ENTERGY

Entergy Operations, Inc.
P.O. Box B
Killona, LA 70066-0751
Tel 504 739-6661

Ross P. Barkhurst
Vice President, Operations
Waterford 3

W3F1-95-0004
A4.05
PR

January 27, 1995

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-38-163

Gentlemen:

The attached description and safety analysis support a change to the Waterford 3 Technical Specification Fuel Assemblies Section 5.3.1. The change described herein increases the maximum enrichment for the spent fuel pool and containment temporary storage rack from 4.1 to 4.9 weight percent U-235 when fuel assemblies contain fixed poisons. Waterford 3 plans to use higher enriched fuel in the next fuel cycle (Cycle 8) to meet the energy plans and maintain a reload batch size similar to that used in Cycles 6 and 7.

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.

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Should you have any questions or comments concerning this request, please contact Roy Prados at (504)739-6632.

Very truly yours,

R.P. Barkhurst
Vice President, Operations
Waterford 3

RPB/RWP/ssf
Attachment: Affidavit
NPF-38-163

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

R.P. Barkhurst, 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-38-163; 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.

R.P. Barkhurst
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 27TH day of JANUARY, 1995.

Notary Public

My Commission expires WITH LIFE.

DESCRIPTION AND SAFETY ANALYSIS
OF PROPOSED CHANGE NPF-38-163

The following is a request to increase the maximum enrichment for the spent fuel pool and containment temporary storage rack from 4.1 to 4.9 weight percent U-235 when fuel bundles contain fixed poisons. The increased enrichment continues to result in reactivity below the NRC fuel storage acceptance criteria of 0.95 k-effective. Waterford 3 plans to use higher enrichment fuel in Cycle 8 to meet the energy plans and maintain a reload batch size similar to that used in Cycles 6 and 7.

Existing Specification

See Attachment I

Proposed Specification

See Attachment II

Description

The Waterford 3 fuel storage areas were previously approved for the storage of fuel containing up to 4.1 weight percent enriched Uranium in Reference 1. The analysis for the 4.1 weight percent enrichments conservatively assumed no fixed poisons were present in the fuel bundles. With increasing cycle lengths, fuel management plans call for a larger fraction of the reload batch to contain poisons. The upcoming Cycle 8 fuel management plan uses poison rods in all of the fuel bundles. Because the poisons significantly reduce the reactivity of the fuel bundles, higher fuel enrichments may be loaded and still meet the fuel storage criticality acceptance criteria. The fuel bundle design used at Waterford 3 loads poison rods in fuel rod locations. Unlike some other designs which load poison rods into control rod guide tubes, this design does not allow the poison rods to be readily removed. Taking credit for the reactivity control effects of these poison rods is consistent with the requirements of Reference 2.

The Spent Fuel Pool criticality safety analysis described in Reference 3 and included as Attachment III demonstrates that a zoned loaded bundle with enrichments of 4.5 and 4.1 weight percent U-235, which contains 8 poison rods with 0.016 B-10 g/in., meets the NRC acceptance criteria of 0.95 k-effective at the 95/95 probability/confidence level. Various other combinations of fuel enrichments and poison loadings were also analyzed and were confirmed to be equivalent to or less reactive than the reference configuration. These

configurations include enrichments between 4.1 and 4.9 weight percent U-235. Equivalent reactivity may be achieved at a specific enrichment by varying the number of poison rods and/or poison concentrations.

The analysis established methodology biases and uncertainties by performing benchmark comparisons to published critical experiments. Uncertainties of the Monte Carlo methodology are also included as well as uncertainties due to variations in the manufacture of the rack and fuel. These uncertainties were addressed by using the worst case value for the parameter or by performing a sensitivity analysis. The reactivity effects of those parameters evaluated with a sensitivity analysis were statistically combined before being added to the other analysis uncertainties.

The Reference 3 criticality analysis assumes all Boraflex panels contain co-planar gaps at the most reactive axial location (top of Boraflex panel). These assumptions are conservative relative to the Waterford 3 blackness test results described in References 4 and 5 and included as Attachments IV and V, respectively. These assumptions are also consistent with industry data reported by EPRI in Reference 6.

The Reference 1 criticality analysis considered the effects of various accident configurations. The results of these analyses concludes that the 0.95 k-effective acceptance criteria for accident conditions is met. The reactivity of the Base Bundle (4.5/4.1 weight percent with 8 boron shims at 0.016 B-10 g/in.) was evaluated relative to the bundle assumed in the Reference 1 analysis. This evaluation considered the relative reactivity of two bundles in various configurations. These configurations include tightly and loosely coupled out of rack configurations as well as in-rack configurations. These comparisons demonstrate that the Base Bundle is less reactive than the bundle assumed in the Reference 1 analysis. Additionally, when including a conservative adjustment to the Reference 1 results due to the potential impact of Boraflex gaps, the spent fuel rack accident analyses results continue to be below the acceptance criteria.

The containment temporary storage racks rely on bundle spacing to control reactivity. The nominal bundle pitch is 18 inches so the bundles are essentially decoupled. Reference 1 analysis established a nominal configuration k-effective less than 0.899 (95/95). A dropped bundle accident was evaluated assuming minimum spacing of 1.762 inches between a bundle in the center rack location and the dropped bundle. When minimum boron concentration was credited during refueling, a k-effective of 0.90 was established for accident conditions. The relative reactivity of the previously analyzed bundle was determined to be bounding in both loose and tightly coupled configurations; therefore, the previous criticality analysis remains bounding for the reference bundle design.

The analysis of the new fuel storage vault is not addressed in this submittal since it is not planned to be used for Cycle 8. The use of the new fuel vault to store fuel with enrichments above 4.1 weight percent will be precluded by administrative controls until a criticality analysis confirming its acceptability can be completed.

In the initial application (Cycle 8), the proposed enrichment increase will not result in a significant increase in burnup; however, it will eventually result in burnup increases for future cycles, but not above the currently approved 60 MWD/KG limit per Reference 7.

Paragraph b of 10CFR51.5z states that licensees using fuel enrichments greater than 4.0 weight percent U-235 or with fuel irradiation in excess of 33 GWD/MT shall provide a full description and detailed analysis of the environmental effect of transporting fuel and waste to and from the reactor. As described in Reference 8, the NRC has performed a generic evaluation for fuel enrichments up to 5.0 weight percent U-235 and irradiation up to 60 GWD/MT. This evaluation concludes that the environmental impact of extended irradiation and increased burnup are bounded by those reported in Table S-4 of 10 CFR Part 51. Since the Waterford 3 enrichment and irradiation levels are equal to or less that those assumed in the Reference 8 evaluation, the conclusions of that evaluation are applicable to Waterford 3.

The Cycle 8 fuel design uses slightly higher fuel rod loadings due to the increased stack height of the Guardian Grid bundle design and the slightly higher pellet density. However, the fuel loading remains bounded by the criticality analysis assumptions and is well within the range considered in the reactor and fuel storage systems static and dynamic loads analysis.

Other aspects of implementing a higher enrichment fuel management core design will be evaluated using approved reload analysis methods.

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

The proposed change will increase the fuel enrichment limit in order to meet the cycle energy requirements while maintaining fuel batch sizes consistent with previous cycle designs. The calculated k-effective, including uncertainties, demonstrate substantial margin to criticality in the storage racks for both normal and accident conditions. No changes to the facility are required. No new modes of operating the fuel storage or transfer systems are required, except a restriction to limit the use of the new fuel vault to fuel with a maximum enrichment of 4.1 weight percent U-235. This restriction will be implemented by administrative controls. Since the plant equipment and operation are essentially the same, there is no significant increase in the probability of a criticality accident. Since a criticality event is demonstrated to be unfeasible, there are no increased adverse consequences for such a postulated event.

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.

   As previously discussed, the proposed change will not result in a physical change to the facility nor will it result in a significant change to the operation of the facility; therefore, it does 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 a margin of safety?

   Response: No

   The proposed change has been analyzed to establish a k-effective, including uncertainties, at or below the NRC criticality acceptance criteria of k-effective below 0.95 including uncertainties at the 95/95 probability/confidence level; therefore, there is no reduction in the 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.

REFERENCES

1) "Issuance of Amendment No. 44 to Facility Operating License NPF-38-Waterford Steam Electric Station, Unit 3 (TAC No. 69003)", David L. Wigginton (NRC) to J.G. Dewease (Waterford 3), dated October 19, 1988.

2) "U.S. NRC to all Power Reactor Licensees", April 14, 1978, Docket No. 50-289, Brian K. Grimes.

3) "Summary of the WSES-3 Criticality Safety Analyses for Fuel Enrichments Above 4.1 weight percent Taking Credit for Fixed Burnable Poisons", T.G. Ober, Central Design Engineering, Entergy Operations, Inc., November, 1994.

4) "Revised Boraflex Surveillance Program of the Spent Fuel Pool Racks", Waterford Steam Electric Station, Unit 3, TAC No. M86006, Docket No. 50-382, August 23, 1993.

5) "Boraflex Surveillance Program", Docket No. 50-382, W3F192-0396, December 31, 1992.

6) "Boraflex Test Results and Evaluation", EPRI TR-101986, February, 1993.

7) "Verification of the Acceptability of a Pin Burnup Limit of 60 MWD/KG for Combustion Engineering 16 x 16 PWR Fuel", CEN-386-P, June, 1989.

8) "NRC Assessment of the Environmental Effects of Transportation Resulting from Extended Fuel Enrichment and Irradiation", Attachment to Letter: B.C. Buckley (NRC) to E.E. Utley (CP&L), "Facility Operation with Higher Fuel Enrichment - Shearon Harris Nuclear Plant, Unit 1", (TAC No. 67089), 8/3/88.

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ATTACHMENT I