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L-07-149

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

Subject: Beaver Valley Power Station, Unit No. 1 and No. 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
10 CFR 50.46 Report of Changes or Errors in ECCS Evaluation Models

This report is provided as an annual notification of changes or errors in emergency core cooling system (ECCS) evaluation models for BVPS Unit Nos. 1 and 2. Current information for both large and small break transients has been provided herein to satisfy reporting requirements. The following attachments provide information as requested by 10 CFR 50.46:

Attachment 1 Provides a listing of each change or error in an acceptable evaluation model that affects the peak fuel cladding temperature (PCT) calculation for particular transients. It quantifies the effects of changes that have occurred since the previous report (December 22, 2006) for the specified transients and provides an "index" into Attachment 2 (Descriptions).

Attachment 2 Provides a description for each model change or error.

The PCT effects, listed in Attachment 1, result in PCTs for the large and small break LOCA transients as follows:

BVPS-1 Large Break LOCA - 2014°F
BVPS-1 Small Break LOCA - 1895°F
BVPS-2 Large Break LOCA - 2017°F
BVPS-2 Small Break LOCA - 1917°F

Changes or errors reflected in the PCT values above include those previously reviewed and approved by the NRC via license amendments associated with Extended Power Uprate, Containment Conversion and BELOCA methodologies for BVPS Unit Nos. 1

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and 2 as well as those described in previous 10 CFR 50.46 reports provided through December 22, 2006.

FENOC previously committed to performing and submitting a re-analysis of the large break LOCA for BVPS Unit No. 1 within two fuel cycles following implementation of containment conversion (spring 2009) because analysis input changes resulted in PCT impacts of greater than 50 degrees Fahrenheit. This schedule has not changed.

There are no regulatory commitments contained in this letter. If there are any questions, or if additional information is required, please contact Mr. Thomas A. Lentz, Manager - FENOC Fleet Licensing, at (330) 761-6071.

Sincerely,

Peter P. Sena III

Attachments:
1) Summary of PCT Effects for BVPS LOCA Transients
2) Descriptions of Model Changes or Errors

c: Ms. N. S. Morgan, NRR Project Manager
Mr. D. L. Werkheiser, NRC Senior Resident Inspector
Mr. S. J. Collins, NRC Region I Administrator
Mr. D. J. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

ATTACHMENT 1

SUMMARY OF PCT EFFECTS FOR BVPS LOCA TRANSIENTS

Attachment 1 of L-07-149
Summary of PCT Effects for BVPS LOCA Transients

DESCRIPTION	PCT EFFECT (°F)	ATTACHMENT 2 PAGE
BVPS-1 LARGE BREAK LOCA		
GENERAL CODE MAINTENANCE	0	1
STEAM GENERATOR NOZZLE VOLUME ACCOUNTING ERROR	0	2
HOTSPOT FUEL RELOCATION ERROR	0	3
ERRORS IN REACTOR VESSEL NOZZLE DATA COLLECTIONS	0	4
BVPS-1 SMALL BREAK LOCA		
GENERAL CODE MAINTENANCE	0	5
NOTRUMP-EM REFINED BREAK SPECTRUM	0	6
ERRORS IN REACTOR VESSEL NOZZLE DATA COLLECTIONS	0	7
BVPS-2 LARGE BREAK LOCA		
GENERAL CODE MAINTENANCE	0	1
STEAM GENERATOR NOZZLE VOLUME ACCOUNTING ERROR	0	2
HOTSPOT FUEL RELOCATION ERROR	40	3
ERRORS IN REACTOR VESSEL NOZZLE DATA COLLECTIONS	0	4
BVPS-2 SMALL BREAK LOCA		
GENERAL CODE MAINTENANCE	0	5
NOTRUMP-EM REFINED BREAK SPECTRUM	0	6
ERRORS IN REACTOR VESSEL NOZZLE DATA COLLECTIONS	0	7

ATTACHMENT 2

DESCRIPTIONS OF MODEL CHANGES OR ERRORS

GENERAL CODE MAINTENANCE

Background

A number of coding changes were made as part of normal code maintenance. Examples include additional information in code outputs, improved automation in the ASTRUM codes, increased WCOBRA/TRAC code dimensions, and general code cleanup.

Affected Evaluation Models

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model
1999 Westinghouse Best Estimate Large Break LOCA Evaluation Model, Application to PWRs with Upper Plenum Injection
2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

Estimated Effect

The nature of these changes leads to an estimated PCT impact of 0°F.

STEAM GENERATOR NOZZLE VOLUME ACCOUNTING ERROR

Background

It was discovered that many plant-specific WCOBRA/TRAC calculations shared a common error of double accounting of the volume of one or both steam generator plenum nozzles. The extent of over-accounting is plant-specific but would be in the vicinity of 7-9 ft^3 per nozzle.

Affected Evaluation Models

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model
1999 Westinghouse Best Estimate Large Break LOCA Evaluation Model, Application to PWRs with Upper Plenum Injection
2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM
SECY UPI WCOBRA/TRAC Large Break LOCA Evaluation Model

Estimated Effect

RCS loop inventory does not significantly contribute to core cooling during blowdown since most of the fluid in both the intact and broken RCS loops will exit the break without entering the core, making RCS loop volume a tertiary player in system behavior. A small volume error of this nature is anticipated to be negligible throughout the transient, such that an estimated effect of 0°F is assigned for 10 CFR 50.46 reporting purposes.

HOTSPOT FUEL RELOCATION

Background

In the axial node where burst is predicted to occur, a fuel relocation model in HOTSPOT is used to account for the likelihood that additional fuel pellet fragments above that elevation may settle into the burst region. It was discovered that the effect of fuel relocation on local linear heat rate was being calculated, but then cancelled out later in the coding.

Affected Evaluation Models

1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model
1999 Westinghouse Best Estimate Large Break LOCA Evaluation Model, Application to PWRs with Upper Plenum Injection
2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

Estimated Effect

1996 and 1999 BELOCA evaluation models analyses were assessed on a plant-specific basis, via the HOTSPOT reanalysis of a representative WCOBRA/TRAC case using the corrected code version at the burst elevation/burst model enabled sub-case. The HOTSPOT 95% probability PCT results were used to establish the plant-specific PCT penalty.

2004 ASTRUM evaluation model analyses were assessed on a plant-specific basis, via the reanalysis of all of the burst cases from the original HOTSPOT calculations using the corrected HOTSPOT code version.

The plant-specific PCT penalty was 0°F for Beaver Valley Unit 1 and 40°F for Beaver Valley Unit 2.

ERRORS IN REACTOR VESSEL NOZZLE DATA COLLECTIONS

Background

Some minor errors were discovered in the reactor vessel nozzle data collections that potentially affect the vessel inlet and outlet nozzle fluid volume, metal mass, and surface area. The corrected values have been evaluated for impact on current licensing-basis analysis results and will be incorporated into the plant-specific input databases on a forward-fit basis.

Affected Evaluation Models

SECY UPI WCOBRA/TRAC Large Break LOCA Evaluation Model
1996 Westinghouse Best Estimate Large Break LOCA Evaluation Model
1999 Westinghouse Best Estimate Large Break LOCA Evaluation Model, Application to PWRs with Upper Plenum Injection
2004 Westinghouse Realistic Large Break LOCA Evaluation Model Using ASTRUM

Estimated Effect

These errors were evaluated to have a negligible impact on the large break LOCA analysis results, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes.

GENERAL CODE MAINTENANCE

Background

Various changes in code input and output format have been made to enhance usability and help preclude errors in analyses. This includes both input changes (e.g., more relevant input variables defined and more common input values used as defaults) and input diagnostics designed to preclude unreasonable values from being used, as well as various changes to code output which have no effect on calculated results. In addition, various updates were made to eliminate inactive coding, improve active coding, and enhance commenting, both for enhanced usability and to facilitate code debugging when necessary.

Affected Evaluation Models

1981 Appendix K Large Break LOCA Evaluation Model with BASH
1985 Appendix K Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

The nature of these changes leads to an estimated PCT impact of 0°F.

NOTRUMP-EM REFINED BREAK SPECTRUM

Background

During the course of reviewing several extended power uprate and replacement steam generator small break LOCA (SBLOCA) analyses, the Nuclear Regulatory Commission (NRC) questioned the break spectrum analyzed in the NOTRUMP evaluation model (EM). The NRC was concerned that the resolution of the break spectrum used in the NOTRUMP EM (1.5, 2, 3, 4, and 6 inch cases) may not be fine enough to capture the worst break with regard to limiting peak clad temperature as per 10 CFR 50.46. That is, the plant could be SBLOCA limited with regard to overall LOCA results.

In response to this, Westinghouse performed some preliminary work indicating that in some cases more limiting results could be obtained from non-integer break sizes; however, the magnitude of the impact was far less than that shown in preliminary work performed by the NRC. Based on this, Westinghouse performed evaluations to determine if all currently operating plants would maintain compliance with the 10 CFR 50.46 acceptance criteria when considering a refined SBLOCA break spectrum. It should be noted that use of a refined break spectrum is not an error, but a change, since evaluating only integer break sizes has been the standard practice since the initial licensing of NOTRUMP.

Affected Evaluation Models

1985 Appendix K Small Break LOCA Evaluation Model

Estimated Effect

Consistent with the method described in Reference 1, for plants with low SBLOCA peak cladding temperatures (PCTs) (i.e., less than 1700°F) and overall SBLOCA results that are significantly non-limiting when compared with large break LOCA (LBLOCA) results, no explicit refined break spectrum calculations were performed, leading to an estimated impact of 0°F for 10 CFR 50.46 reporting purposes. For plants with high SBLOCA PCTs (i.e., equal to or greater than 1700°F), explicit refined break spectrum calculations were performed, and PCT penalties were assessed, if necessary. Since the refined break spectrum was used in analyzing SBLOCA in support of the extended power uprate license amendments for BVPS-1 and BVPS-2, the effect of this change is reflected in the overall PCT calculated by these analyses and no PCT penalty applies to either unit.

Reference 1: LTR-NRC-06-44, "Transmittal of LTR-NRC-06-44 NP-Attachment, 'Response to NRC Request for Additional Information on the Analyzed Break Spectrum for the Small Break Loss of Coolant Accident (SBLOCA) NOTRUMP Evaluation Model (NOTRUMP EM), Revision 1,' (Non-Proprietary)," July 14, 2006.

ERRORS IN REACTOR VESSEL NOZZLE DATA COLLECTIONS

Background

Some minor errors were discovered in the reactor vessel nozzle data collections that potentially affect the vessel inlet and outlet nozzle fluid volume, metal mass and surface area. The corrected values have been evaluated for impact on current licensing-basis analysis results and will be incorporated into the plant-specific input databases on a forward-fit basis.

Affected Evaluation Models

1981 Westinghouse Large Break LOCA Evaluation Model with BASH
1985 Westinghouse Small Break LOCA Evaluation Model with NOTRUMP

Estimated Effect

The differences in the vessel inlet and outlet nozzle fluid volume, metal mass and surface area are relatively minor and would be expected to produce a negligible effect on large break and small break LOCA analysis results, leading to an estimated PCT impact of 0°F for 10 CFR 50.46 reporting purposes.