Duke Power
Catawba Nuclear Station
4800 Concord Road
York, SC 29745
(803) 831-4251 OFFICE
(803) 831-3221 FAX

Duke Power
A Duke Energy Company

Gary R. Peterson
Vice President

April 11, 2001

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

Subject: Catawba Nuclear Station, Units 1 and 2
Docket Number 50-413 and 50-414
Report Pursuant to 10 CFR 50.46, Changes to or Error in an ECCS
Evaluation Model

Reference: 1) Letter, G. R. Peterson (DPC) to USNRC, "Report Pursuant to 10 CFR
50.46, Changes to or Error in an ECCS Evaluation Model", June 12, 2000.

10 CFR 50.46 (a)(3)(ii) requires the reporting of errors or changes in the Emergency Core Cooling System (ECCS) evaluation models. Previous submittals for Catawba Nuclear Station (CNS) in regard to this regulation were submitted in October. In order to be consistent with the schedule of our new fuel vendor, Westinghouse, future submittals for CNS will be made in April covering the period of January through December of the preceding year. This report covers the time period from October 1, 1999 to December 31, 2000.

During this time period, both Catawba units implemented Westinghouse RFA fuel requiring a reanalysis of the UFSAR Chapter 15 safety analysis. For Catawba Unit 1, large break LOCA (LBLOCA) calculations were performed by Westinghouse using the WCOBRA/TRAC best estimate evaluation model. For Catawba Unit 2, LBLOCA calculations were performed using the BASH evaluation model. Westinghouse also performed small break LOCA (SBLOCA) analyses for both Catawba units using the NOTRUMP evaluation model. No changes were made to the Westinghouse evaluation models during this period, however several errors which had an impact on the calculated peak cladding temperatures (PCTs) were discovered.

On June 12, 2000, significant input errors were reported in the large break LOCA analysis for Catawba Unit 2 (Reference 1). These errors were corrected and all of the affected calculations were reanalyzed. Thus, the analysis of record PCT for the Catawba Unit 2 large break evaluation model was reestablished. As such, the errors reported in the June 12, 2000 10 CFR 50.46 report are not included in this report.

The first error being reported for this time period is related to the mixture level tracking in the NOTRUMP computer code. The impact of this error on the Catawba SBLOCA analysis is an increase in the PCT of 13 degrees F. The second error is in the decay heat uncertainty calculation in the Monte Carlo calculations performed as part of the best estimate LBLOCA
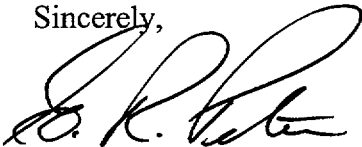
A001

analysis. The impact of this error on the Catawba Unit 1 LBLOCA analysis is an increase in the PCT of 8 degrees F. The next three errors impact the LOCBART heat transfer calculation used in the BASH large break analysis. The net impact of the LOCBART heat transfer errors is an increase in PCT of 3 degrees F, while the sum of the absolute magnitudes of these changes is 27 degrees F. The details of the errors that impact the calculated PCTs are presented in Table 1. A summary of the peak cladding temperatures for Catawba Unit 1 and Unit 2 including the impact of these errors are provided in Tables 3 and 4 respectively. None of these errors is classified as significant per the 10 CFR 50.46 criterion.

Seven other errors in the Westinghouse evaluation models were assessed and found to have no PCT impact. The nature of these errors is provided in Table 2. Since there was no PCT impact determined for these errors, they are not included in the PCT summary tables.

Please address any comments or questions regarding this matter to Kay Nicholson at (803) 831-3237.

Sincerely,

G. R. Peterson

xc: L. A. Reyes, Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85

C. P. Patel, NRR Senior Project Manager (CNS)
U. S. Nuclear Regulatory Commission
Mail Stop O-8 H12
Washington, DC 20555-0001

D. J. Roberts, Senior Resident Inspector (CNS)
U. S. Nuclear Regulatory Commission
Catawba Nuclear Station

Table 1
Errors / Evaluation Model Changes with PCT Impact

Mixture Level Tracking/Region Depletion Errors (NOTRUMP SBLOCA Model)

Several closely related errors were discovered in the NOTRUMP computer code dealing with how the stack mixture level transitions across a node boundary in a stack of fluid nodes. The impact of this error was evaluated on a generic basis for all standard EM applications. A bounding PCT impact of 13 degrees F has been assigned.

Decay Heat Uncertainty Error in Monte Carlo Calculations (WCOBRA/TRAC LBLOCA Model)

An error was discovered in the calculation of the decay heat uncertainty in the Monte Carlo code used for the 95th percentile PCT for best estimate LBLOCA analyses. The impact of this error was evaluated on a plant specific basis. The impact for the McGuire/Catawba BE LBLOCA analysis was determined to be 4 degrees F for the first reflood phase (Reflood-1) and 8 degrees 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 less than or 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.

LOCBART Cladding Emissivity Errors (BASH LBLOCA Model)

It was discovered that the values of the cladding emissivity used in the LOCBART computer code were substantially lower than the values that would be expected to exist during a large break LOCA reflood transient. The impact of this error was evaluated on a generic basis. The PCT impact for the McGuire/Catawba class of plants was assigned a value of 9 degrees F.

LOCBART Vapor Film Flow Regime Heat Transfer Error (BASH LBLOCA Model)

An error was discovered in the LOCBART computer code related to the cladding-to-fluid heat transfer coefficient for conduction across the vapor film. The error resulted in a minor under prediction of the cladding-to-fluid heat transfer coefficient. The impact of this error was evaluated on a generic basis. The PCT impact for the McGuire/Catawba class of plants was assigned a value of -12 degrees F.

LOCBART Dispersed Flow Regime Flow Wall Emissivity Error (BASH LBLOCA Model)

An error was discovered in the LOCBART computer code whereby the wall emissivity in the dispersed flow regime was substantially lower than the value identified in the code documentation. The impact of correcting this error was evaluated on a generic basis. The PCT impact for the McGuire/Catawba class of plants was assigned a value of 6 degrees F.

Table 2
Errors / Evaluation Model Changes with no PCT Impact

NOTRUMP Core Heat Transfer Error (NOTRUMP SBLOCA Model)

An error was discovered in the NOTRUMP computer code, which resulted in either the code to abort or the use of invalid steam table properties and/or heat transfer correlation in the core region under certain conditions. This error can only occur when complete subcooling of the core cladding exists in conjunction with core uncovery. The nature of this error leads to no PCT impact for all standard EM applications.

LOTIC2 Nitrogen Addition Logic Error (WCOBRA/TRAC and BASH LBLOCA Models)

The LOTIC2 computer code calculated the minimum containment back pressure during a LBLOCA transient for plants with ice condenser containment designs. An error was discovered whereby some of the nitrogen was being released to the upper compartment instead of correctly being released entirely to the lower compartment. Representative calculations with this error corrected showed a negligible effect on containment pressure, which in turn would have a negligible effect on PCT. Therefore, this correction has been assigned a 0 degrees F value for 10 CFR 50.46 reporting purposes.

LOTIC2 Time Step Logic Error (WCOBRA/TRAC and BASH LBLOCA Models)

An error was discovered in the LOTIC2 computer code whereby the transient time was being adjusted twice in a typical time step, which led to negative time step sizes under certain conditions. Representative calculations with this error corrected showed a negligible effect on containment pressure, which in turn would have a negligible effect on PCT. Therefore, this correction has been assigned a 0 degrees F value for 10 CFR 50.46 reporting purposes.

BASH Implementation of LOCBART Corrections (BASH LBLOCA Model)

Computer coding contained in BART is used in both the LOCBART and BASH computer codes. The errors described in Table 1 for the LOCBART computer code, cladding emissivity, vapor film flow regime heat transfer, and dispersed flow regime wall emissivity, also apply to the BASH computer code. Representative calculations with these errors corrected in the BASH computer code showed a relatively minor effect on the core inlet flooding rate, which in turn would have a negligible effect on PCT. Therefore, this correction has been assigned a 0 degrees F value for 10 CFR 50.46 reporting purposes.

LOCBART Rod-to-Rod Radiation Error (BASH LBLOCA Model)

An error was discovered in the LOCBART computer code whereby a variable was not being defined for rod-to-rod radiation calculations. This error caused the radiation heat flux for the hot rod to be calculated incorrectly and caused the radiation heat flux for the adjacent rod to be zero. Representative plant calculations using the LOCBART computer code showed that correcting this error has a negligible effect on the results. Therefore, this correction has been assigned a 0 degrees F value for 10 CFR 50.46 reporting purposes

SATAN6 Momentum Flux Logic Error (BASH LBLOCA Model)

An error was discovered in the SATAN6 momentum flux logic whereby the sonic velocity was being applied incorrectly. In some instances, this caused the break flow to hang up near the end of blowdown. Representative calculations with this error corrected showed a very minor effect on the blowdown results for typical cases, which in turn would be expected to have a negligible effect on PCT. Even for a case with a more substantial effect on SATAN6 results, the effect on PCT was found to be small, due mainly to the fact that the core heatup near end-of-blowdown is essentially adiabatic. Therefore, this correction has been assigned a 0 degrees F value for 10 CFR 50.46 reporting purposes.

SATAN Reactor Coolant Pump Logic Error (BASH LBLOCA Model)

An error was discovered in the SATAN6 reactor coolant pump logic where, during a time step in which the pump critical flow iteration failed to converge, the pump flow rate was reset incorrectly to the value of the last iteration. Representative plant calculations with this error corrected showed either no effect or a negligible effect on the blowdown results, which would be expected to have either no effect or a negligible effect on PCT. Therefore, this correction has been assigned a 0 degrees F value for 10 CFR 50.46 reporting purposes.

Table 3
Peak Cladding Temperature Summary – Catawba Unit 1

LBLOCA	Cladding Temp (degrees F)	Comments
Evaluation model : WCOBRA/TRAC		
Analysis of record PCT	2028	MNS/CNS Composite Model
Prior errors (ΔPCT) 1. None	0	
Prior evaluation model changes (ΔPCT) 1. None	0	
Errors (ΔPCT) 1. Decay heat in Monte Carlo calculations	8	
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	8	
Net change in PCT for this report	8	
Final PCT	2036	
SBLOCA		
Evaluation model : NOTRUMP		
Analysis of record PCT	1177	Note (1)
Prior errors (ΔPCT) 1. None	0	
Prior evaluation model changes (ΔPCT) 1. None	0	
Errors (ΔPCT) 1. Mixture level tracking/region depletion	13	
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	13	
Net change in PCT for this report	13	
Final PCT	1190	

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

Table 4
Peak Cladding Temperature Summary – Catawba Unit 2

LBLOCA	Cladding Temp (degrees F)	Comments
Evaluation model : BASH		
Analysis of record PCT	2140	Note (1)
Prior errors (ΔPCT) 1. None	0	
Prior evaluation model changes (ΔPCT) 1. None	0	
Errors (ΔPCT) 1. LOCBART vapor film flow regime heat transfer 2. LOCBART dispersed flow regime wall emissivity 3. LOCBART cladding emissivity	9 -12 6	
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	27	
Net change in PCT for this report	3	
Final PCT	2143	
SBLOCA		
Evaluation model : NOTRUMP		
Analysis of record PCT	1073	Note (2)
Prior errors (ΔPCT) 1. None	0	
Prior evaluation model changes (ΔPCT) 1. None	0	
Errors (ΔPCT) 1. Mixture level tracking/region depletion	13	
Evaluation model changes (ΔPCT) 1. None	0	
Absolute value of errors/changes for this report (ΔPCT)	13	
Net change in PCT for this report	13	
Final PCT	1086	

Notes:
(1) The analysis of record PCT includes a 50 degree F transition core penalty
(2) The analysis of record PCT includes a 10 degree F allowance for the presence of FCF fuel