

10CFR50.46

June 19, 2003
5928-03-20109

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

SUBJECT: 10 CFR 50.46 Annual Report

Three Mile Island, Unit 1 (TMI Unit 1)
Operating License No. DPR-50
Docket No.50-289

- References:
1. FANP Topical Report BAW-10104P-A, Rev. 5, "B&W's ECCS Evaluation Model," November 1988.
 2. FANP Topical Report BAW-10154-A, Rev. 0, "B&W's Small-Break LOCA ECCS Evaluation Model," July 1985.
 3. FANP Topical Report BAW-10192P-A, Rev. 0, "BWNT LOCA – BWNT Loss-of-Coolant Accident Evaluation Model for Once-Through Steam Generator Plants," June 1998.

10 CFR 50.46 (a)(3)(ii) states that each holder of an operating license shall report to the Nuclear Regulatory Commission (NRC) at least annually each change or error in an accepted emergency core cooling system (ECCS) evaluation model (EM) or in the application of such a model that affects the peak cladding temperature (PCT) calculation.

For the reporting period from January 1, 2002 through December 31, 2002, Framatome ANP has confirmed that no significant errors were reported in the CRAFT2-based B&W ECCS EM (Reference 1 for LBLOCA and Reference 2 for SBLOCA). Two changes were reported in the RELAP5/MOD2-B&W-based BWNT LOCA EM (Reference 3) as described in Enclosure 1. Enclosure 2 provides a summary of the EM changes applicable to TMI Unit 1 as identified and evaluated by Framatome ANP, and reported in accordance with 10 CFR 50.46(a)(3)(ii).

ADD

No new regulatory commitments are established in this submittal.

If any additional information is needed, please contact David J. Distel at (610) 765-5517.

Very truly yours,

A handwritten signature in black ink, reading "Michael P. Gallagher". The signature is fluid and cursive, with the first name "Michael" being the most prominent part.

Michael P. Gallagher
Director - Licensing & Regulatory Affairs
AmerGen Energy Company, LLC

Enclosures: 1) EM Changes and Significant Error Notification
2) Summary of EM Changes Applicable to TMI Unit 1

cc: H. J. Miller, USNRC Administrator, Region I
T. G. Colburn, USNRC Senior Project Manager, TMI Unit 1
C. W. Smith, USNRC Senior Resident Inspector, TMI Unit 1
File No. 00068

ENCLOSURE 1

EM CHANGES AND SIGNIFICANT ERROR NOTIFICATION

1.1 CRAFT2 Evaluation Model Error Corrections or Changes

No errors or changes were reported in the CRAFT2-based B&W ECCS EM, BAW-10104P-A, Rev. 5 for LBLOCA (Reference 1.1) and BAW-10154-A, Rev. 0 for SBLOCA (Reference 1.2), during 2002.

1.2 BWNT LOCA Evaluation Model Error Correction or Changes

This model is applicable to all B&W designed pressurized water reactors for large and small break LOCA analyses. The NRC approved topical report for this evaluation model is BAW-10192P-A Rev 0 (Reference 1.3).

The large break LOCA Evaluation Model consists of four computer codes: (1) BAW-10164P-A, RELAP5/MOD2-B&W to compute the system, core, and hot rod response during blowdown (Reference 1.4), (2) BAW-10171P-A, REFLOD3B to calculate the time for refill of the lower plenum and core reflood rate (Reference 1.5), (3) BAW-10095-A, CONTEMPT to compute the containment pressure response (Reference 1.7), and (4) BAW-10166P-A, BEACH (RELAP5/MOD2-B&W reflood heat transfer package) to determine the hot pin thermal response during refill and reflood phases (Reference 1.6). The small break LOCA Evaluation Model consists of two codes: (1) BAW-10164P-A, RELAP5/MOD2-B&W to compute the system, core, and hot rod response during the transient and (2) BAW-10095-A, CONTEMPT to compute the containment pressure response, if needed. An NRC-approved fuel code (currently BAW-10162P-A, TACO3 (Reference 1.9) or BAW-10184P-A, GDTACO (Reference 1.10)) is used to supply the fuel rod steady-state conditions at the beginning of the small or large break LOCA. These codes are approved for use with M5 cladding via the SER on BAW-10227P-A (Reference 1.8).

Two EM changes were reported in the RELAP5/MOD2-B&W-based BWNT LOCA EM, BAW-10192P-A Rev. 0 during 2002. The first item (Section 1.2.1) is associated with the power uncertainty factor applicable to Appendix K power uprates. The second item (Section 1.2.2) discusses the recent approval of Revision 4 of the RELAP5/MOD2-B&W topical report.

1.2.1 Power Measurement Uncertainty

The NRC has modified Appendix K to 10 CFR 50 to allow two options for defining the reactor power level for LOCA applications. It allows the power to be modeled as: (1) at least 1.02 times the licensed power level (to allow for

instrumentation error), or (2) an alternate power level (not less than the licensed power level), provided the proposed alternative value has been demonstrated to account for uncertainties due to power level instrumentation error. The FANP LOCA evaluation models were written prior to this modification and specified the use of a power level at least 1.02 times the rated power level. The EM change reported herein simply acknowledges the change in the regulations and allows current or future EM analyses to be performed with either of the Appendix K prescribed options.

This issue is considered a change in the ECCS EM. The PCT change associated with the EM change for TMI Unit 1 is discussed in Enclosure 2.

1.2.2 Approval of RELAP/MOD2-B&W Topical Report Revision

The NRC, by letter dated April 9, 2002, approved Revision 4 of the RELAP5/MOD2-B&W topical report, BAW-10164, and its use with the once-through steam generator large break and small break LOCA evaluation models, BAW-10192P-A. The RELAP5 revision for large break analyses allows: (i) modeling of the hot fuel assembly as a hot pin and a hot bundle, each with their own heat structure, (ii) improvements to the TACO3-based, steady state, fuel temperature uncertainties, and (iii) automation of the BEACH (BAW-10166P-A) blockage limitation. The RELAP5 revision for small break analyses allows an automation of the void-dependent cross-flow model. Material was also added to the RELAP5 topical report revision reflecting prior approvals for M5TM cladding (BAW-10227P-A) applications with the once-through steam generator evaluation model.

This issue is considered a change in the ECCS EM. The PCT change associated with the EM change for TMI Unit 1 is discussed in Enclosure 2.

References

- 1.1 FANP Topical Report BAW-10104P-A, Rev. 5, "B&W's ECCS Evaluation Model," November 1988.
- 1.2 FANP Topical Report BAW-10154-A, Rev. 0, "B&W's Small-Break LOCA ECCS Evaluation Model," July 1985.
- 1.3 FANP Topical Report BAW-10192P-A, Rev. 0, "BWNT LOCA – BWNT Loss-of-Coolant Accident Evaluation Model for Once-Through Steam Generator Plants," June 1998.
- 1.4 FANP Topical Report BAW-10164P-A, Rev. 4, "RELAP5/MOD2-B&W – An Advanced Computer Program for Light Water Reactor LOCA and Non-LOCA Transient Analysis", November 2002.

- 1.5 FANP Topical Report BAW-10171P-A, Rev. 3, "REFLOD3B – Model for Multinode Core Reflooding Analysis", December 1995.
- 1.6 FANP Topical Report BAW-10166P-A, Rev. 4, "BEACH – A computer Program for Reflood Heat Transfer During LOCA" February 1996.
- 1.7 FANP Topical Report BAW-10095-A, "CONTEMPT – Computer Program for Predicting Containment Pressure-Temperature Response to a LOCA", January 1995.
- 1.8 FANP Topical Report BAW-10227P-A, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel", February 2000.
- 1.9 FANP Topical Report BAW-10162P-A, "TACO3 Fuel Pin Thermal Analysis Code" October 1989.
- 1.10 FANP Topical Report BAW-10184P-A, "GDTACO – Gadolinia Fuel Rod Thermal Analysis Code", February 1995.

ENCLOSURE 2

SUMMARY OF EM CHANGES APPLICABLE TO TMI UNIT 1

Each of the 2002 licensing analyses or evaluations applicable to TMI Unit 1 is described below, with the inclusion of the FANP recommended reporting category and applicable PCT change. Each activity and the effect on the limiting ECCS analysis is summarized in Table 1. Limiting ECCS analyses are tracked for the Mark-B9 and the Mark-B12 fuel rod designs (Reference 2.2). The modified Mark-B9 fuel rod design and gadolinia are considered with the limiting Mark-B9 ECCS analysis. The Mark-B12 gadolinia rods are considered with the limiting Mark-B12 ECCS analysis.

2.1 Power Measurement Uncertainty

No analyses or evaluations were performed to support a change in the power measurement uncertainty assumed in the TMI-1 licensing analyses (Generic Item 1.2.1).

This issue is considered a change in the ECCS EM. This change has not been applied to the TMI Unit 1 plant applications.

2.2 Approval of RELAP5/MOD2-B&W Topical Report Revision

Of the newly approved models in BAW-10164P-A Revision 4 (Generic Issue 1.2.2), only the automation of the BEACH blockage limitation is applied to the TMI-1 LBLOCA analyses. This change only automated a check and has no affect on the temperature calculation.

The void-dependent cross-flow model was applied to the analyses performed for the resolution of PSC 2-00 (Reference 2.1), and the NRC was notified of the use of this model for those cases (Reference 2.3). However, the void-dependent cross-flow model was not utilized in the current limiting SBLOCA case. Therefore, this EM change has not yet been applied to the limiting TMI-1 SBLOCA analysis.

This issue is considered a change in the ECCS EM. The stored energy uncertainty, hot pin modeling, and void-dependent cross-flow model have not been applied to the limiting TMI-1 LOCA analyses. The LBLOCA PCT change is (0 F) for the automation of the BEACH blockage limitation.

2.3 Investigation of High BU Pins w/COPERNIC

FANP is currently developing the COPERNIC code for use in providing the initial fuel conditions for LOCA analyses. An R&D investigation (Reference 2.4) was performed to evaluate the four high-burnup M5 lead test pins (LTPs) in TMI-1 Cycle 14 with respect to COPERNIC steady-state fuel code initializations. Based on this evaluation, a reduction in the allowed LHR limit would be necessary if the COPERNIC steady-state fuel code results were applied to the LOCA

evaluations. The core power distribution analyses were reviewed (Reference 2.5), and it was found that the M5 pins never have the limiting margin if the lower LHR limit is applied. At this time, no COPENIC results have been applied to the TMI-1 licensing applications.

This issue is considered a LOCA-related analysis that was performed but does not relate directly to PCT predictions. A PCT change is not applicable to this item.

References

- 2.1 FANP Document 51-5009856-00, "Summary of PSC 2-00 Analyses", 4/13/01.
- 2.2 FANP Document 86-5011294-00, "TMI-1 Mk-B12 LOCA Summary Report", 3/22/01.
- 2.3 Letter to USNRC, "Report of Preliminary Safety Concern Related to Core Flood Line Break with 2-Minute Operator Action Time", FTI-00-2433, September 26, 2000.
- 2.4 FANP Document 51-5012026-02, "TMI-1 Cycle 14 LOCA LHR Limits", 7/31/02.
- 2.5 FANP Proprietary Document 32-5011271-03, "TMI-1 Cycle 14 Man Anal", 8/21/02.

Table 1: 2002 LOCA Licensing Activity for TMI Unit 1

Plant Name:		Three Mile Island – Unit 1	LOCA Spectrum		
Utility Name:		AmerGen	<i>Mark-B9 LBLOCA</i>	<i>Mark-B12 LBLOCA</i>	<i>Mark-B9 / Mark-B12 SBLOCA</i>
Previous Licensing Basis			2083 F	1989 F	1454 F
2002 Licensing Activity					
Item #	Reporting Category	Description	PCT or (PCT Change)		
2.1	EM Change	Power Measurement Uncertainty	N/A	N/A	N/A
2.2	EM Change	Approval of RELAP5/MOD2-B&W Topical Report Revision Automation of BEACH blockage limitation	(0 F)	(0 F)	N/A
2.3	Other	Investigation of High BU Pins w/COPERNIC	N/A	N/A	N/A
Revised Licensing Basis			2083 F	1989 F	1454 F