



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

ENCLOSURE 2

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO. 130 TO FACILITY OPERATING LICENSE NO. DPR-79

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNIT 2

DOCKET NO. 50-328

1.0 INTRODUCTION

By letter dated January 12, 1990, the Tennessee Valley Authority (TVA or the licensee) submitted a request for changes to the Sequoyah Nuclear Plant, Units 1 and 2, Technical Specifications (TSs) which are needed for the use of VANTAGE 5 Hybrid (V5H) fuel assemblies for the Sequoyah, Units 1 and 2, reload core and future cores. The V5H fuel design evolved from the V5H Optimized Fuel Assembly (OFA) and Standard (STD) fuel assembly designs. The features of the V5H fuel assembly consist of reconstitutable or removable top nozzles, integral fuel burnable adsorbers, lower-pressure drop and snag-resistant grids, debris filter bottom nozzles (DFBNs), and the capability of achieving extended burnups. These features were previously reviewed and approved by NRC in its evaluation of the Westinghouse Electric Corporation topical report WCAP-10444-P-A, "Reference Core Report VANTAGE 5 Fuel Assembly," Addendum 2 (REF. 1).

In its letter, the licensee stated that the evaluations performed for this new fuel accomodate the effects from the following modifications that are planned for the Cycle 4 refueling outage in 1990 for each unit:

1. Resistance temperature detector bypass elimination,
2. Eagle 21 digital protection system,
3. Upper head injection removal,
4. Boron injection tank deactivation,
5. New steamline break protection, and
6. Reactor trip on steam flow/feed flow mismatch.

Unit 2 is currently in the Unit 2 Cycle 4 refueling outage and will be placing the new fuel in the core during this outage. The new fuel will be used in the Unit 2 Operating Cycle 5 once it has restarted from the refueling outage. Unit 1 shutdown for the Unit 1 Cycle 4 refueling outage in the spring of 1990. The V5H fuel was placed in the Unit 1 core in that outage. Unit 1 is currently in the Unit 1 Operating Cycle 5.

Therefore, as a result of this fuel upgrade for Unit 2, TVA proposed to modify the Unit 2 TSs for the following changes: (1) revise the TSs Bases for safety limits to refer to the WRB-1 correlation and to the associated safety analysis limit for departure from nucleate boiling ratio (DNBR); (2) revise TS 3.1.3.4 to incorporate a new rod drop time of less than or equal to 2.7 seconds; (3) revise TS 3.2.3 to delete the rod bow penalty as a function of burnup in the FNH (Nuclear Enthalpy Hot Channel Factor) equation and delete Figures 3.2-3 and 3.2-4; (4) revise Table 3.2-1 and TS 3.2.5 to define the reactor coolant system (RCS) total flow rate limit, including uncertainties, to be 378,400 gallons per minute (gpm) for the departure from nucleate boiling (DNB) parameters and add surveillance requirements for RCS total flow rate; and (5) revise the Bases for TSs 3.2.3, 3.2.5, and 3.4.1. The titles in the index of the TSs for the following sections would also be revised: Section 3/4.2.3, Bases Section 3/4.2.2 and Bases Section 3/4.2.3.

The licensee provided additional information concerning the fuel criteria used for the locked rotor analysis for the V5H fuel in its letter dated April 13, 1990. This information does not change the substance of the proposed action published in the Federal Register (55 FR 4281) on February 7, 1990 and does not affect the staff's initial determination of no significant hazards consideration in that notice.

The proposed changes for the Unit 1 TSs were issued in the staff's letter dated May 8, 1990 during the Unit 1 Cycle 4 refueling outage.

2.0 EVALUATION

During the staff's review of the VANTAGE 5 fuel design in WCAP-10444-P-A, the staff identified a few conditions to be resolved for licensees who proposed using the VANTAGE 5 fuel design. Since the V5H fuel design adopts some features from the VANTAGE 5 fuel design, the staff's evaluation will address those conditions listed in the Safety Evaluation (SER) (Ref. 1) for WCAP-10444-P-A which could affect Sequoyah's V5H fuel. These conditions are the following:

(1) Statistical Convolution Method

In the SER on WCAP-10444, the staff stated that the statistical convolution method should not be used in the VANTAGE 5 fuel for evaluating the fuel rod shoulder gap. The licensee stated that the statistical convolution method was not used for the V5H fuel design for Sequoyah and the currently NRC approved method was used for evaluating the fuel rod shoulder gap. Therefore, the staff concludes that this is acceptable and the licensee has met this condition.

(2) Irradiation Demonstration Program

In the SER on WCAP-10444, the staff required that an irradiation program be performed to confirm the VANTAGE 5 fuel performance. The licensee stated that there were numerous demonstration programs involving OFA fuel assemblies containing Zircaloy grids irradiated in 14x14, 15x15, and 17x17 fuel assembly array cores. Sequoyah has a 17x17 array core. The satisfactory performance of these demonstration assemblies resulted in OFA with Zircaloy grids reload

applications in many Westinghouse reactors. The OFA fuel assemblies with Zircaloy grids cover the V5H fuel design features for Sequoyah; therefore, the staff concludes that the V5H fuel assemblies should perform satisfactorily in Sequoyah and the licensee has met this condition.

(3) Improved Thermal Design Procedure (ITDP)

In the SER on WCAP-10444, the staff stated that those restrictions in approving the use of Westinghouse improved thermal design procedure (ITDP) should be applied to the VANTAGE 5 fuel design. The licensee stated that they conform to these restrictions of ITDP for Sequoyah. The staff, therefore, concludes that this is acceptable and the licensee has met this condition.

(4) DNBR Limit

In the SER on WCAP-10444, the staff stated that a plant-specific analysis should be performed to show that the DNBR limit is not violated with the higher value of FNH. The licensee stated that the V5H fuel for Sequoyah does not employ higher values of FNH, thus no reanalysis of DNBR transients is needed. The staff, therefore, concludes that this condition is satisfied for V5H fuel at Sequoyah and the licensee has met this condition.

(5) Positive Moderator Temperature Coefficient (MTC)

In the SER on WCAP-10444, the staff stated that if a positive moderator temperature coefficient (MTC) is intended, the same positive MTC should be used in the plant-specific analysis. The licensee stated that no positive MTC was considered for Sequoyah. The staff, therefore, concludes that this condition is satisfied for V5H fuel at Sequoyah.

(6) Reactor Coolant Pump Shaft Seizure

In the SER on WCAP-10444, the staff stated that the mechanistic approach (2700°F peak clad temperature) in determining the fraction of fuel failures during the reactor coolant pump seizure accident was unacceptable and the fuel failure criterion should be the 95/95 DNBR limit. The licensee reanalyzed the reactor coolant pump shaft (locked rotor) accident based on a failure criterion of 95/95 DNBR limit for V5H fuel. The licensee concluded that the fuel rod failure rate is less than 10% of the total rods in the core, which is bounded in the FSAR analysis. The staff, therefore, concludes that the reactor coolant pump shaft seizure accident is adequately addressed for V5H fuel at Sequoyah.

2.2 Technical Specification Changes

The proposed TS changes are related to the use of the V5H fuel at Sequoyah, a new DNBR correlation, and a new rod bow penalty methodology. The proposed changes are evaluated below:

(1) TS Bases Section 2.1.1, Pages B2-1, B2-3, and B2-5 for Units 1 and 2

The old W-3 DNBR correlation is changed to the WRB-1 correlation for standard and V5H fuel designs. This DNBR correlation has been approved by the staff for use in licensing applications. The staff concludes that these changes are acceptable.

(2) TS Bases Section 3/4.2.5

The phrase "a minimum DNBR of 1.30" is changed to "a minimum DNBR greater than or equal to the safety analysis DNBR limit" because there is only one DNBR correlation intended for two different fuel designs. The staff concludes that this change is acceptable.

(3) TS Section 3.1.3.4

The rod drop time is revised to be less than or equal to 2.7 seconds due to the use of the V5H fuel. The increased rod drop time is due to the reduced guide tube diameter for the V5H fuel grids and the resulting increased dash pot effect. The licensee has taken into account the effect of the increased rod drop time in the safety analyses. The staff concludes that this change is acceptable.

(4) TS Section 3/4.2.3, and TS Bases Sections 3/4.2.2 and 3/4.2.3

The rod bow penalty is revised to incorporate a new methodology which reduces the rod bow penalty. The Figures 3.2-3 and 3.2-4 are being deleted. New statistical methods have been developed by Westinghouse that verify that the past treatment of rod bow penalty provided an overestimation of the affects on DNB. Application of the new methods to Sequoyah for the standard and the V5H fuel has verified the reduction in rod bow penalty. The reduction allows for accomodation of the entire penalty in the establishment of the DNBR safety limit. The licensee has demonstrated that the use of new DNBR correlations has enough margin to offset the rod bow penalty at burnups greater than 24,000 MWD/MTU. The staff concludes that the proposed reduced rod bow penalty is acceptable for Unit 2.

(6) TS Section 3/4.2.5

These proposed changes are to include the reactor coolant system (RCS) total flow rate in the list of DNB parameters. The RCS flow limit and its associated surveillance requirements have been moved from TS 3/4.2.3 to TS 3/4.2.5, DNB parameters, which now establishes a minimum allowable RCS flow to prevent violation of the DNB safety limit during normal operation and accident conditions. The minimum limit of 378,400 gpm was established for this flow. The staff concludes that these changes are acceptable for Unit 2.

2.3 Conclusion

The staff has evaluated the licensee's submittal on the V5H fuel design and the proposed TS changes for Sequoyah Units 1 and 2 transition cores and all future V5H cores. Based on the NRC approved generic topical report WCAP-10444-P-A and the plant-specific Sequoyah analyses discussed above, the staff concludes that the use of V5H fuel at Sequoyah and the proposed TS changes for Sequoyah Unit 2 are acceptable. The proposed TS changes for Unit 1 were issued in the staff's letter dated May 8, 1990.

The transition cores are the cores starting from the reload core for the Operating Cycle 5 until all the fuel in the core are the V5H fuel. Unit 2 is currently in the Unit 2 Cycle 4 refueling outage preparing for the Unit 2 Operating Cycle 5.

3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change to a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes to the surveillance requirements. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

4.0 CONCLUSION

The Commission made a proposed determination that the amendment involves no significant hazards consideration which was published in the Federal Register (55 FR 4281) on February 7, 1990, and consulted with the State of Tennessee. No public comments were received and the State of Tennessee did not have any comments.

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

5.0 REFERENCE

- 1.0 Letter from C. Thomas (NRC) to E.P. Rahe (Westinghouse Electric Corporation), Subject: "Acceptance For Referencing of Licensing Topical Report WCAP-10444, VANTAGE 5 Fuel Assembly" dated July 18, 1985.

Principal Contributor: S. Wu

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