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April 3, 2002

U. S. Nuclear Regulatory Commission
Washington, D. C. 20555-001
Attention: Document Control Desk

Subject: Duke Energy Corporation
McGuire Nuclear Station, Units 1 and 2
Docket Number 50-369 and 50-370

Report Pursuant to 10 CFR 50.46, Changes to or Errors in an ECCS Evaluation Model

10 CFR 50.46 (a)(3)(ii) requires the reporting of errors or changes in the Emergency Core Cooling System (ECCS) evaluation models. This report covers the time period from January 1, 2000 to December 31, 2001.

During this time period, McGuire Unit 1 implemented Westinghouse RFA fuel, and as such the LOCA analysis of record for Unit 1 has been updated. McGuire Unit 2 implemented Westinghouse RFA fuel in year 2000, and now the LOCA analyses for both units are based on Westinghouse methods.

One error was identified in the Westinghouse large break LOCA analyses during 2001 which had a PCT impact. This error is not classified as significant per the 10 CFR 50.46 criterion. The error is related to the power level uncertainty calculated in the MONTECF Monte Carlo code. The original calculations attempted to calculate a 1% power uncertainty by adjusting other input parameters. A revision to the MONTECF code was subsequently made to allow a user defined power level uncertainty. A revised analysis explicitly calculating the 1% power uncertainty resulted in a 20 °F increase in the 95th percentile peak cladding temperature over the previously calculated value. Details of this error are presented in Table 1. A summary of the peak cladding temperatures for McGuire Units 1 and 2 are provided in Table 3.

There were two other errors in the Westinghouse evaluation models for which no PCT impact was assessed. In addition, Westinghouse made two changes or enhancements to the evaluation model. These changes are not considered to have any impact on the calculated PCTs. The nature of these errors and changes are provided in Table 2. Since there was no PCT impact determined for these errors/changes, they are not included in the PCT summary table.

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Please address any comments or questions regarding this matter to J. S. Warren at (704) 382-4986.

Very truly yours,

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xc w/Attachments:

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Table 1
Errors / Evaluation Model Changes with PCT Impact

MONTECF Power Uncertainty Correction (WCOBRA/TRAC LBLOCA Model)

The MONTECF Monte Carlo computer code is used to calculate the uncertainty of various parameters used in the WCOBRA/TRAC LBLOCA model. The original computer code used a hardwired power uncertainty of 2%. Duke requested that the original analysis consider a 1% uprated power level and a 1% power uncertainty. Given the limitation of the MONTECF code, the original analysis attempted to model the reduced power level uncertainty by reducing the F_Q and $F\Delta H$ values. A revision to the MONTECF code was subsequently made to allow a user defined power level uncertainty. A revised analysis utilizing the proper F_Q, $F\Delta H$, and 1% power uncertainty was performed. The calculated 95th percentile peak cladding temperature resulted in an increase of 8 °F for the first reflood phase (Reflood-1) and 20 °F for the second reflood phase (Reflood-2) with Reflood-2 remaining the limiting period. It should be noted that this error is generic in nature. Thus, the impact on the individual units would be the same as the impact on the McGuire/Catawba composite plant model. Therefore the composite plant model, with the PCT penalty applied, remains bounding for the McGuire and Catawba units.

Table 2
Errors / Evaluation Model Changes with no PCT Impact

Oxidation Thickness Index Error (WCOBRA/TRAC Models)
A coding error has been identified in the initial outside oxidation thickness array used for fuel rods. The error results in an incorrect index for storage of the oxide thickness for each fuel rod. The computer coding used the rod number index instead of the rod type index. This error was found to have no effect for standard BELOCA analyses that follow the published guidance material for input of this variable. This error also did not affect any test simulations performed to support the licensing of the BE Evaluation Model. Thus, there are no instances where an erroneous oxidation thickness was used and therefore, no PCT impact results from this error.

Neutronics Calculation – Moderator Density Weighting Factor Error (WCOBRA/TRAC Models)
An error was discovered in WCOBRA/TRAC whereby the power used in normalizing the moderator density weighting factors was double-accounted for in channels with multiple simulated rods. The error biases the average moderator density to be slightly higher, resulting in a slight increase in the power generation in the hot rod. The error is in the conservative direction; however, the magnitude of the error is insignificant. At the beginning of the transient calculation, the difference in weighted density is less than 1% for all plant types. The difference in the average moderator density affects the reactivity. As the transient progresses, voiding in the core occurs which dominates the reactivity response. Therefore, it was estimated that this error has a 0 °F PCT impact on plant calculation.

SPADES Update to Use NOTRUMP Subcooled Steam Table Routines (NOTRUMP SBLOCA Model)
A review of the SPADES calculation methodology determined that the subcooled fluid node properties were being calculated based on steam tables that were not consistent with those of NOTRUMP. SPADES is an input processor for the NOTRUMP computer code. The difference in subcooled steam properties resulted in slight differences in fluid node conditions seen in SPADES and NOTRUMP. The SPADES code has been modified to utilize the NOTRUMP subcooled steam tables properties. This update reduces the perturbations incurred during the steady-state simulation period in NOTRUMP resulting from the differences in the subcooled steam table properties. The nature of this changes leads to an estimated PCT impact of 0 °F.

NOTRUMP Accumulator Line Friction Factor (NOTRUMP SBLOCA Model)
The current input for the NOTRUMP evaluation model uses a dimensionless friction factor for the accumulator injection line of 0.013. This value is based on fully developed turbulent flow for pipe sizes in the range of the accumulator injection lines. However, during a small break LOCA, the accumulator injection flow seldom obtains velocities high enough to support fully developed turbulent flow. A more appropriate value of the friction factor is on the order of 0.016. The nature of this changes leads to an estimated PCT impact of 0 °F.

Table 3
Peak Cladding Temperature Summary – McGuire Units 1 & 2

LBLOCA	Cladding Temp (°F)	Comments
Evaluation model : WCOBRA/TRAC		
Analysis of record PCT	2028	MNS/CNS Composite Model
Prior errors (ΔPCT) 1. Decay heat in Monte Carlo calculations	8	Reference A
Prior evaluation model changes (ΔPCT) 1. None	0	
Errors (ΔPCT) 1. MONTECF power uncertainty correction	20	
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	20	
Net change in PCT for this report	20	
Final PCT	2056	
SBLOCA		
Evaluation model : NOTRUMP		
Analysis of record PCT	1177	Note (1)
Prior errors (ΔPCT) 1. Mixture level tracking/region depletion	13	Reference A
Prior evaluation model changes (ΔPCT) 1. None	0	
Errors (ΔPCT) 1. None	0	
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	0	
Net change in PCT for this report	0	
Final PCT	1190	

Reference:
A) letter, M. S. Tuckman (DEC) to USNRC, "Report Pursuant to 10 CFR 50.46, Changes to or Errors in an ECCS Evaluation Model", May 3, 2001

Note:
(1) The analysis of record PCT includes a 10 °F allowance for the presence of FCF fuel.

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