TVA

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APR 2 1 1995

U.S. Nuclear Regulatory Commission
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Gentlemen:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

WATTS BAR NUCLEAR PLANT (WBN) - SPENT FUEL STORAGE RACKS

This letter describes several issues affecting the spent fuel storage racks at WBN and how TVA is addressing these issues so that the existing racks can be used for interim storage of irradiated fuel after WBN Unit 1 begins operation. The information in this letter is intended to resolve Inspector Followup Item 390/94-89-01 from Inspection Report Nos. 50-390/94-89 and 50-391/94-89, dated February 14, 1995.

Section 9.1.2 of the Final Safety Analysis Report (FSAR) describes the spent fuel storage racks that are currently installed at WBN. Originally, the racks were intended to provide storage for up to 1312 fuel assemblies. However, several issues have been identified which TVA intends to resolve on an interim basis by restricting the amount and location of fuel storage within the racks. The principal issues affecting WBN's current spent fuel storage racks include:

- The usable capacity of each rack module is limited to 80% based on an updated seismic analysis of the racks. This revised seismic analysis considered various fabrication deficiencies related to welding that were discovered after installation of the racks.
- Industry experience with Boraflex, which is used as a neutron poison in the cell walls of the racks, indicates the likelihood that Boraflex will degrade due to the effects of irradiation and thermal aging after spent fuel assemblies are placed in the racks. NRC Information Notices 87-43 and 93-70 describe the industry problems associated with Boraflex.

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- The results of preoperational testing for verticality, drag, and levelness determined that several cell locations are unusable or restricted.

In response to these issues, TVA evaluated the adequacy of the existing spent fuel storage racks for long-term storage of irradiated fuel assemblies. The evaluation determined that it is possible to ensure conservative criticality and seismic margins for spent fuel storage by restricting the placement of fuel assemblies in the existing racks. Accordingly, TVA imposed administrative restrictions to prevent placing fuel assemblies in two of the four perimeter rows for each rack module and in the individual cells which failed preoperational testing. These restrictions are in effect at this time to compensate for the fabrication problems that imposed a seismic limitation on the racks. After fuel load of WBN Unit 1 whenever irradiated fuel storage becomes necessary, TVA has imposed additional restrictions of not placing assemblies in face-adjacent cells (i.e., fuel is stored in a checkerboard pattern) and in any of the cells along the perimeter of the spent fuel pool. These additional restrictions are a very conservative means of addressing the potential degradation of Boraflex in the racks. With fuel stored in a checkerboard pattern, the criticality limit of $K_{eff} \leq 0.95$ is achieved without taking credit for the neutron poison in the Boraflex. In the future when Boraflex surveillance data and additional industry experience is available, TVA expects to be able to justify relaxing the checkerboarding restriction on irradiated fuel storage.

Enclosure 1 shows proposed changes to FSAR Sections 3.1.2.6, 4.3, 9.1.2, and 15.4. The changes incorporate the above information concerning the restrictions that TVA is imposing to support the continued use of WBN's existing spent fuel storage racks.

In a letter dated December 28, 1981, TVA summarized its methods of complying with various regulations including 10 CFR 50, Appendix A, General Design Criterion (GDC) 62, "Prevention of Criticality in Fuel Storage and Handling." Based on the spent fuel rack restrictions described above, TVA has modified WBN's method for complying with GDC 62. Therefore, the information concerning GDC 62 that was submitted on pages 34 and 35 of the enclosure to the letter dated December 28, 1981, is no longer valid. This information stated:

> "As noted in Section 3.1.2.6, the restraints and interlocks provided for safe handling and storage of new or spent fuel are discussed in Section 9.1. The center-to-center distance between the adjacent spent fuel assemblies is sufficient to ensure subcriticality, even if unborated water is used to fill the spent fuel storage pool. The design of the spent fuel storage rack assembly is such that it is impossible to insert the spent fuel assemblies in other than prescribed locations, thereby preventing any possibility of accidental

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> criticality. Layout of the fuel handling area is such that the spent fuel casks will never be required to traverse the spent fuel storage pool during removal of the spent fuel assemblies."

The above wording is now replaced by the following:

> "The restraints and interlocks provided for safe handling and storage of new or spent fuel are discussed in FSAR Section 9.1. The distance between adjacent spent fuel assemblies is maintained to ensure subcriticality, even if unborated water is used to fill the spent fuel storage pool. Layout of the fuel handling area is such that the spent fuel casks will never be required to traverse the spent fuel storage pool during removal of the spent fuel assemblies."

The stated design basis of ensuring subcriticality for stored fuel even with unborated water requires clarification. During fuel handling, ≥2000 ppm boron is maintained in the spent fuel pool water to ensure $K_{eff} \leq 0.95$ for the worst-case fuel assembly geometry that could result from a postulated fuel handling accident. At the completion of fuel handling operations and after verifying that stored assemblies are in their correct locations, fuel assembly spacing alone, without any credit for boron in the spent fuel pool water, is sufficient to ensure $K_{eff} \leq 0.95$. TVA proposes a revision to WBN's Draft Technical Specifications (TS) to address this restriction. Enclosure 2 shows TVA's proposed changes to TS Sections 3.9.9 and 4.3.

TVA is investigating the option of replacing WBN's existing spent fuel storage racks with racks removed from Sequoyah Nuclear Plant (SQN). These SQN racks do not contain Boraflex and provide fuel storage capacity approximately equal to the original design capacity of WBN's existing racks. The racks were in use at SQN for a number of years and are being made available for use at WBN following the installation at SQN of newer racks that provide increased storage capacity. However, if TVA decides to pursue the option of installing the SQN racks at WBN, they would have to be modified for use at WBN and analyzed for WBN-specific criticality and seismic conditions. For these reasons, TVA does not plan to take any action concerning the SQN racks until after licensing of WBN Unit 1. Therefore, the existing racks remain the licensing basis for WBN, subject to the restrictions described above.

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If you have any questions about the information provided in this letter, please telephone John Vorees at (615) 365-8819.

Sincerely,

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ENCLOSURE 1

FSAR PAGE MARKUPS

UPDATING THE DESCRIPTION OF WBN'S

SPENT FUEL STORAGE RACKS

3. Individual components which contain significant radioactivity are located in confined areas which are adequately ventilated through appropriate filtering systems.

4. The spent fuel cooling systems provide cooling to remove residual heat from the fuel stored in the spent fuel pool. The system is designed for testability to permit continued heat removal.

5. The spent fuel pool is designed such that no postulated accident could cause excessive loss of coolant inventory.

Radioactive waste treatment systems are located in the Auxiliary Building, which contains or confines leakage under normal and accident conditions.

The auxiliary building gas treatment system includes charcoal filtration which minimizes radioactive material release associated within a postulated spent fuel handling accident.

Fuel storage and handling is discussed in Section 9.1, and radioactive waste management in Chapter 11.

Criterion 62 - Prevention of Criticality in Fuel Storage and Handling

Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations.

Compliance

The restraints and interlocks provided for safe handling and storage of new or spent fuel are discussed in Section 9.1.

The ~~center-to-center~~ distance between ~~the~~ adjacent spent fuel assemblies is maintained ~~sufficient~~ to ensure sub-criticality, even if unborated water is used to fill the spent fuel storage pool.

~~The design of the spent fuel storage rack assembly is such that it is impossible to insert the spent fuel assemblies in other than prescribed locations, thereby preventing any possibility of accidental criticality.~~

Layout of the fuel handling area is such that the spent fuel casks will never be required to traverse the spent fuel storage pool during removal of the spent fuel assemblies.

Under normal conditions, the fresh fuel racks are maintained in a dry environment. The introduction of water into the fresh fuel rack area is the worst case accident scenario. The full density and low density optimum moderation cases are bounding accident situations which result in the most conservative fuel rack K_{eff}.

Other accidents can be postulated which would cause some reactivity increase (i. e., dropping a fuel assembly between the rack and wall or on top of the rack). For these other accident conditions, the double contingency principle of ANSI N16.1-1975 is applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these other accident conditions, the absence of a moderator in the fresh fuel storage racks can be assumed as a realistic initial condition since assuming its presence would be a second unlikely event. The maximum reactivity increase for these kinds of postulated accidents is less than 10% delta-K/K, and since the normal, dry fresh fuel rack reactivity is less than 0.70, these postulated accidents will not result in a K_{eff} which is more limiting than the analyzed worst case accident scenarios of full density and optimum moderation water flooding.

Thus, using the method described above, the maximum K_{eff} was determined to be less than 0.95, which meets the criteria stated in Section 4.3.1.5.

Spent Fuel Storage - Wet

The criticality analysis for the high density fuel racks was performed by Pickard, Lowe, and Garrick, Inc. using analytical techniques similar to those used for the licensing of spent fuel racks at other plants, the most recent being Point Beach. LEOPARD and PDQ-7 calculational accuracies were verified by means of benchmark comparisons with critical assembly experiments, and use conservative techniques for the determination of the infinite multiplication factor.

NRC Information Notice 92-21 alerted utilities of possible non-conservatism in reactivity calculations performed by Pickard, Lowe, and Garrick (PLG) using the two-dimensional diffusion theory code PDQ. The non-conservatism is attributed to inaccuracies inherent in using diffusion theory to predict the attenuation of a strong neutron absorber. As a result of NRC Information Notice 92-21, the PLG analysis described below was evaluated using Monte Carlo methods described above and demonstrated to have sufficient margin to be acceptable[40].

[INSERT 4.3.2.7-A]

In the analysis for the storage facilities, the fuel assemblies are assumed to be in their most reactive condition, namely fresh or undepleted and with no control rods or removable neutron absorbers present. Assemblies can not be closer together than the design separation provided by the storage facility except in special cases such as in fuel shipping containers where analyses are carried out to establish the acceptability of the design. The mechanical integrity of the fuel assembly is assumed.

[INSERT 4.3.2.7 - A]

NRC Information Notices 87-43 and 93-70 indicated significant uncertainties with Boraflex (neutron absorber) behavior during storage of irradiated fuel. Boraflex surveillance data will be necessary to provide evidence of the rate of neutron absorber degradation. However, due to indicated uncertainty in Boraflex degradation, temporary storage restrictions (after storage of irradiated fuel) will be placed on the spent fuel pool until the surveillance data is available. The temporary restrictions will preclude storage of fuel in fuel pool peripheral storage cells and will assure fuel is stored in a fuel/water checkerboard pattern (i.e., no face adjacent fuel) in the pool interior storage cells. Adjustments to the storage restrictions may be made following Boraflex surveillance evaluation. Evaluation of potential criticality impacts due to the storage restrictions (assuming 100% loss of Boraflex) was performed as an extension of the IN 92-21 evaluation described above.[40] This evaluation demonstrates that the administrative restrictions are sufficient to ensure spent fuel rack $K_{eff} \leq 0.95$ with 3.5 w/o fuel and 100% loss of Boraflex assuming storage or accident conditions.

A summary of the perturbations to the basic cell reactivity calculations is shown in Table 4.3-16. The conservatively calculated reactivity of the spent fuel pool fully loaded with unirradiated bundles with 3.5 weight percent U-235 and no burnable poison is 0.9229 for a pool temperature of 68°F for the most pessimistic manufacturing conditions and including calculational uncertainties. In addition, there are a number of conservative assumptions in the calculations such that the maximum reactivity is less than 0.9229.

Accident Analysis

The reactivity impact of a dropped fuel bundle landing on top of the fuel racks was analysed. ~~The fuel racks are designed to prevent a dropped fuel bundle from penetrating and occupying a position other than a normal fuel storage location.~~ The only positive effect of such a bundle on the reactivity of the rack would be by virtue of a reduction in axial neutron leakage from the rack. Since the calculations reported here show the total axial neutron leakage effect to be less than 0.002 Δk, a dropped fuel bundle would not have any significant effect on the reported maximum possible reactivity of the spent fuel storage rack.

The reactivity effect of a fresh fuel assembly located adjacent to the fully loaded spent fuel storage rack has been evaluated for all postulated locations other than normal fuel storage locations. The spent fuel storage rack design and restrictions assure~~s~~ that the multiplication factor is ~~significantly~~ less than 0.95.

4.3.2.8 Stability

4.3.2.8.1 Introduction

The stability of the PWR cores against xenon-induced spatial oscillations and the control of such transients are discussed extensively in references [6], [12], [13], and [14]. A summary of these reports is given in the following discussion and the design bases are given in Section 4.3.1.7.

In a large reactor core, xenon-induced oscillations can take place with no corresponding change in the total power of the core. The oscillation may be caused by a power shift in the core which occurs rapidly by comparison with the xenon-iodine time constants. Such a power shift occurs in the axial direction when a plant load change is made by control rod motion and results in a change in the moderator density and fuel temperature distributions. Such a power shift could occur in the diametral plane of the core as a result of abnormal control action.

Due to the negative power coefficient of reactivity, PWR cores are inherently stable to oscillations in total power. Protection against total power instabilities is provided by the Reactor Control System as described in Section 7.7. Hence, the discussion on the core stability is limited here to xenon-induced spatial oscillations.

38. Liu, Y. S., et al., "ANC: A Westinghouse Advanced Nodal Code," WCAP-10965-P-A (Westinghouse Proprietary), December 1985.

39. Nguyen, T. Q., et al., "Qualification of the PHOENIX-P/ANC Nuclear Design System for Pressurized Water Reactor Cores," WCAP-11596, November 1987.

40. Martin, Z. I., "WBN Spent Fuel Storage Rack Criticality Analysis - Recaged Cycle 1 Fuel Reactivity Margin," Revision 1, April 1993 (RIMS No. L36 930331 800), and Revision 2, March 28, 1995 (RIMS No. L36 950328 801).

The new fuel assemblies are stored dry, the 21 inch center to center spacing ensuring an ever safe geometric array. Under these conditions, a criticality accident during refueling and storage is not considered credible.

Design of the storage racks is in accordance with Regulatory Guide 1.13 and 1.29 and ensures adequate safety under normal and postulated accidents.

Consideration of criticality safety analysis is discussed in Section 4.3.2.7.

9.1.2 SPENT FUEL STORAGE

9.1.2.1 Design Bases

The spent fuel racks are designed in accordance with the following listed criteria:

replace with INSERT

1. ~~The spent fuel storage space is to provide storage for 1312 fuel assemblies as shown in Figures 9.1-15 and 9.1-16.~~ The design meets all the structural and seismic requirements of Category I equipment as defined by the NRC Position Paper dated April 14, 1978, on spent fuel storage and handling applications and the codes listed in Table 9.1-3.

2. The fuel array in the ~~fully loaded~~ spent fuel racks is maintained such that $K_{eff} \leq .95$ assuming the array is fully flooded with nonborated water, the fuel is new with an enrichment of 3.5 weight percent U-235 or less, and the geometric array is the worst possible considering mechanical tolerances and abnormal conditions.

~~3. The spent fuel storage racks are designed such that no fuel assembly can be placed within the rack array in other than a design storage location.~~

3. ~~4.~~ The spent fuel storage facility is designed to prevent severe natural phenomena, including missiles generated from high winds, from causing damage to the spent fuel. The spent fuel storage facility, including the spent fuel racks, is Seismic Category I.

4. ~~5.~~ The spent fuel storage racks are designed to withstand handling and normal operating loads and the maximum uplift forces generated by the fuel handling equipment.

5. ~~6.~~ A loss of pool cooling accident is not considered a credible accident because the pool cooling system is Seismic Category I and single failure proof.

6. ~~7.~~ The spent fuel storage racks are designed to withstand the impact of a dropped spent fuel assembly from the maximum lift height of the spent fuel pit bridge hoist.

7. ~~8.~~ The spent fuel storage facilities provide the capability for limiting the potential offsite exposures, in the event of significant release of radioactivity from the stored fuel, to less than 10 CFR 100 guidelines.

INSERT TO FSAR 9.1.2.1

The spent fuel storage racks were designed for storage of 1312 fuel assemblies as shown in Figures 9.1-15 and 9.1-16. However, due to fabrication deficiencies and a potential degradation of the neutron absorber contained within the rack structural assembly, the total storage positions have been administratively reduced to 484 locations.

9.1.2.2 Facilities Description

The spent fuel storage pool is a reinforced concrete structure with a stainless steel liner for leak tightness. This storage pool is a part of the Seismic Category I Auxiliary Building, and is shared between units one and two. Both the liner and pool walls are designed to withstand the effects of an OBE and SSE. The location of the spent fuel storage pool is shown on Figures 1.2-3 and 1.2-8. The spent fuel storage rack design is shown on Figure 9.1-16.

The spent fuel storage pool opens onto the elevation 757 floor, and is protected by a guard rail which surrounds the pool. The depth of the pool is sufficient to allow some 26 feet of water shielding (nominally) above the spent fuel. This water depth ensures that the doses from spent fuel on the operating floor are negligibly small.

The spent fuel storage racks consist of stainless steel structures with receptacles for nuclear fuel assemblies as they are used in a reactor, receptacles for neutron poison ~~assemblies, and a supporting structure~~ (Figures 9.1-15 and 9.1-16). Space for storage of 1312 fuel assemblies is provided in 16 modular structures, 12 of which may contain up to 80 assemblies and 4 of which may contain up to 88 assemblies. The basic rack structure is formed of square stainless steel tubes approximately 10.75 inches on a side by .093-inch wall by ~~15~~ 14 feet long. Each box interior is divided into one fuel space and two poison spaces by a pair of channel sections welded to two adjacent box sides. The center-to-center spacing of the ~~stored~~ fuel cells is 10.75 inches. At the bottom of the box a 0.5 inch thick bottom plate is welded. The rack module assembly is composed by welding these boxes into a close-packed array. ← INSERT

9.1.2.3 Safety Evaluation

Design of these storage racks is in accordance with Regulatory Guide 1.13 and ensures a safe condition under normal and postulated accident conditions. The ~~center-to-center~~ distance ~~of 10.75 inches~~ between ~~the adjacent~~ spent fuel assemblies is maintained ~~is sufficient~~ to ensure a $K_{eff} \leq 0.95$ even if unborated water is used to fill the spent fuel storage pool. ~~The design of the spent fuel storage rack assembly is such that it is impossible to insert the spent fuel assemblies in other than prescribed locations, thereby preventing any possibility of accidental criticality.~~ Consideration of criticality safety analysis including potential degradation of Boraflex is discussed in Section 4.3.2.7.

The initial seismic design of the fuel racks ~~and supporting structures are designed for~~ considered fully loaded spent fuel racks in water less than boiling temperature undergoing a safe shutdown earthquake (SSE). All affected rack components are sized and stress-analyzed for the above conditions. The racks and rack components were also checked for all normal operating conditions and 1/2 SSE loads, and were found to be satisfactory. See Section 3.8.4. ← INSERT

The racks can withstand the drop of a fuel assembly from its maximum supported height and the drop of tools used in the pool. Electrical and mechanical stops prevent the movement of heavy objects over the spent fuel pool including

INSERT TO 9.1.2.2

The spent fuel racks were designed for storage of 1312 fuel assemblies in 16 modular structures, 12 of which were designed to contain up to 80 assemblies, and 4 of which were designed to contain up to 88 assemblies. Due to spent fuel rack fabrication deficiencies, the total storage positions for fuel assemblies were reduced to 1022 locations. Additionally, based on a potential degradation of the neutron absorber "Boraflex," the total number of useable spent fuel assembly storage locations was further reduced to 484 positions.

INSERT TO 9.1.2.3

Due to weld deficiencies at the pedestal stiffeners, the spent fuel storage racks are individually limited to a maximum of 80% of the initial designed capacity. Thus, the 88 cell racks are limited to 70 total fuel assemblies, and the 80 cell racks are limited to 64 total assemblies of new or spent fuel. (Reference 44). This limitation is within the 1022 allowable storage positions addressed in Section 9.1.2.2.

the shipping casks. The movement of the casks is restricted to areas away from the pool and the cask loading area. The wall which separates the fuel storage area from the cask loading area has been designed to restrict damage to the cask loading area if a cask were dropped even in a tipped position in the cask loading area.

Loss of pool cooling and pool water events are discussed in Section 9.1.3. Radiation sources and protection for the pool water are discussed in Sections 12.2.1 and 12.3.2.2. Although the number of stored fuel assemblies is increased, the capacity of the pool water cleanup system is adequate to maintain radionuclide concentrations within design limits. Therefore no increase in personnel exposures is expected.

9.1.2.4 Materials

The materials used in the construction of the spent fuel racks are 304 stainless and Inconel 718. The neutron poison material is a commercial product known as Boreflex and contains B_4C powder in a matrix.

Each poison assembly compartment contains a neutron poison assembly consisting of two stainless steel covered Boraflex sheets (0.1 inches thick Boraflex and 0.03 inches thick[a] stainless steel) separated by a one inch neutron flux trap. The overall dimensions of the neutron poison assembly are 1.43 inches thick x 8.71 inches wide x 147 inches long. The top of the poison assembly is attached to an adapter support in the form of a lead-in guide for the adjacent fuel assembly compartments to which it is locked. Alpha-numeric location designations are formed on the appropriate sloped surfaces of the lead-in guides for aid in positioning the fuel assemblies into the proper adjacent fuel compartments. Industry experience has indicated that Boraflex undergoes degradation with significant irradiation. Consideration of criticality issues related to Boraflex degradation is discussed in section 4.3.2.7. The rack support pedestals are welded to special bottom plates in each corner of the rack. These pedestals transmit vertical support loads as well as horizontal shear loads due to a seismic event. Holes in the pedestal bottom plates engage pins which extend upward from the floor embedments to transmit these horizontal loads to the floor. These pins are mounted in ball joint assemblies to accommodate small angular misalignments between rack pedestals and embedments.

9.1.3 Spent Fuel Pool Cooling and Cleanup System (SFPCCS)

The SFPCCS is designed to remove from the spent fuel pool water the decay heat generated by stored spent fuel assemblies. Additional functions of the SFPCCS are to clarify and purify the water in the spent fuel pool, transfer canal, and refueling water storage tanks. If a warning of flood above plant grade is received when one or both reactor vessels are open or vented to the containment atmosphere, the SFPCCS will be modified as indicated in Section 2.4.14 to accomplish cooling the reactor core(s).

9.1.3.1 Design Bases

SFPCCS design parameters are given in Table 9.1-1.

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[a].030" is nominal dimension, .035" is maximum used in criticality worst case analyses.

was conservatively calculated assuming that DNB occurs at the initiation of the transient. The results of these calculations (peak pressure, peak clad temperature, and zirconium-steam reaction) are also summarized in Table 15.4-10.

15.4.4.3 Conclusions

1. Since the peak reactor coolant system pressure reached during any of the transients is less than that which cause stresses to exceed the faulted condition stress limits, the integrity of the primary coolant system is not endangered.

2. Since the peak clad surface temperature calculated for the hot spot during the worst transient remains considerably less than 2700°F, and the amount of zirconium-water reaction is small, the core will remain in place and intact with no consequential loss of core cooling capability.

15.4.5 Fuel Handling Accident

15.4.5.1 Identification of Causes and Accident Description

The accident is defined as dropping of a spent fuel assembly onto the fuel storage area floor resulting in the rupture of the cladding of all the fuel rods in the assembly despite many administrative controls and physical limitations imposed on fuel handling operations. Dropping a fuel assembly in the spent fuel pool has been analyzed and will not result in criticality (reference 43).

15.4.5.2 Analysis of Effects and Consequences

For the analyses and consequences of the postulated fuel handling accident, refer to Section 15.5.6.

15.4.6 Rupture of a Control Rod Drive Mechanism Housing (Rod Cluster Control Assembly Ejection)

15.4.6.1 Identification of Causes and Accident Description

This accident is defined as the mechanical failure of a control rod mechanism pressure housing resulting in the ejection of a rod cluster control assembly (RCCA) and drive shaft. The consequence of this mechanical failure is a rapid positive reactivity insertion together with an adverse core power distribution, possibly leading to localized fuel rod damage.

15.4.6.1.1 Design Precautions and Protection

Certain features in Westinghouse Pressurized Water Reactors are intended to preclude the possibility of a rod ejection accident, or to limit the consequences if the accident were to occur. These include a sound, conservative mechanical design of the rod housings, together with a thorough quality control (testing) program during assembly, and a nuclear design which lessens the potential ejection worth of RCCAs and minimizes the number of assemblies inserted at high power levels.

35. U.S. Nuclear Regulatory Commission, Code Federal Regulations - Energy 10, Chapter 1, Part 50, Section 50.46(c), "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors."

36. Westinghouse Emergency Core Cooling System Plant Sensitivity Studies," WCAP-8340 (Proprietary), July 1974.

37. Devault, R. M., Smith, J. D., and Studer, P. G., "MONSTER - A Multi-Compartment Containment System Analysis Program User Manual," System I.D. 262303, March 1993.

38. Monahan, J. S., and White, D. W., "LOFTTR2 Analysis for a Steam Generator Tube Rupture for Watts Bar Nuclear Plant Units 1 and 2," WCAP-13575, Revision 1 (Proprietary), and WCAP-13576, Revision 1 (Non-Proprietary), October 1993.

39. Letter from Walsh, L. A., Westinghouse Owners Group, to Jones, R. C., U.S. Nuclear Regulatory Commission, "Steam Generator Tube Uncovery Issue," OG-92-25, March 1992.

40. "Report on the Methodology for the Resolution of the Steam Generator Tube Uncovery Issue," WCAP-13247 (Proprietary), March 1992.

41. Letter from Jones, R. C., U.S. Nuclear Regulatory Commission, to Walsh, L. A., Westinghouse Owners Group, "Steam Generator Tube Uncovery Issue," March 10, 1993.

42. Watts Bar "Design Basis Events Design Criteria", Document WB-DC-40-64.

43. "Criticality Analysis For The Watts Bar Nuclear Plant Spent Fuel Storage Racks" transmitted by Wachter Associates Inc. letter TVA-T-51 dated May 5, 1978 (B41 871005 043).

44. TVA Calculation WCG-1-1367 (R1) "Spent Fuel Storage Rack Pedestal Weld Evaluation for New Fuel Load" (B26 950308 402)