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DOCKET 50-266 AND 50-301
ECCS EVALUATION MODEL CHANGES, 10 CFR 50.46
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

As required by Title 10 of the Code of Federal Regulations Part 50.46(a)(3)(ii), Wisconsin Electric Power Company (Licensee) is submitting this report of changes to and errors discovered in emergency core cooling system (ECCS) evaluation models for Point Beach Nuclear Plant, Units 1 and 2. This letter provides a discussion of Wisconsin Electric's change in 10 CFR 50.46 reporting implementation, along with a summary of 1992 ECCS evaluation model changes and errors identified in a letter from Westinghouse Electric Corporation, received February 5, 1993. Model changes include changes to the large break loss of coolant accident (LOCA) model considered to be reportable under the 30 day reporting requirement in 10 CFR 50.46(a)(3)(ii).

10 CFR 50.46 Reporting Implementation

WCAP-13451, "Westinghouse Methodology for Implementation of 10 CFR 50.46 Reporting", issued in October 1992, will now be used as a guide for implementing 10 CFR 50.46 reporting requirements. Annual reporting will be done in the first quarter of each calendar year, starting with this report of 1992 evaluation model changes. No evaluation model changes were made during the transition period between the last annual report issued by Wisconsin Electric to the Nuclear Regulatory Commission, dated July 26, 1991, and this report of 1992 evaluation model changes.

Evaluation Model Changes

A summary of the 1992 large break and the small break LOCA evaluation model changes is provided below. The attachment to this letter describes the model changes in more detail and also provides LOCA peak cladding temperature (PCT) margin summary sheets.

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1. Small Break LOCA Evaluation Model

Four issues relating to the small break LOCA evaluation model are identified in the Westinghouse Electric Corporation letter. No benefits to and no penalties against the PCT have been assessed as a result of the changes to the small break LOCA evaluation model. Additional details are located in the attachment.

2. Large Break LOCA Evaluation Model

A group of large break LOCA evaluation model issues relating to the computer code WCOBRA/TRAC are identified in the Westinghouse Electric Corporation letter. The issues include six coding errors, an axial power input data error, and an inconsistent loss of offsite power assumption. The issues have been resolved and a plant specific reanalysis for the Point Beach limiting transient has been performed. Results show a PCT decrease, or benefit, of 76°F. A 76°F change in PCT is considered to be a significant change, as defined in 10 CFR 50.46(a)(3)(i), and is therefore reportable under the 30 day reporting requirement. The required schedule for reanalysis is not necessary since reanalysis has already been performed; compliance with the maximum PCT, specified in 10 CFR 50.46(b)(1), is demonstrated with a lower PCT being calculated. Additional details are located in the attachment.

Please contact us if you have any questions about this information.

Sincerely,

Bob Link
Vice President
Nuclear Power

Attachment

cc: NRC Resident Inspector
NRC Regional Administrator

Subscribed and sworn to before me this 23rd day of February, 1993.

Notary Public, State of Wisconsin

My Commission expires 10-27-96.

MMB/akf

ATTACHMENT

Point Beach Nuclear Plant 1992 ECCS Evaluation Model Changes

SMALL BREAK LOCA EVALUATION MODEL

1. Auxiliary Feedwater Flow Table Error
2. Steam Generator Secondary Side Modeling Enhancements
3. Basis Change for Hot Assembly Rod Gap Pressure
4. Limiting Time in Life in SBLOCA

LARGE BREAK LOCA EVALUATION MODEL

1. WCOBRA/TRAC Upper Plenum Injection Model Issues

PCT MARGIN SUMMARY SHEETS

1. Table 1: Small Break Peak Cladding Temperature Margin Utilization
2. Table 2: Large Break Peak Cladding Temperature Margin Utilization

SMALL BREAK LOCA EVALUATION MODEL

Name: 1985 SBLOCA Model

Application: Analysis of Small Break LOCA

Codes Used: NOTRUMP for the System Hydraulic Transient
LOCTA-IV for the Fuel Rod Thermal Transient

1992 SMALL BREAK LOCA EVALUATION MODEL CHANGES

1. Auxiliary Feedwater Flow Table Error

Background

The steam generator auxiliary feedwater (AFW) flow rate is governed by a timing variable. A minor logic error associated with this variable was discovered which led to a step change in the AFW flow rate once the transient time passed a certain value of the timing variable. This error affects long transient calculations. In addition, the nature of the error is to allow the AFW flow rate to immediately revert to the full value of the main feedwater flow rate. This enormous step change has led to code aborts in the cases where it has occurred.

SBLOCA transients are generally terminated before the logic error can have an effect and the code is incapable of handling the step change if it does occur. Therefore, it was reasoned that the logic could not affect LOCA results.

Estimated Effect

This error correction has no effect on any current or prior applications of the evaluation model.

2. Steam Generator Secondary Side Modeling Enhancements

Background

A set of related changes which make steam generator secondary side modeling more convenient for the user were implemented into NOTRUMP. This model improvement involved several facets of feedwater flow modeling. First, the common donor boundary node for the standard evaluation model nodalization has been separated into two identical boundary nodes. These donor nodes are used to set the feedwater enthalpy. The common

donor node configuration did not allow for loop specific enthalpy changeover times in cases where asymmetric AFW flow rates or purge volumes were being modeled for plant specific sensitivities.

The second improvement is the additional capability to initiate main feedwater isolation on either loss of offsite power coincident with reactor trip (low pressurizer pressure) or alternatively on safety injection signal (low-low pressurizer pressure). The previous model allowed this function only on loss of offsite power coincident with reactor trip. The auxiliary feedwater pumps are still assumed to start after a loss of offsite power with an appropriate delay time to model diesel generator start-up and bus loading times.

The final improvement is in the area of modeling the purging of high enthalpy main feedwater after auxiliary feedwater is calculated to start. This was previously modeled through an approximate time delay necessary to purge the lines of the high enthalpy main feedwater before credit could be taken for the much lower enthalpy auxiliary feedwater reaching the steam generator secondary. This time delay was a function of the plant specific purge volume and the auxiliary feedwater flow rate. The new modeling allows the user to input the purge volume directly. This then is used together with the code calculated integrated feedwater flow to determine the appropriate time at which the feedwater enthalpy can be assumed to change.

These changes involve only enhancements to the capabilities and useability of the evaluation model, and not changes to results calculated consistently with the previous model.

Estimated Effects

Because these enhancements only allow greater ease in modeling plant specific steam generator secondary side behavior over the previous model, it is estimated that no effect will be seen in evaluation model calculations.

3. Basis Change for Hot Assembly Rod Gap Pressure

Background

In the past, the effective hot assembly average rod power assumed to calculate the gap pressure in the hot assembly average rod was based on the total power in the hot assembly spread over all available bundle positions. That is, the power was averaged over both active rods as well as thimble tubes, which generate no power. This led to an artificially low rod internal pressure in the hot assembly average rod due to the artificially low power. In the future, the hot assembly average rod power based only on active fuel rods in the assembly will be used to calculate the rod internal pressure. The power modeled in the hot assembly rod for the purposes of channel fluid heating is still the appropriate power averaged over both fuel rods and unpowered thimble tubes.

For calculations in which rod burst is not predicted to occur, this change in basis will have a negligible effect. For calculations in which rod burst has been predicted, this change in basis will have the effect of increasing the tendency towards the limiting condition of coincident hot rod and hot assembly average rod burst. This instance would lead to a change in PCT of less than 50°F.

An ongoing evaluation of this issue is being performed. The effect of this change on the PCT is considered to be temporary pending final resolution of the issue.

Estimated Effect

This change has no effect on previous analyses pending final resolution of the issue.

This issue is not expected to have any impact on the Point Beach PCT since this change in basis is expected to have a negligible effect on calculations where rod burst is not predicted to occur. The small break LOCA results for Point Beach do not predict rod burst.

4. Limiting Time in Life in SBLOCA

Background

It has historically been assumed that the limiting time in life for SBLOCA has coincided with the time of maximum fuel densification and, therefore, maximum fuel temperatures. It has recently been concluded that for some calculations performed under this assumption, a more limiting PCT will occur at some later time in life. This effect occurs only in cases where no rod burst has been predicted and the calculated PCT is greater than 1700°F.

This penalty arises due to both coolant channel flow blockage effects and from the heat deposited in the cladding from the Zirc-water reaction which occurs on the clean interior surface of a newly burst rod. This rod burst later in life occurs due to the increase in rod internal pressure caused by the build up of fission gases in the fuel rod. While an evaluation tool has been developed to conservatively assess the impact of this issue, future analyses will include a plant specific limiting time in life determination.

An ongoing evaluation of the issue is being performed. The effect of this change on the PCT is considered to be temporary pending final resolution of the issue.

Estimated Effect

This change has no effect on previous analyses pending final resolution of the issue.

This issue is not expected to have any impact on the Point Beach PCT since this effect occurs only in cases where the calculated PCT is greater than 1700 degrees F. The PCT, including margin allocations, for the Point Beach small break LOCA analysis is 871 degrees F.

LARGE BREAK LOCA EVALUATION MODEL

Name:	UPI WCOBRA/TRAC
Application:	Analysis of Large break LOCA for Plants with Upper Plenum Injection
Codes Used:	COBRA/TRAC for the Combined Thermal and Hydraulic Transient COCO for the Containment Pressure Transient

1992 LARGE BREAK LOCA EVALUATION MODEL CHANGES

1. WCOBRA/TRAC Upper Plenum Injection Model Issues

Background

A number of nonconformances were discovered in the UPI (upper plenum injection) WCOBRA/TRAC evaluation model. Six of these nonconformances are coding errors. A seventh item deals with the way in which WCOBRA/TRAC uses the axial power input data supplied by the user. While no coding errors exist relative to this item, the coded model has the effect of slightly reducing the peak linear heat rate specified by the code user. An update to code was implemented to eliminate this problem.

Briefly, the coding errors discovered and corrected are as follows:

a. The code does not include the dp/dt term (pressure derivative) in the energy equation.

b. The equation for convection of transverse momentum across a section boundary to a single level channel is incomplete.

c. The structure heat transfer coefficients array is not properly initialized.

d. There is an incorrect Taylor expansion derivative term in the coding of the Chen correlation.

e. The lateral mass flux for heat transfer calculations is incorrect due to a coding logic error.

f. There are two typographical errors in the equation operators in subroutine XSCHEM.

In addition to these items, an inconsistent assumption regarding the loss of offsite power (LOOP) was identified in the WCOBRA/TRAC analysis. The inconsistent loss of offsite power assumption concerns a discrepancy between the assumption of LOOP for the COCO inputs used to generate the containment backfill pressure for the WCOBRA/TRAC analysis and the assumption of no LOOP in the final WCOBRA/TRAC analysis of record. The revised containment back pressures resulting from a revised COCO incorporating loss of offsite power assumptions have been included in the inputs for the reanalyses performed to assess the effect of the coding errors identified above.

Estimated Effects

A reanalysis was performed to assess the impact of the above described discrepancies which showed a net PCT benefit of 76°F. A reduction in the accumulator line resistance was employed to mitigate any effects of the coding errors.

The accumulator line resistance is a Point Beach specific input value that was initially given a value very conservative relative to the actual plant condition. Out of a range of values acceptable for the accumulator line resistance, the most conservative value was initially chosen. Some of the conservatism was removed from the value resulting in a more realistic, but still conservative value.

Table 1

PCT Margin Summary Sheet

Small Break Peak Cladding Temperature Margin Utilization

	Cladding Temperature
A. Analysis of Record (7/88)	PCT = 809°F
B. Prior Permanent ECCS Model Assessments	ΔPCT = 37°F
C. 10 CFR 50.59 Safety Evaluations 1. Auxiliary Feedwater Enthalpy Delay	 ΔPCT = 25°F
D. 1992 10 CFR 50.46 Model Assessments (Permanent Assessment of PCT Margin)	ΔPCT = 0°F
E. Temporary ECCS Model Issues	ΔPCT = 0°F
F. Other Margin Allocations	ΔPCT = 0°F
Licensing Basis PCT + Margin Allocations	PCT = 871°F

Table 2

PCT Margin Summary Sheet

Large Break Peak Cladding Temperature Margin Utilization

	Cladding Temperature
A. Analysis of Record (2/91)	PCT = 2028°F
B. Prior Permanent ECCS Model Assessments	ΔPCT = 0°F
C. 10 CFR 50.59 Safety Evaluations	ΔPCT = 0°F
D. 1992 10 CFR 50.46 Model Assessments (Permanent Assessment of PCT Margin)	
1. WCOBRA/TRAC Upper Plenum Injection Model Issues	ΔPCT = -76°F
E. Temporary ECCS Model Issues	ΔPCT = 0°F
F. Other Margin Allocations	ΔPCT = 0°F
Licensing Basis PCT + Margin Allocations	PCT = 1952°F