Commonwealth Edison Company
1400 Opus Place
Downers Grove, IL 60515-5701

ComEd

April 23, 1997

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Document Control Desk

Subject: Braidwood Station Units 1 and 2
Byron Station Units 1 and 2
Zion Station Units 1 and 2
30 Day 10 CFR 50.46 Report
NRC Docket Nos. 50-456/457, 50-454/455, and 50-295/304

Reference: Commonwealth Edison Letter, M. T. Lesniak to US NRC, "Braidwood Station Units 1 and 2, Byron Station Units 1 and 2, Zion Station Units 1 and 2, 30 day 10 CFR 50.46 Report, NRC Docket Nos. 50-456/457, 50-454/455, and 50-295/304," dated April 25, 1996.

This letter fulfills the annual reporting requirement of 10 CFR 50.46(a)(3)(ii) for Units 1 and 2 of the Braidwood, Byron and Zion Nuclear Power Stations. The Reference transmitted to the NRC the 1996 Annual report for Braidwood, Byron, and Zion Stations.

Attachment 1 provides updated information regarding the Peak Clad Temperature (PCT) of the limiting Small Break and Large Break Loss of Coolant Accident analysis evaluations for Braidwood, Byron, and Zion Stations. Attachment 1 includes all assessments as of April 1, 1997. Attachment 2 contains a detailed description for each change or error reported. Attachment 3 contains a brief description of items that were reported to ComEd by Westinghouse but are not included in the PCT rack up sheets.

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Westinghouse has notified ComEd of several issues which have resulted in PCT assessments to both the large and small break LOCA analyses for Braidwood, Byron, and Zion Stations. ComEd has reviewed the Westinghouse notifications and concurs with Westinghouse's conclusions that ComEd has no reporting obligations under 10 CFR 21. For all the discrepancies contained in this report, Westinghouse and ComEd have determined that these issues do not constitute substantial safety hazards, and that all ComEd plants continue to comply with the requirements of 10 CFR 50.46 and 10 CFR 50 Appendix K acceptance criteria. Because compliance with 10 CFR 50.46 is maintained with existing PCT penalties, no near term reanalysis is planned for these Units.

Please direct any questions to this office.

Marcia T. Lesniak

Marcia T. Lesniak
Nuclear Licensing Administrator

Attachments

cc: A.B. Beech, Regional Administrator - Region III
G. Dick, Byron/Braidwood Project Manager - NRR
C. Shiraki, Zion Project Manager - NRR
C. Phillips, Senior Resident Inspector - Braidwood
S. Burgess, Senior Resident Inspector - Byron
A. Vegel, Senior Resident Inspector - Zion
Office of Nuclear Safety - IDNS

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Braidwood Station Unit 1
ECCS EVALUATION MODEL: Small Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 7*

ANALYSIS OF RECORD

Evaluation Model: NOTRUMP
Calculation: Westinghouse SEC-SAII-4730-C0, May, 1995
Fuel: VANTAGE5 17 x 17
FQ = 2.60
FNΔH = 1.70
SGTP = 30%

Reference PCT	PCT =	1723.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS		
Missing Grid Piece (Note 1)	ΔPCT =	17.0°F
NOTRUMP Specific Enthalpy Error (Note 14)	ΔPCT =	20.0°F
SALIBRARY Double Precision Error (Note 15)	ΔPCT =	-15.0°F
B. CURRENT LOCA MODEL ASSESSMENTS		
SBLOCTA Fuel Rod Initialization Error (Note 16)	ΔPCT =	10.0°F
Burst and Blockage/Time in Life (Note 9)	ΔPCT =	30.0°F
NET PCT	**PCT =**	**1785.0°F**

* Unit is Currently in refueling following Cycle 6. Expected Cycle 7 startup is in May 1997.

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Braidwood Station Unit 1
ECCS EVALUATION MODEL: Large Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 7*

ANALYSIS OF RECORD

Evaluation Model: BASH
Calculation: Westinghouse SEC-SAII-4747-C2, July, 1996
Fuel: VANTAGE5 17 x 17
FQ = 2.60
FNΔH = 1.70
SGTP = 30%

Reference PCT	PCT =	1968.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS		
Missing Grid Piece (Note 1)	ΔPCT =	17.0°F
B. CURRENT LOCA MODEL ASSESSMENTS		
Translation of Fluid Conditions from SATAN to LOCTA (Note 17)	ΔPCT=	15.0
NET PCT	**PCT =**	**2000.0°F**

* Unit is Currently in refueling following Cycle 6. Expected Cycle 7 startup is in May 1997.

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Braidwood Station Unit 2
ECCS EVALUATION MODEL: Small Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 6

ANALYSIS OF RECORD

Evaluation Model: NOTRUMP
Calculation: Westinghouse SEC-SAII-4730-C0, May, 1995
Fuel: VANTAGE5 17 x 17
FQ = 2.60
FNΔH = 1.70
SGTP = 30%

Reference PCT	PCT =	1723.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

NOTRUMP Specific Enthalpy Error (Note 14)	ΔPCT =	20.0°F
SALIBRARY Double Precision Error (Note 15)	ΔPCT =	-15.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

SBLOCTA Fuel Rod Initialization Error (Note 16)	ΔPCT =	10.0°F
Burst and Blockage/Time in Life (Note 9)	ΔPCT =	30.0°F

NET PCT	**PCT =**	**1768.0°F**

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Braidwood Station Unit 2
ECCS EVALUATION MODEL: Large Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 6

ANALYSIS OF RECORD

Evaluation Model: BASH
Calculation: Westinghouse SEC-SAII-4747-C2, July, 1996
Fuel: VANTAGE5 17 x 17
FQ = 2.60
FNΔH = 1.70
SGTP = 30%

Reference PCT	PCT = 1968.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

None

B. CURRENT LOCA MODEL ASSESSMENTS

Translation of Fluid Conditions from SATAN to LOCTA (Note 17)	ΔPCT = 15.0°F
NET PCT	**PCT = 1983.0°F**

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME:	Byron Station Unit 1
ECCS EVALUATION MODEL:	Small Break LOCA
REPORT REVISION DATE:	4/1/97
CURRENT OPERATING CYCLE:	8

ANALYSIS OF RECORD

Evaluation Model: NOTRUMP
Calculation: Westinghouse SEC-SAII-4730-C0, May, 1995
Fuel: VANTAGE5 17 x 17
FQ = 2.60
FNΔH = 1.70
SGTP = 30%

Reference PCT	PCT =	1723.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS		
NOTRUMP Specific Enthalpy Error (Note 14)	ΔPCT =	20.0°F
SALIBRARY Double Precision Error (Note 15)	ΔPCT =	-15.0°F
B. CURRENT LOCA MODEL ASSESSMENTS		
SBLOCTA Fuel Rod Initialization Error (Note 16)	ΔPCT =	10.0°F
Burst and Blockage/T[illegible]e in Life (Note 9)	ΔPCT =	30.0°F
NET PCT	**PCT =**	**1768.0°F**

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Byron Station Unit 1
ECCS EVALUATION MODEL: Large Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 8

ANALYSIS OF RECORD

Evaluation Model: BASH
Calculation: Westinghouse SEC-SAII-4747-C2, July, 1996
Fuel: VANTAGE5 17 x 17
FQ = 2.60
FNΔH = 1.70
SGTP = 30%

Reference PCT	PCT =	1968.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

Removed Upper Internal Assembly Alignment Pins (Note 4)	ΔPCT =	5.0°F
Assembly Guide Pin Flakes (Note 10)	ΔPCT =	6.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

Translation of Fluid Conditions from SATAN to LOCTA (Note 17)	ΔPCT =	15.0°F

NET PCT	**PCT =**	**1994.0°F**

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Byron Station Unit 2
ECCS EVALUATION MODEL: Small Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 7

ANALYSIS OF RECORD

Evaluation Model: NOTRUMP
Calculation: Westinghouse SEC-SAII-4730-C0, May, 1995
Fuel: VANTAGE5 17 x 17
FQ = 2.60
FNΔH = 1.70
SGTP = 30%

Reference PCT	PCT =	1723.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

NOTRUMP Specific Enthalpy Error (Note 14)	ΔPCT =	20.0°F
SALIBRARY Double Precision Error (Note 15)	ΔPCT =	-15.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

SBLOCTA Fuel Rod Initialization Error (Note 16)	ΔPCT =	10.0°F
Burst and Blockage/Time in Life (Note 9)	ΔPCT =	30.0°F

NET PCT	**PCT =**	**1768.0°F**

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Byron Station Unit 2
ECCS EVALUATION MODEL: Large Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 7

ANALYSIS OF RECORD

Evaluation Model: BASH
Calculation: Westinghouse SEC-SAII-4747-C2, July, 1996
Fuel: VANTAGE5 17 x 17
FQ = 2.50
FNΔH = 1.65
SGTP = 30%

Reference PCT	PCT =	1968.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS		
Removed Upper Internal Alignment Pins (Note 4)	ΔPCT =	28.0°F
B. CURRENT LOCA MODEL ASSESSMENTS		
Translation of Fluid Conditions from SATAN to LOCTA (Note 17)	ΔPCT =	15.0°F
NET PCT	**PCT =**	**2011.0°F**

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Zion Station Unit 1
ECCS EVALUATION MODEL: Small Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 15

ANALYSIS OF RECORD

Evaluation Model: NOTRUMP
Calculation: Westinghouse SEC-SAII-3659-C3, April, 1992
Fuel: VANTAGE5 15 x 15 without IFMs
FQ = 2.50
FNΔH = 1.70
SGTP = 15%

Reference PCT	PCT =	1963.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

Boiling Heat Transfer Correlation Error (Note 6)	ΔPCT =	-6.0°F
Steam Line Isolation Logic Error (Note 7)	ΔPCT =	18.0°F
Axial Nodalization, RIP Model Revision, and SBLOCTA Error Correction Analysis (Note 8)	ΔPCT =	-4.0°F
LUCIFER Error Corrections (Note 12)	ΔPCT =	-16.0°F
Drift Flux Flow Regime Errors (Note 13)	ΔPCT =	-13.0°F
Fuel Assembly Reconstitution (Note 5)	ΔPCT =	1.0°F
NOTRUMP Specific Enthalpy Error (Note 14)	ΔPCT =	20.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

SBLOCTA Fuel Rod Initialization Error (Note 16)	ΔPCT =	10.0°F
Automatic containment Spray during SBLOCA (Note 18)	ΔPCT =	4.0°F
Burst and Blockage/Time in Life (Note 9)	ΔPCT =	118.0°F

NET PCT	**PCT =**	**2095.0°F**

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Zion Station Unit 1
ECCS EVALUATION MODEL: Large Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 15

ANALYSIS OF RECORD

Evaluation Model: BASH
Calculation: Westinghouse SEC-SAII-3609-C3, April, 1992
Fuel: VANTAGE5 15 x 15 without IFMs
FQ = 2.40
FNΔH = 1.65
SGTP = 15%

Reference PCT	PCT =	2065.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

Containment Mini-Purge Assumption (Note 3)	ΔPCT =	1.0°F
WREFLOOD Structural Metal Model Error Fix (Note 11)	ΔPCT =	-25.0°F
LUCIFER Error Corrections (Note 12)	ΔPCT =	-6.0°F
Fuel Assembly Reconstitution (Note 5)	ΔPCT =	1.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

Translation of Fluid Conditions from SATAN to LOCTA (Note 17)	ΔPCT =	15.0°F
Model enhancement benefits (Note 2)	ΔPCT =	-21.0°F
IFBA evaluation (Note 19)	ΔPCT =	24.0°F

NET PCT	**PCT =**	**2054.0°F**

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Zion Station Unit 2
ECCS EVALUATION MODEL: Small Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 14

ANALYSIS OF RECORD

Evaluation Model: NOTRUMP
Calculation: Westinghouse SEC-SAII-3659-C3, April, 1992
Fuel: VANTAGE5 15 x 15 without IFMs
FQ = 2.50
FNΔH = 1.70
SGTP = 15%

Reference PCT	PCT =	1963.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS		
Boiling Heat Transfer Correlation Error (Note 6)	ΔPCT =	-6.0°F
Steam Line Isolation Logic Error (Note 7)	ΔPCT =	18.0°F
Axial Nodalization, RIP Model Revision, and SBLOCTA Error Correction Analysis (Note 8)	ΔPCT =	-4.0°F
LUCIFER Error Corrections (Note 12)	ΔPCT =	-16.0°F
Drift Flux Flow Regime Errors (Note 13)	ΔPCT =	-13.0°F
Fuel Assembly Reconstitution (Note 5)	ΔPCT =	1.0°F
NOTRUMP Specific Enthalpy Error (Note 14)	ΔPCT =	20.0°F
B. CURRENT LOCA MODEL ASSESSMENTS		
SBLOCTA Fuel Rod Initialization Error (Note 16)	ΔPCT =	10.0°F
Automatic containment Spray during SBLOCA (Note 18)	ΔPCT =	4.0°F
Burst and Blockage/Time in Life (Note 9)	ΔPCT =	118.0°F
NET PCT	**PCT =**	**2095.0°F**

Attachment 1
ComEd 10 CFR 50.46 Report

PLANT NAME: Zion Station Unit 2
ECCS EVALUATION MODEL: Large Break LOCA
REPORT REVISION DATE: 4/1/97
CURRENT OPERATING CYCLE: 14

ANALYSIS OF RECORD

Evaluation Model: BASH
Calculation: Westinghouse SEC-SAII-3609-C3, April, 1992
Fuel: VANTAGE5 15 x 15 without IFMs
FQ = 2.40
FNΔH = 1.65
SGTP = 15%

Reference PCT	PCT =	2065.0°F

MARGIN ALLOCATION

A. PRIOR LOCA MODEL ASSESSMENTS

Containment Mini-Purge Assumption (Note 3)	ΔPCT =	1.0°F
WREFLOOD Structural Metal Model Error Fix (Note 11)	ΔPCT =	-25.0°F
LUCIFER Error Corrections (Note 12)	ΔPCT =	-6.0°F
Fuel Assembly Reconstitution (Note 5)	ΔPCT =	1.0°F

B. CURRENT LOCA MODEL ASSESSMENTS

Translation of Fluid Conditions from SATAN to LOCTA (Note 17)	ΔPCT =	15.0°F
Model enhancement benefits (Note 2)	ΔPCT =	-21.0°F
IFBA evaluation (Note 19)	ΔPCT =	24.0°F

NET PCT	**PCT =**	**2054.0°F**

Attachment 2
ComEd 10 CFR 50.46 Report
Assessment Notes

1. Missing Grid Piece

   This penalty is the result of potential flow blockage at a fuel assembly lower nozzle due to unrecovered debris in the reactor. The debris is a small (approximately 0.5 inches square) piece of a torn grid strap from assembly C22S. This assembly was damaged during fuel movement following Braidwood Unit 1 Cycle 2. This penalty applies to Braidwood Unit 1 only.

2. Model Enhancements

   This 21 °F benefit is due to rerunning LOCBART, the cladding heat-up code, with model enhancements. The first significant change is the BART spacer grid heat transfer model correction for a coding error. The other significant change was a revised burst and strain limit model. The combination resulted in a net benefit of 21 °F. (This issue was addressed for Byron/Braidwood in the new LOCA analysis (May 1995). This only applies to the Zion LBLOCA analysis.)

3. Containment Mini-Purge Assumption

   This penalty resulted from an evaluation of the containment mini-purge valve. The penalty results from the lower containment backpressure during the blowdown phase of the LOCA assuming the mini-purge valves are open and do not close until the isolation signal is generated plus appropriate delays. (This issue was addressed for Byron/Braidwood in the new LOCA analysis (May 1995). This only applies to the Zion LBLOCA analysis.)

4. Removed Upper Internal Assembly Alignment Pins

   This penalty addresses the removal of upper internals alignment pins at Byron Station. Two pins have been removed from Byron Unit 1 and six pins have been removed from Byron Unit 2. Removal of the alignment pins resulted in a LBLOCA PCT penalty of +5.0°F for Byron Unit 1. Byron Unit 2 previously accounted for the cut pins by penalizing FQ. Starting with Byron Unit 2 Cycle 6 a LBLOCA PCT penalty of +28.0°F was assessed instead of the FQ penalty. This will establish consistent treatment of the cut alignment pins for both Byron units.

5. Fuel Assembly Reconstitution

   This penalty is assessed on a cycle specific basis to account for power distribution anomalies associated with the replacement of leaking fuel pins with stainless steel filler rods. The penalty is assigned to the entire core, not the individual assembly. For Zion, an evaluation was performed to show that a 1°F PCT assessment can support the use of up to a maximum of 20 filler rods. No reconstituted fuel assemblies are currently in use at ComEd. However, for Zion, a 1 °F PCT Penalty is assessed in the event a reconstituted fuel assembly is put into service.

6. Boiling Heat Transfer Correlation Error

   The mixture velocity calculations did not properly account for drift and slip effects in the NOTRUMP code. The error affected heat transfer coefficient calculations using the Westinghouse Transition Boiling Correlation and the Dougall-Rohsenow saturated Film Boiling Correlation. The correction to the code results in a PCT benefit of 6°F for Zion Small Break LOCA PCT. For Byron/Braidwood, the new LOCA analysis (May 1995) used a new version of the NOTRUMP code which had this error corrected.

7. Steam Line Isolation Logic Error

   This PI deals with Steam and Feed Water Isolation logic. In essence the steam flow was isolated later than it should have been, resulting in a lower calculated PCT than it actually would be if it were isolated earlier in the transient. The correction of this PI results in a PCT penalty of 18°F for the Zion SBLOCA. For Byron/Braidwood, the new LOCA analysis (May 1995) used a new version of the NOTRUMP code which had this error corrected.

8. Axial Nodalization, Rod Internal Pressure (RIP) Model Revision, and SBLOCTA Error Correction Analysis

   The axial nodalization in the SBLOCTA code was incorrect which resulted in erroneous energy transport calculations associated with the mixture level. To correct the error a finer (0.25 ft) axial nodalization was incorporated in the SBLOCTA code. The penalty associated with this nodalization correction was offset by the revised RIP model. In the revised RIP model the rod internal pressure is not held constant (this essentially predicts earlier rupture, when the clad temperature is lower and hence there is not significant Zirc water reaction). For details see Westinghouse letter NTD-NRC-94-4098 dated April 4, 1994. For Byron/Braidwood, the new LOCA analysis (May 1995) used a new version of the SBLOCTA code which includes these changes. For Zion the correction results in a SBLOCA benefit of 4 °F.

9. Burst and Blockage/Time in Life

Typically the Small Break LOCA was performed using BOL fuel performance data (PAD) and evaluated at other burnups using the SPIKE code. Presently this is explicitly modeled using a "time in life study." The burst and blockage model does not have any effect on the PCT if the PCT is less than 1700°F. The analysis of record for Zion already incorporated the penalty due to burst and blockage (a time in life study was performed). However, the axial nodalization error and the revised rod internal pressure model had synergistic effects in the burst and blockage model which result in a SBLOCA PCT penalty of 83°F for Zion. In addition, as a result of the NOTRUMP specific enthalpy error (Note 14), the RWST draindown (Note 18) and the SBLOCTA fuel rod initialization error (Note 16), an additional 35°F penalty is applicable to Zion resulting in a total penalty of 118°F. As a result of the NOTRUMP specific enthalpy error (Note 14), the SBLOCTA fuel rod initialization error (Note 16), and SALIBRARY double precision error (Note 15), a 30°F burst and blockage/time in life penalty is applicable to the Small Break LOCA for Braidwood and Byron.

10. Assembly Guide Pin Flakes

Bending of fuel assembly alignment pins to angles greater than 5 degrees may result in the generation of pin flakes or fragments. The flakes could potentially lodge themselves in an assembly and locally reduce assembly flow. The flakes could increase blockage of the hot rod subchannel during the reflood period and increase the PCT. This penalty is only applicable to Byron Station Unit 1.

11. WREFLOOD Structural Metal Heat Model

The 25°F benefit is the result of a correction in the calculation of heat transfer from the structural metal in the vessel during the reflood stage. The material properties assumed in the analysis of record correspond to those of Stainless Steel. While this is correct for internal structures, it is inappropriate for the vessel wall which consists of carbon steel with a stainless steel clad. This applies only to Zion. For Byron/Braidwood, the new LOCA analysis (May 1995) used a new version of the LUCIFER code which had these errors corrected.

12. LUCIFER Error Corrections

This benefit is the result of errors that were identified in the VESCAL subroutine of the LUCIFER code. These errors were in the geometric and mass calculations of the vessel and steam generator portions of the needed data. Westinghouse estimated a 16°F benefit in the Small Break LOCA PCT and a 6°F benefit in the Large Break LOCA PCT would result due to implementation of this Evaluation Model change. This applies only to Zion. For Byron/Braidwood, the new LOCA analysis (May 1995) used a new version of the LUCIFER code which had these errors corrected.

13. Drift Flux Flow Regime Map Errors

Errors were discovered in WCAP-10079-P-A and related coding in NOTRUMP subroutine DFCORRS where the improved TRAC-P1 vertical flow regime map is evaluated. In Evaluation Model applications, this model is only used during counter-current flow conditions in vertical flow links. A discontinuity was allowed to exist in the flow regime map under some circumstances. This problem was corrected by placing an upper limit on the C_T parameter. Westinghouse generically estimated a PCT benefit of at least 13°F to the Small Break LOCA. This applies only to Zion. For Byron/Braidwood, the new LOCA analysis (May 1995) used a new version of the NOTRUMP code which had these errors corrected.

14. NOTRUMP Specific Enthalpy Error

A typographical error was found in a line of coding in the NOTRUMP code. This line of coding was intended to model the calculation found in Equation L-127 of WCAP-10079P-A. Although the equation in the topical report is correct, the coding represented the last term as a partial derivative with respect to the fluid node mixture region total energy instead of the mixture region total mass. This 20°F penalty applies to the SBLOCA analyses for Braidwood, Byron, and Zion.

15. SALIBRARY Double Precision Errors

During migration of the LOCA codes from the CRAY computer to UNIX-based platforms, programming errors were made in two library routines related to improper specification of double precision variables. These errors were found and fixed during later code maintenance. Test cases with individual codes in the models demonstrated very small differences in only the SATAN and NOTRUMP code results, with correspondingly minor effects on final peak clad temperature predictions. Because the error only affects a very limited number of LBLOCA analyses which were performed on the UNIX platform prior to correcting the codes, the evaluation of effects for LBLOCA analyses were assessed on a plant-specific basis. The LBLOCA analyses for Byron, Braidwood, and Zion were not affected. For SBLOCA analyses performed on the UNIX platform, representative plant calculations resulted in an estimated generic effect of -15°F for affected analyses. This error only applies to the SBLOCA analyses for Braidwood and Byron since the Zion analyses were performed on the CRAY platform.

Attachment 2
ComEd 10 CFR 50.46 Report
Assessment Notes

16. SBLOCTA Fuel Rod Initialization

An error was discovered in the SBLOCTA code related adjustments which are made as part of the fuel rod initialization process which is used to obtain agreement between the SBLOCTA model and the fuel data supplied from the fuel thermal-hydraulic design calculations at full power, steady-state conditions. Specifically, an adjustment to the power, which is made to compensate for adjustments to the assumed pellet diameter was incorrect. Additionally, updates were made to the fuel rod clad creep and strain model to correct logic errors that could occur in certain transient conditions. These model revisions also had a small affect on the fuel rod initialization process, and can produce small affects during the transient. Due to the small magnitude of the affects, and the interaction between the two items, they are being evaluated as a single, closely related affect. Calculations with the corrected model resulted in an increase of 10°F in the PCT for the Small Break LOCA. This penalty applies to Braidwood, Byron and Zion.

17. Translation of Fluid Conditions from SATAN to LOCTA

An error was discovered in the coding related to the translation of fluid conditions between the SATAN blowdown hydraulics code and the LOCTA code used for subchannel analysis of the fuel rods. In performing axial interpolations to translate the SATAN fluid conditions onto the mesh nodalization used by the LOCTA code, the length of the lower core channel fluid connection to the lower plenum node was incorrectly calculated. Calculations with the corrected model resulted in an increase of 15°F in the PCT for the Large Break LOCA. This penalty applies to Braidwood, Byron and Zion.

18. Automatic Containment Spray During Small Break LOCA

The generic Westinghouse evaluation for RWST draindown assumes a maximum of two containment sprays drawing water from the RWST. Zion has 3 containment sprays which results in an earlier draindown of the RWST during a Small Break LOCA transient. This earlier draindown results in a 4°F PCT penalty for the Zion Small Break LOCA.

19. IFBA Fuel Evaluation

An evaluation was performed to support IFBA fuel with 100 psig backfill pressure. This evaluation consisted of re-running the cladding heatup code LOCBART with the model enhancements in Note 2. The evaluation resulted in a 24 °F PCT penalty that is applicable until the lead rod burnup reaches 1,000 MWD/MTU. After exceeding 1,000 MWD/MTU, the penalty is no longer applicable. This penalty only applies to Zion.

Attachment 3
ComEd 10 CFR 50.46 Report
Westinghouse Assessments Not Included in Rack-Ups

The following is a brief description of other LOCA assessments which have been reported to ComEd by Westinghouse. ComEd has decided not to incorporate these items in the rack up sheets at this time. Items 1 and 2 were previously reported to the NRC in a 30 day report dated October 28, 1993 and the 1994 Annual report dated July 8, 1994. Items 3, 4 and 5 were previously reported to the NRC in a 30 day report dated November 28, 1994. The current PCTs for all 6 units remain conservative without incorporation of these assessments in the current Evaluation Models.

Several other evaluation model changes were reported to ComEd by Westinghouse which resulted in a 0°F PCT change. These 0°F changes have been reviewed by ComEd, but are not included in this report. Generally these only apply to Zion. For Byron/Braidwood, the new LOCA analysis (May 1995) used new code versions which incorporate these changes.

Evaluations of the following PCT changes are based upon conservative generic studies for Westinghouse designed NSSSs. They do not constitute a change to the application of the evaluation models in the current licensing bases for Braidwood, Byron, or Zion Stations. If ComEd obtains a re-analysis or an evaluation which includes these effects, these effects will be reported at that time.

1. Effect of SI on Broken Loop

   In previous analysis it was assumed that modeling SI flow into the broken RCS loop would result in a lower calculated PCT since additional SI flow would be expected to provide additional core cooling. Recent analyses identified that SI flow into the broken RCS loop will actually result in an increase in PCT due to competition between the steam venting out the break and the SI into the broken loop which also exits through the break. The competition between the steam and the SI results in higher RCS pressures and thus, lower delivered SI flow rates to the intact RCS loops, leading to an increased PCT. Westinghouse estimated a 150°F increase in the Small Break LOCA PCT. This PCT increase was offset by the implementation of an improved Condensation model resulting in a net change of 0°F to the PCT (see Item 2). This applies only to SBLOCA for Zion. For Byron/Braidwood, the new SBLOCA analyses (May 1995) explicitly model SI in the broken loop in addition to the extra conservatism of using containment backpressure for the broken loop.

Attachment 3
ComEd 10 CFR 50.46 Report
Westinghouse Assessments Not Included in Rack-Ups

2. Effect of Improved Condensation Model

When a conservative model based on prototypic test is used to model the configuration of the SI piping to the RCS cold leg in a Westinghouse designed PWR, a net PCT benefit is calculated. Improved condensation of the loop steam in the intact loops results in lower RCS pressure and larger SI flow rates. The increase in SI flow rates, due to lower RCS pressure, leads to a lower PCT. Westinghouse estimated the Small Break LOCA PCT decrease to be at least 150°F. The negative effects of SI into the broken loop (see Item 1 above) are offset by this improved SI condensation model in the intact RCS loops. This applies only to SBLOCA for Zion. For Byron/Braidwood, the new LOCA analyses (May 1995) conservatively do not credit the improved condensation model since it has not received NRC approval.

3. Average Rod Burst Strain

The rod burst strain model was not applied to the hot assembly average rod in order minimize the rod gap and therefore minimize the heat transferred to the fluid channel. This would maximize the hot rod temperature. Due to zirc-water temperature excursion mechanisms, modeling of clad burst strain for the hot assembly average rod can result in a penalty for the hot rod by increasing the channel enthalpy at the time of PCT. Incorporation of this Evaluation Model change would result in an estimated PCT penalty of 6°F in the Small Break LOCA PCT. This item only applies to Zion Station. When combined with item 4 below, the net PCT change is 0°F.

4. Fuel Rod Burst Strain Limit

A revised burst strain limit model which limits strains is being implemented into the rod heat up codes used in both the Large Break and Small Break LOCA. Incorporation of this model would result in a PCT benefit of 6°F in the Small Break LOCA PCT. This item only applies to Zion Station. When combined with item 3 above, the net PCT change is 0°F.

Attachment 3
ComEd 10 CFR 50.46 Report
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5. LB-LOCA Power Distribution

Appendix K to 10 CFR 50 requires that the power distribution which results in the most severe calculated consequences be used in the ECCS Evaluation Model calculations. The current basis for all Westinghouse large break LOCA evaluations is the chopped cosine power distribution. Calculations were performed with BASH which examined peak power locations and power distributions which were not considered in the original analysis. Under some circumstances, these evaluations lead to PCTs greater than those calculated with the cosine distribution. Previously, Byron and Braidwood Units 1 and 2 included a conservative temporary penalty of 100°F to bound the effects of other power shapes. ComEd had chosen to operate under the generic JCO until the NRC approved WCAP-12909-P, Westinghouse ECCS Evaluation Model: Revised Large Break LOCA Power Distribution Methodology." Previously, Zion Units 1 and 2 applied a surveillance factor penalty to the measured value of FXY to ensure that the chopped cosine power shape remains bounding.

Westinghouse has developed an alternate axial power shape methodology, ESHAPE (Explicit SHape Analysis for PCT Effects), to replace PSSM. The ESHAPE methodology is based on explicit analysis of a set of skewed axial power shapes. The explicit use of skewed power shapes has been previously approved by the NRC as part of the Westinghouse's Large Break LOCA Evaluation Model. Westinghouse has performed evaluations using ESHAPE and has determined that ComEd's current Large Break analysis of record is not impacted, since the cosine shape remains limiting. Therefore, the temporary 100°F PCT penalty has been removed for Byron/Braidwood stations, and the FXY surveillance penalty is no longer needed for Zion station.