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PR

October 16, 1996

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Technical Specification Change Request NPF-38-185

Gentlemen:

The attached description and safety analysis support a change to the Waterford 3 Technical Specifications Table 4.3-1. The change described herein expands the applicability for Core Protection Calculator (CPC) operability and allows for the application of a Cycle Independent Shape Annealing Matrix (CISAM).

The proposed changes have been evaluated in accordance with 10CFR50.91(a) (1) using criteria in 10CFR50.92 (c) and it has been determined that the changes involve no significant hazards considerations. The bases for these determinations are described in the attached submittal.

The circumstances surrounding this change do not meet the NRC's criteria for exigent or emergency review. However, due to the significant impact on our upcoming refueling outage, we respectfully request an expeditious review. The ABB-CE safety and setpoint analysis for Cycle 9 was prepared based on these TS changes being incorporated into the Waterford 3 Technical Specifications. The Waterford 3 refueling outage is currently scheduled to begin April 11, 1997. Entergy Operations requests the effective date for this change be within 60 days of approval.

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Should you have any questions or comments concerning this request, please contact Jim Fisicaro at (504) 739-6242.

Very truly yours,

Mike Sellman

M.B. Sellman
Vice President, Operations
Waterford 3

MBS/ELL/ssf
Attachment: Affidavit
NPF-38-185

cc: L.J. Callan, NRC Region IV
C.P. Patel, NRC-NRR
R.B. McGehee
N.S. Reynolds
NRC Resident Inspectors Office
Administrator Radiation Protection Division
(State of Louisiana)
American Nuclear Insurers

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter of	)	
	)	
Entergy Operations, Incorporated	)	Docket No. 50-382
Waterford 3 Steam Electric Station	)	

AFFIDAVIT

M.B. Sellman, being duly sworn, hereby deposes and says that he is Vice President Operations - Waterford 3 of Entergy Operations, Incorporated; that he is duly authorized to sign and file with the Nuclear Regulatory Commission the attached Technical Specification Change Request NPF-38-185; that he is familiar with the content thereof; and that the matters set forth therein are true and correct to the best of his knowledge, information and belief.

M.B. Sellman
Vice President Operations - Waterford 3

STATE OF LOUISIANA)
) ss
PARISH OF ST. CHARLES)

Subscribed and sworn to before me, a Notary Public in and for the Parish and State above named this 16TH day of OCTOBER, 1996.

Notary Public

My Commission expires WITH LIFE.

DES :RIPTION AND SAFETY ANALYSIS
OF PROPOSED CHANGE NPF-38-185

The following is a request to change the Waterford 3 Technical Specifications Table 4.3-1 to expand the applicability for Core Protection Calculator (CPC) operability and to allow for the application of a Cycle Independent Shape Annealing Matrix (CISAM).

Existing Specification

See Attachment A

Proposed Specification

See Attachment B

Description

A) The Technical Specification Table 4.3-1, Notation 2, is being revised to require adjustment of the Linear Power Level, the CPC delta T power, and CPC nuclear power signals to match or be greater than the calorimetric calculation if from 15% to 80% of RATED THERMAL POWER the difference is less than -0.5% or greater than 10%. At or above 80% RATED THERMAL POWER, adjustment is required if the absolute difference is greater than 2%.

The Core Protection Calculator system is part of the Reactor Protection System (RPS). It is designed to provide automatic protective action to assure that the specified acceptable fuel design limits (SAFDL) are not exceeded during an anticipated operational occurrence (AOO). The CPC system ensures that the departure from nucleate boiling ratio (DNBR) of the most limiting fuel assembly in the reactor core is not less than 1.26 and that the local power density (LPD) of the most limiting fuel assembly in the core does not exceed 21 KW/ft.

The CPC system monitors reactor parameters via the four redundant CPC's and the two redundant control element assembly calculators (CEAC's). Calculations are performed on these variables by each channel. If an unsafe condition is found to exist, the channel sends a reactor trip signal(s) to the RPS. The RPS circuitry will shut down the reactor upon receiving trip signals from two of four CPC channels. Four independent CPC's are provided, one in each protection channel. Calculation of DNBR and LPD is performed in each CPC.

In addition to using the three excore Subchannels as a power measurement, the CPC's also use a primary calorimetric calculation, $Q = m\ c_p(T_h - T_c)$ which utilizes T_c and pressure to derive C_p; C_p, T_h and RCP speed to derive mass flow rate; and T_h provide the enthalpy rise across the core. Where,

Q = primary calorimetric

m = mass flow rate

C_p = specific heat

T_h = T-hot, and

T_c - T-cold

The CPC's then internally auctioneer the higher of the Calibrated Linear Power and Primary Calorimetric Power to determine which power is to be used in the DNBR and LPD algorithms. The thermal power calculation must also be periodically calibrated (checked daily) to match COLSS Secondary Calorimetric Power Calculation. This is done via the "TPC" addressable constant (Point ID 064). A minimum power level of at least 20 percent is auctioneered in.

The linear power level, the CPC delta T power, and CPC nuclear power signals provide inputs to the Plant Protection System and CPC algorithms. The calibration tolerances in Table 4.3-1, Notation 2, ensure that these power inputs are equal to or greater than the calorimetric power calculation.

During low power operation, the linear power level, the CPC delta T power, and the CPC nuclear power signals require calibration to the calculated, calorimetric power. The narrow acceptance band on these power signals identified in the current TS results in frequent adjustments, even when the signals are conservatively high relative to calorimetric power.

The proposed changes to Table 4.3-1, Notation 2, expand the acceptance band so that the power signals are calibrated only if they fall outside a band of -0.5% to +10% between 15% and 80% RATED THERMAL POWER, and $\pm$ 2% at and above 80% RATED THERMAL POWER except as required during physics testing. These changes ensure that the power indications are conservative relative to safety analyses, while reducing the required number of changes to these power indications.

Combustion Engineering recommended a one-sided requirement to recalibrate any time CPC power is less than the calorimetric by 0.5% RTP since it would leave a small tolerance for operator convenience and would gain thermal margin relative to the current value of 2.0%. Rather than an open tolerance when CPC power is greater than calorimetric, Waterford has chosen a +10% tolerance to be conservative.

The change in CPC power calibration outlined above is done to provide assurance that the CPC will be conservative following a power reduction and subsequent power

increase. By allowing the CPC to indicate a higher than actual power, the CPC will conservatively determine LPD and DNBR. Currently, an adjustment would be required following a power reduction. During the subsequent power increase, the CPC powers would become non-conservative and would require adjustment. The proposed TS change would assure that the CPC's are conservative through the entire evolution. This change is being done per ABB-CE recommendations.

The Nuclear Regulatory Commission has issued Amendment No. 98 to Facility Operating License No. NPF-41, Amendment No. 86 to Facility Operating License No. NPF-51, and Amendment No. 69 to Facility Operating License No. NPF-69 for the Palo Verde Nuclear Generating Station, Unit Nos. 1, 2, and 3 respectively, allowing this same change for expanding the applicability for CPC operability.

B) The Technical Specification Table 4.3-1, Notation 5, is being revised to allow "verification" of the shape annealing matrix elements "used" in the CPC's. This will allow the use of a Cycle Independent Shape Annealing Matrix (CISAM) in the CPC's.

The Core Protection Calculators (CPC's) use the excore detector signals to trip the reactor to ensure the specified acceptable fuel design limits (SAFDL) on minimum departure from nucleate boiling ratio (DNBR) and peak linear heat rate (LPD) are not violated in the event of an anticipated operational occurrence. However, the raw excore signals from each detector are not purely the product of the core regions immediately adjacent to that detector. This is because the detectors are able to detect neutron leakage from all heights of the core. This adds to the inaccuracy in measuring axial power distribution. During power ascension testing, it is determined how much of each excore signal is contributed from each third of the core height, and addressable constants called the shape annealing matrix (SAM) are verified and adjusted if necessary. The result of the shape annealing correction is to adjust the excore signal so that each detector effectively sees only those core nodes immediately adjacent to it.

Technical Specification Table 4.3-1, Notation 5, requires a determination of the SAM constants from the incore measurements after each refueling and prior to exceeding 70% of RATED THERMAL POWER. Incore and excore signal data are recorded at regular intervals during initial power ascension following refueling. The incore data is then processed through a computer code to determine the relative power at the core periphery. Each detector then has the correct response for power changes in the peripheral fuel assemblies immediately adjacent to it. An automated data reduction code is then used to verify the data, calculate the SAM constants, and determine whether the measured SAM meets a set of review and acceptance criteria to justify its use in the CPC's. The cycle specific SAM is measured only once during the reload startup and has been observed to be less accurate as the cycle progresses and the power shape evolves from a flattened cosine to a saddle shape.

Rather than being based just on data obtained during startup and power ascension to 70% RATED THERMAL POWER, the Cycle Independent Shape Annealing Matrix (CISAM) elements will be based on measured data from one or more previous cycles. This will typically be from middle of cycle measurements and will be used to determine CISAM elements that produce the best results for the entire cycle. This should result in better fidelity of the axial power shapes in the latter parts of the fuel cycle than that obtainable with the SAM from the current method.

The proposed change to Notation 5 allows the existing CISAM to be verified during startup as acceptable rather than determining and installing a new SAM based on startup tests.

The implementation of the (CISAM) has provided a method of reducing startup testing time. The CISAM allows a SAM to be installed prior to startup and utilized throughout the fuel cycle. The CISAM potentially provides reduced error in the axial shape modeling of the CPC late in the cycle. This improved modeling removes some of the uncertainty associated with the axial shape and provides increased assurance that the CPC is appropriately modeling the core. Additional information on this change is described in CE NPSD-984-P.

The Nuclear Regulatory Commission has issued Amendment No. 100 to Facility Operating License No. NPF-41, Amendment No. 88 to Facility Operating License No. NPF-51, and Amendment No. 71 to Facility Operating License No. NPF-69 for the Palo Verde Nuclear Generating Station, Unit Nos. 1, 2, and 3 respectively, allowing the use of cycle independent shape annealing matrix elements (CISAM) in CPC's.

Safety Analysis

The proposed change described above shall be deemed to involve a significant hazards consideration if there is a positive finding in any of the following areas:

1. Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   A. The proposed change will reduce the amount of non-conservatism presently allowed for linear power level, the CPC delta T power, and CPC nuclear power signals. Changing the tolerance range from ± 2% to between -0.5% and 10% between 15% and 80% RATED THERMAL POWER, except during physics testing, will allow more conservative settings than currently allowed. The consequences of an accident will be reduced due to the proposed change because it is less likely to be non-conservative in power.

B. This proposed change will allow use of Cycle Independent Shape Annealing Matrix (CISAM) elements. These elements will be validated, during startup testing, by monitoring the same parameters used for cycle specific shape annealing matrix (SAM) elements. If the CISAM is determined to be no longer valid, a cycle specific SAM will be calculated and used in the CPC's. In addition, use of CISAM gives better agreement throughout the cycle.

Therefore, the proposed changes will not involve a significant increase in the probability or consequences of any accident previously evaluated.

2. Will operation of the facility in accordance with this proposed change create the possibility of a new or different type of accident from any accident previously evaluated?

Response: No

A. The proposed change to TS power calibration tolerance limits is conservative relative to the current TS requirement. CPC's cannot cause an accident and this change will not create the possibility of a new or different type accident. The changes ensures that the reactor will trip prior to the current condition due to higher CPC power.

B. As stated previously, CISAM modeling removes some of the uncertainty associated with axial shape and provides increased assurance that the CPC is appropriately modeling the core.

Therefore, the proposed changes will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Will operation of the facility in accordance with this proposed change involve a significant reduction in margin of safety?

Response: No

A. The proposed change to the TS reduces the amount of non-conservatism in safety system power indications and maintains the margin of safety for design basis events which take credit for the linear power level, the CPC delta T power, and CPC nuclear power signals.

B. CISAM will be validated each cycle during startup testing and must meet the same parameters as cycle specific SAM elements. Since CISAM has a better accuracy than the cycle dependent SAM, the margin of safety is improved.

Therefore, the proposed changes will not involve a significant reduction in a margin of safety.

Safety and Significant Hazards Determination

Based on the above safety analysis, it is concluded that: (1) the proposed change does not constitute a significant hazards consideration as defined by 10CFR50.92; and (2) there is a reasonable assurance that the health and safety of the public will not be endangered by the proposed change; and (3) this action will not result in a condition which significantly alters the impact of the station on the environment as described in the NRC final environmental statement.

NPF-38-185

ATTACHMENT A