis at (610) 765-5510.

Respectfully,



David P. Helker
Manager - Licensing

Attachments: 1) Peak Cladding Temperature Rack-Up Sheets
2) Assessment Notes

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5928-08-20103

May 15, 2008

Page 2

cc: S. J. Collins, USNRC Administrator, Region I
P. J. Bamford, USNRC Project Manager, TMI Unit 1
D. M. Kern, USNRC Senior Resident Inspector, TMI Unit 1
File No. 00068

ATTACHMENT 1

10 CFR 50.46

**“Acceptance criteria for emergency core
cooling systems for light-water nuclear power reactors”**

**Report of the Emergency Core Cooling System
Evaluation Model Changes and Errors Assessments**

Assessments as of May 14, 2008

Peak Cladding Temperature Rack-Up Sheets

TMI, Unit 1

PLANT NAME: Three Mile Island, Unit 1
 ECCS EVALUATION MODEL: Small Break Loss of Coolant Accident (SBLOCA)
 REPORT REVISION DATE: 05/14/08
 CURRENT OPERATING CYCLE: 17

ANALYSIS OF RECORD (AOR)

Evaluation Model: BWNT¹
 Calculation: Framatome ANP 86-5011294-00, March 2001
 AREVA NP, 86-9049246-000, June 2007
 Fuel: Mark-B9, Mark-B12, Mark-B-HTP
 Limiting Fuel Type: Mark-B9
 Limiting Single Failure: Loss of One Train of ECCS
 Limiting Break Size and Location: 0.05 ft² Break in Cold Leg Pump Discharge Piping

Reference Peak Cladding Temperature (PCT) PCT = 1454 °F

MARGIN ALLOCATION

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

10 CFR 50.46 report dated June 6, 2002 (see note 3)	ΔPCT = 0 °F
10 CFR 50.46 report dated June 19, 2003 (see note 4)	ΔPCT = 0 °F
10 CFR 50.46 report dated June 1, 2004 (see note 5)	ΔPCT = 0 °F
10 CFR 50.46 report dated May 16, 2005 (see note 6)	ΔPCT = 0 °F
10 CFR 50.46 report dated May 9, 2006 (see note 7)	ΔPCT = 0 °F
10 CFR 50.46 report dated May 16, 2007 (see note 8)	ΔPCT = 0 °F

NET PCT **PCT = 1454 °F**

B. CURRENT LOCA MODEL ASSESSMENTS

RELAP5 bypass pin pressure calculation limitation (see note 9)	ΔPCT = 0 °F
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NET PCT **PCT = 1454 °F**

¹ The BWNT EM is based on RELAP5/MOD2-B&W.

PLANT NAME: Three Mile Island, Unit 1
 ECCS EVALUATION MODEL: Large Break Loss of Coolant Accident (LBLOCA)
 REPORT REVISION DATE: 05/14/08
 CURRENT OPERATING CYCLE: 17

ANALYSIS OF RECORD (AOR)

Evaluation Model: BWNT²
 Calculation: Framatome ANP 86-5002073-02, July 1999 (Mark-B9)
 Framatome ANP 86-5011294-00, March 2001 (Mark-B12)
 AREVA NP 86-9049246-000, June 2007 (Mark-B-HTP)
 Fuel: Mark-B9, Mark-B12, Mark-B-HTP
 Limiting Fuel Type: Mark-B9
 Limiting Single Failure: Loss of One Train of ECCS
 Limiting Break Size and Location: Guillotine Break in Cold Leg Pump Discharge Piping

Reference Peak Cladding Temperature (PCT) PCT = 2083 °F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 report dated June 5, 2000 (see note 1)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
10 CFR 50.46 report dated June 11, 2001 (see note 2)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
10 CFR 50.46 report dated June 6, 2002 (see note 3)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
10 CFR 50.46 report dated June 19, 2003 (see note 4)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
10 CFR 50.46 report dated June 1, 2004 (see note 5)	$\Delta PCT = -25 \text{ } ^\circ\text{F}$
10 CFR 50.46 report dated May 16, 2005 (see note 6)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
10 CFR 50.46 report dated May 9, 2006 (see note 7)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
10 CFR 50.46 report dated May 16, 2007 (see note 8)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$

NET PCT PCT = 2058 °F

B. CURRENT LOCA MODEL ASSESSMENTS

EDF application error correction (see note 10)	$\Delta PCT = 0 \text{ } ^\circ\text{F}$
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NET PCT PCT = 2058 °F

² The BWNT EM is based on RELAP5/MOD2-B&W.

ATTACHMENT 2

**10 CFR 50.46
“Acceptance criteria for emergency core
cooling systems for light-water nuclear power reactors”**

**Report of the Emergency Core Cooling System
Evaluation Model Changes and Errors Assessments**

Assessments as of May 14, 2008

Peak Cladding Temperature Rack-Up Sheets

TMI, Unit 1

Assessment Notes

1. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated June 5, 2000 reported new LBLOCA and SBLOCA analyses to support operations at 20% steam generator tube plugging conditions for Mark-B9 fuel.

2. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated June 11, 2001 reported evaluations for LBLOCA and SBLOCA model changes which resulted in 0 °F PCT change.

3. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated June 6, 2002 reported new LBLOCA analyses to support operations with Mark-B12 fuel. For SBLOCA, an increase in SBLOCA PCT of 42 °F for Mark-B9 fuel was reported due to increase in emergency feedwater temperature. This analysis is applicable to both Mark-B12 fuel and Mark-B9 fuel.

4. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated June 19, 2003 reported evaluation for LBLOCA model change which resulted in 0 °F PCT change. SBLOCA was not impacted.

5. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated June 1, 2004 reported evaluation for LBLOCA and SBLOCA model changes which resulted in 0 °F PCT change. An error correction in containment pressure input resulted in a reduction in PCT for the LBLOCA analysis.

6. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated May 16, 2005 reported evaluations for LBLOCA model changes which resulted in a 0 °F PCT change. LOCA oxygen/hydrogen recombination was considered and the PCT effect was determined to be 0 °F. SBLOCA was not impacted.

7. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated May 9, 2006 reported evaluations for LOCA model changes which resulted in a 0 °F PCT change. Reported changes included operation with no APSR pull and batch 18 fuel design changes. These were applicable for SBLOCA and LBLOCA.

8. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated May 16, 2007 reported an evaluation for a LOCA model change which resulted in a 0 °F PCT change. The reported evaluation considered the effect on the containment pressure response for LOCA due to GSI-191 related reactor building sump screen replacement. The evaluation resulted in 0 °F impact for both LBLOCA and SBLOCA PCTs.

9. RELAP5 bypass pin pressure calculation limitation

An unexpected behavior was observed in the fuel pin internal pressure of a pin channel for demonstration 3025 MWt power uprate SBLOCA analyses. The faulted channel showed no change in the pin pressure; in contrast, the pin pressures in the other channels continued to change as expected.

The code logic of RELAP5/MOD2-B&W was reviewed to determine what had caused the unexpected behavior. It was discovered that the code logic would bypass the pin pressure calculations after the uppermost pin segment in an unruptured pin channel becomes plastic. The logic flaw did not appreciably alter the results and therefore the PCT impact of this error was determined to be 0 °F.

10. EDF Application Error

An error affecting the energy deposition factors (EDF) utilized in LOCA analyses was identified. The source of the error was an incorrect interpretation of gamma energy fractions reported from the ORIGEN2 code. The correction of the gamma energy fractions resulted in an increase in the energy deposited within the fuel during the LBLOCA transient for high burnup and low power conditions (e.g., end-of-life analyses). The effect of this error was evaluated and the PCT impact was determined to be 0 °F.