

10 CFR 50.46

TMI-11-086  
May 13, 2011

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

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

Subject: 10 CFR 50.46 Annual Report

- References:
- 1) Letter from D. P. Helker (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 Report," dated May 14, 2010
  - 2) Letter from P. B. Cowan (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 30-Day Report," dated September 7, 2010
  - 3) Letter from P. Bamford (U.S. Nuclear Regulatory Commission) to M. Pacilio (Exelon Generation Company, LLC), "Three Mile Island Nuclear Station, Unit 1 – Request for Additional Information Regarding 30-Day Notification of Changes to an Emergency Core Cooling System Evaluation Resulting in a Peak Cladding Temperature Difference in Excess of 50 Degrees Fahrenheit (TAC No. ME4666)," dated October 22, 2010
  - 4) Letter from P. B. Cowan (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "10 CFR 50.46 30-Day Report - Response to Request for Additional Information," dated November 29, 2010

The purpose of this letter is to submit the 10 CFR 50.46 reporting information for Three Mile Island Nuclear Station (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.

Since the Reference 1 report was issued, one vendor notification of Emergency Core Cooling System (ECCS) model error/changes applicable to TMI, Unit 1 was issued (References 2 through 4) through May 12, 2011. No other ECCS-related changes or modifications have occurred at TMI, Unit 1 that affect the assumptions of the ECCS system.

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 SBLOCA and LBLOCA analyses. 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,

A handwritten signature in black ink, appearing to read "Michael D. Jesse", is written over a horizontal line. To the right of the signature, the letters "CPR" are written in a smaller, less legible font.

Michael D. Jesse  
Director - Licensing & Regulatory Affairs  
Exelon Generation Company, LLC

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

cc: W. Dean, USNRC Administrator, Region I  
P. J. Bamford, USNRC Project Manager, TMI, Unit 1  
D. M. Kern, USNRC Senior Resident Inspector, TMI, Unit 1

**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 13, 2011**

**Peak Cladding Temperature Rack-Up Sheets**

**TMI, Unit 1**

PLANT NAME: Three Mile Island Nuclear Station, Unit 1  
 ECCS EVALUATION MODEL: Small Break Loss of Coolant Accident (SBLOCA)  
 REPORT REVISION DATE: 5/13/11  
 CURRENT OPERATING CYCLE: 18

**ANALYSIS OF RECORD (AOR)**

Evaluation Model: BWNT<sup>1</sup>  
 Calculation: AREVA NP, 86-9111507-000, August 2009 (Mark-B-HTP with Enhanced  
 Once-Through Steam Generators (EOTSGs))  
 Fuel: Mark-B12, Mark-B-HTP  
 Limiting Fuel Type: Mark-B-HTP  
 Limiting Single Failure: Loss of One Train of ECCS

Limiting Break Size and Location: 0.07 ft<sup>2</sup> Break in Cold Leg Pump Discharge Piping

Reference Peak Cladding Temperature (PCT) PCT = 1444°F

**MARGIN ALLOCATION**

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

10 CFR 50.46 report dated May 9, 2006 (see Note 7)	$\Delta PCT = 0^\circ F$
10 CFR 50.46 report dated May 16, 2007 (see Note 8)	$\Delta PCT = 0^\circ F$
10 CFR 50.46 report dated May 14, 2010 (see Note 11)	$\Delta PCT = 0^\circ F$
10 CFR 50.46 report dated September 7, 2010 (see Note 12)	$\Delta PCT = 225^\circ F$
<b>NET PCT</b>	<b>PCT = 1669°F</b>

**B. CURRENT LOCA MODEL ASSESSMENTS**

None (see Note 13)	$\Delta PCT = 0^\circ F$
<b>NET PCT</b>	<b>PCT = 1669°F</b>

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

PLANT NAME: Three Mile Island Nuclear Station, Unit 1  
 ECCS EVALUATION MODEL: Large Break Loss of Coolant Accident (LBLOCA)  
 REPORT REVISION DATE: 5/13/11  
 CURRENT OPERATING CYCLE: 18

**ANALYSIS OF RECORD (AOR)**

Evaluation Model: BWNT<sup>2</sup>  
 Calculation: Framatome ANP 86-5011294-00, March 2001 (Mark-B12)  
                   AREVA NP, 86-9111507-000, August 2009 (Mark-B-HTP with EOTSGs)  
 Fuel: Mark-B12, Mark-B-HTP  
 Limiting Fuel Type: Mark-B12  
 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 = 1989°F

**MARGIN ALLOCATION**

A. PRIOR LOCA MODEL ASSESSMENTS

10 CFR 50.46 report dated June 5, 2000 (see Note 1)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated June 11, 2001 (see Note 2)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated June 6, 2002 (see Note 3)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated June 19, 2003 (see Note 4)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated June 1, 2004 (see Notes 5 and 11)	$\Delta PCT = -35^{\circ}F$
10 CFR 50.46 report dated May 16, 2005 (see Note 6)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated May 9, 2006 (see Note 7)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated May 16, 2007 (see Note 8)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated May 15, 2008 (see Note 9)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated May 15, 2009 (see Note 10)	$\Delta PCT = 0^{\circ}F$
10 CFR 50.46 report dated May 14, 2010 (see Note 11)	$\Delta PCT = 0^{\circ}F$
<b>NET PCT</b>	<b>PCT = 1954°F</b>

B. CURRENT LOCA MODEL ASSESSMENTS

None (see Note 13)	$\Delta PCT = 0^{\circ}F$
<b>NET PCT</b>	<b>PCT = 1954°F</b>

<sup>2</sup> 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 13, 2011**

**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 a new LBLOCA analysis 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 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 a new LBLOCA analyses to support operations with Mark-B12 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.

5. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated June 1, 2004 reported evaluation for LBLOCA 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.

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 LBLOCA and SBLOCA PCTs.

#### 9. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated May 15, 2008 reported evaluations for LOCA model changes which resulted in a 0°F PCT change. Reported changes included the impact of an energy deposition factor error which resulted in a LBLOCA PCT impact of 0°F.

#### 10. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated May 15, 2009 reported no evaluations or PCT penalties for LBLOCA.

#### 11. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated May 14, 2010 reported a change to the reference PCT value for LBLOCA due to the final discharge of all Mark-B9 fuel. Additionally, with the change in limiting fuel type from Mark-B9 to Mark-B12, the PCT reduction for the LBLOCA analysis reported in 2004 was updated to be a -35°F.

Also identified in this report was a new SBLOCA analysis, implemented beginning with the Cycle 18 operation. This SBLOCA analysis was evaluated with the mixed core of Mark-B12 and Mark-B-HTP and a new PCT of 1444°F was calculated for the limiting Mark-B-HTP fuel type, which bounds the Mark-B12 fuel type. This analysis also includes consideration of the effect of reduced EFW wetting associated with the Enhanced Once-Through Steam Generators (EOTSGs).

#### 12. Prior LOCA Model Assessment

The 10 CFR 50.46 report dated September 7, 2010 reported an evaluation for the SBLOCA analysis due to a non-bounding axial power shape from middle-of-cycle to end-of-cycle conditions. This resulted in a PCT increase of 225°F. The large break LOCA is not affected in this report.

#### 13. Current LOCA Model Assessment

None