



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 14, 2015

Mr. Joseph W. Shea
Corporate Vice President, Nuclear Licensing
Tennessee Valley Authority
6A Lookout Place
1101 Market Street, LP 3R-C
Chattanooga TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 – SUPPLEMENTAL INFORMATION
NEEDED FOR ACCEPTANCE OF REQUESTED LICENSING ACTION
REGARDING APPLICATION TO INCREASE TRITIUM PRODUCING
BURNABLE ABSORBER RODS (TAC NO. MF6050)

Dear Mr. Shea:

By letter dated March 31, 2015, Tennessee Valley Authority (TVA) submitted a license amendment request for Watts Bar Nuclear Plant, Unit 1 (Agencywide Documents Access and Management System Accession Number ML15098A446). The proposed amendment request would revise Technical Specification (TS) 4.2.1, "Fuel Assemblies"; TS 3.5.1 "Accumulators"; Surveillance Requirement (SR) 3.5.1.4; TS 3.5.4, "Refueling Water Storage Tank"; and SR 3.5.4.3, to increase the maximum number of tritium producing burnable absorber rods and to delete outdated information related to the tritium production program. The purpose of this letter is to provide the results of the U.S. Nuclear Regulatory Commission (NRC) staff's acceptance review of this amendment request. The acceptance review was performed to determine if there is sufficient technical information in scope and depth to allow the NRC staff to complete its detailed technical review. The acceptance review is also intended to identify whether the application has any readily apparent information insufficiencies in its characterization of the regulatory requirements or the licensing basis of the plant.

Consistent with Section 50.90 of Title 10 of the *Code of Federal Regulations* (10 CFR), an amendment to the license (including the TSSs) must fully describe the changes requested, and following, as far as applicable, the form prescribed for original applications. Section 50.34 of 10 CFR addresses the content of technical information required. This section stipulates that the submittal address the design and operating characteristics, unusual or novel design features, and principal safety considerations.

The NRC staff has reviewed your application and concluded that the information delineated in Enclosures 1, 2, and 3 to this letter is necessary to enable the staff to make an independent assessment regarding the acceptability of the proposed amendment in terms of regulatory requirements and the protection of public health and safety and the environment.

In order to make the application complete, the NRC staff requests that TVA supplement the application to address the information described in the enclosures. This will enable the NRC staff to complete its detailed technical review. If information responsive to the NRC staff's request is not received in a timely manner, the application will not be accepted for review pursuant to 10 CFR 2.101, and the NRC staff will cease its review activities associated with the

J. Shea

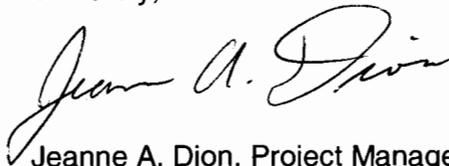
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application. If the application is subsequently accepted for review, you will be advised of any further information needed to support the NRC staff's detailed technical review by separate correspondence.

The information requested and associated timeframe in Enclosure 1 was discussed with Thomas Hess of your staff on April 29, 2015. The information requested and associated timeframe in Enclosures 2 and 3 were discussed with Thomas Hess of your staff on May 6, 2015.

If you have any questions, please contact me at (301) 415-1349 or jeanne.dion@nrc.gov.

Sincerely,

A handwritten signature in cursive script, appearing to read "Jeanne A. Dion".

Jeanne A. Dion, Project Manager
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosures:

1. Supplemental Information Related to Human Factors
2. Supplemental Information Related to Radiological Protection
3. Supplemental Information Related to Radiological Consequences

cc w/enclosures: Distribution via Listserv

SUPPLEMENTAL INFORMATION NEEDED FOR HUMAN FACTORS

LICENSE AMENDMENT TO INCREASE

TRITIUM PRODUCING BURNABLE ABSORBER RODS

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-390

Information needed by the U.S. Nuclear Regulatory Commission staff to begin its review of the Tennessee Valley Authority's (TVA) request to increase tritium producing burnable absorber rods related to human factors considerations is described below.

On page E1-8 of 18 of TVA's March 31, 2015, submittal, TVA states:

In order to eliminate this unborated dilution source and the associated manual actions, TVA will replace the containment isolation thermal relief check valves on the lower compartment supply lines to the containment for WBN [Watts Bar Nuclear Plant], Unit 1 Component Cooling Water System and Essential Raw Cooling Water (ERCW) System with simple relief valves.

- E1-1. Provide a list of the operator actions being eliminated, changed, or added in support of the license amendment request (LAR) (list the operator actions approved in Amendment No. 51 and indicate which ones are being eliminated or changed).
- E1-2. Provide a list of procedures that require revision in support of the LAR (number, title, and revision).
- E1-3. Provide a list of any training required to support of the LAR.
- E1-4. Identify any changes to the control room interface (displays, controls, alarms) resulting from this LAR.
- E1-5. Identify any changes to the simulator required to support the LAR.
- E1-6. Describe any required changes to the Safety Parameter Display System.

The information listed in this enclosure was discussed with Thomas Hess of your staff on April 29, 2015. A supplement addressing this information is expected by May 28, 2015.

SUPPLEMENTAL INFORMATION NEEDED FOR RADIOLOGICAL PROTECTION

LICENSE AMENDMENT TO INCREASE

TRITIUM PRODUCING BURNABLE ABSORBER RODS

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-390

Information needed by the U.S. Nuclear Regulatory Commission staff to begin its review of the Tennessee Valley Authority's (TVA, the licensee) request to increase tritium producing burnable absorber rods (TPBARs) related to radiological protection are described below.

The radiological considerations for production of tritium at Watts Bar Nuclear Plant, Unit 1 with 1,792 TPBARs irradiated per cycle, are provided in Enclosure 2 of the March 31, 2015, license amendment request (LAR), "Review of Radiological and Environmental Considerations for Production of Tritium at Watts Bar Nuclear Plant Unit 1 - 1,792 TPBAR Core." Consistent with the NUREG-0800 Standard Review Plan, TVA uses two source terms for the evaluations (i.e., a design basis source term and a realistic source term).

1. The design basis (DB) case assumes a maximum loading of 2,500 TPBARs in the core with a release rate of tritium (H-3) into the reactor coolant system (RCS) of 10 Ci/TPBARs/year. The design basis source term is used to evaluate the adequacy of the plant design features (e.g., radiation shielding, plant ventilation, and radwaste systems) to meet the occupational and public dose limits in 10 CFR [Title 10 of the *Code of Federal Regulations*] Part 20.
2. The realistic source term assumes a maximum loading of 1,900 TPBARs in the core with a release rate of H-3 to the RCS of 5 Ci/TPBARs/year. The realistic source term is used to demonstrate compliance with the offsite as low as reasonably achievable (ALARA) design objectives of 10 CFR Part 50, Appendix I.

In general, the proposed revisions to the source term and the associated radiological assessment are a significant departure from those contained in the Topical Report which formed the basis for the original TPBAR license amendment. TVA needs to identify those assumptions and evaluations contained in this LAR that depart from the Topical, and provide a clear basis for the acceptability of each departure.

The evaluation provided in LAR Enclosure 2 contains several inconsistencies and omissions that must be provided as a supplement before the staff can draw any conclusions as to the acceptability of the proposed amendment request in terms of regulatory requirements and the protection of public health and safety and the environment. The information needed related to radiological protection include the following:

E2-1. Impact on Occupational Radiation Dose

LAR Enclosure 2 does not completely evaluate the impact occupational radiation doses. Based on several unsupported conversion factors (100 tritium derived air concentration (DAC)-hours per micro-Curie (μCi)/gm of RCS, and $1 \mu\text{Ci}/\text{gm}$ in RCS = 0.08 DAC in containment), LAR Enclosure 2 (pages 23 and 24) calculates the expected average airborne H-3 levels in containment from operating at the DB assumptions, then calculates a corresponding minimal increase in containment dose rates and a moderate increase in annual collective occupational dose. However, as noted on page 23, the "primary radiological significance of exposure to tritium is in the form of internal exposure and a potential hazard arises when personnel are exposed to open processes that have been wetted with tritiated liquids." This assessment presented in Enclosure 2 does not evaluate the magnitude of this potential increased exposure pathway.

TVA needs to quantify the impact from the expected increase in RCS H-3 (resulting from operating at the DB conditions) on individual occupational radiation doses. In addition, TVA needs to provide a basis for the conversion factors used in this evaluation.

Pages E2-24 and E-25 of the LAR discuss Tritium Control Values that are provided in the Topical Report to control the "undesirable radiological conditions" that can result from the buildup of H-3 in the RCS. Presumably, the basis for this control level is the potential for occupational dose since the revised value (the previous $3 \mu\text{Ci}/\text{gm}$ increased to $14 \mu\text{Ci}/\text{gm}$) is based on the occupational Derived Airborne Concentration for H-3 in 10 CFR Part 20. However, the sixth paragraph on page E2-25 clearly states that the DB case (source term and assumptions) will not be able to meet this control level as revised. The estimated $29.8 \mu\text{Ci}/\text{gm}$ DB case exceeds the control level by more than a factor of 2.

The licensee needs to clarify the basis for this control value, how it is applied to plant operations, and how the proposed DB is still within the Topical Report.

E2-2. Impacts on Radioactive Waste Generation and Control

Enclosure 2, "Radwaste System Design Basis Operation" (page E2-24), does not address whether the radwaste system has sufficient capacity to effectively process the increased liquid input generated by the additional feed-and-bleed operations necessary to maintain the RCS H-3 concentrations below the tritium control level under DB conditions. The estimated DB case exceeds the control level by more than a factor of 2. TVA estimates the DB to result in H-3 concentrations of $29.8 \mu\text{Ci}/\text{gm}$ then states that if H-3 concentrations exceed the $14 \mu\text{Ci}/\text{gm}$ in the RCS, it will take further action to minimize the onsite and offsite radiological impacts of abnormal RCS tritium levels. Some examples of these actions include increased RCS feed and bleed operations. However, there is no indication of how effective these actions will be, nor the magnitude of the onsite and offsite radiological impacts that are expected to be attained. TVA needs to address this. In addition, "Solid Radioactive Waste" (page E2-27) does not address any increase in solid waste generated (e.g., expended ion exchange resins) from the increased liquid processing necessary to maintain RCS H-3 concentrations below the H-3 control level.

The licensee should provide this information or a basis for why no increase is expected.

E2-3. Impacts on Public Dose

Design Basis Source Term and 10 CFR Part 20 Compliance:

The fifth paragraph on page E2-24 indicates that the 14-fold increase in liquid and gaseous releases under the DB (26,889 Ci/year) continues to meet the 10 CFR Part 20 limits. No analytical evaluation results are provided to support these statements.

The licensee needs to provide an updated evaluation (similar to the corresponding safety analysis report tables) demonstrating that the increased DB effluent releases (liquid and gaseous) continue to meet 10 CFR Part 20 limits. This evaluation should include updated values for non-tritium isotopes, if the increased volume of radwaste discussed above reduces the efficiency of the radwaste processing.

Realistic Source Term and 10 CFR Part 50 Appendix I Compliance:

Enclosure 2, "Tritium Impacts on Public Dose" (page E2-26), does not describe the impact of the H-3 on public dose. Table 5 on page E2-27 provides the results of two sets of offsite dose calculations: those performed to support License Amendment No. 40, allowing 2,304 TPBARs, and those performed to support this LAR, performed at 1,900 TPBARs. There is no explanation provided to explain why a more than 400 percent increase in H-3 releases (from 2,304 Ci/year to 9,500 Ci/year) results in a lower dose to the whole body from gaseous and significantly lower doses to the whole body and maximum organ dose from liquid emissions. The increase in maximum organ dose from gaseous effluents appears to be the result of adding Carbon-14 to the source term.

The licensee should provide an evaluation indicating the offsite dose resulting from the increased release and a rationale, including a description of any changes to the calculation input parameters and assumptions, for the unexpected results in Table 5.

The information listed in this enclosure was discussed with Thomas Hess of your staff on May 6, 2015. A supplement addressing this information is expected by June 15, 2015.

SUPPLEMENTAL INFORMATION NEEDED FOR RADIOLOGICAL CONSEQUENCES

LICENSE AMENDMENT TO INCREASE

TRITIUM PRODUCING BURNABLE ABSORBER RODS

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNIT 1

DOCKET NO. 50-390

Information needed by the U.S. Nuclear Regulatory Commission (NRC) staff to begin its review of the Tennessee Valley Authority's (TVA, the licensee), license amendment request (LAR) to increase tritium producing burnable absorber rods (TPBARs) related to radiologic consequences is described below.

On page E2-29 of 33, "Radiological Consequences of Accidents," TVA describes that Watts Bar Nuclear Plant, Unit 1 License Amendment No. 40 (Agencywide Documents Access and Management System Accession No. ML022540925) assessed the station accident analyses affected by the production of 2,304 TPBARs and that the March 31, 2015, LAR for 1,792 TPBARs is bounded by the previously NRC-approved license amendment, and that the radiological consequences remain well within a small fraction of the regulatory limits of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 100, 10 CFR 50.67, and General Design Criterion 19. The March 31, 2015, submittal does not include sufficient information to support these statements. In addition, new insights were gained from Cycles 6 through 12. The Department of Energy topical report referred to in License Amendment No. 40 contains information on permeation rates that are now known to be inaccurate.

For the application to be acceptable, the licensee needs to provide information supporting the statements in its application. Specifically, it should provide the following:

- E3-1. Provide a discussion of the technical analysis performed to determine that the current licensing basis radiological consequences for the design-basis accidents (DBAs) bound the new radiological consequences for DBAs accounting for the requested increase to 1,792 TPBARs per cycle. This technical analysis should do the following:
- Show the current inputs and assumptions used for *each* design basis radiological consequence evaluation *as compared* to the new inputs and assumptions that reflect the insights gained from Cycles 6 through 12.
 - Explain any differences, or if there are no differences, then it should explain why it is acceptable to remain the same considering the insights gained from Cycles 6 through 12.

- E3-2. Provide the current licensing basis source term used *for each design basis accident* compared to the new source term that reflects the insights gained from Cycles 6 through 12.
- E3-3. Provide the current licensing basis calculated doses compared to the new calculated doses that reflect the insights gained from Cycles 6 through 12.

The information listed in this enclosure was discussed with Thomas Hess of your staff on May 6, 2015. A supplement addressing this information is expected by June 15, 2015.

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application. If the application is subsequently accepted for review, you will be advised of any further information needed to support the NRC staff's detailed technical review by separate correspondence.

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If you have any questions, please contact me at (301) 415-1349 or jeanne.dion@nrc.gov.

Sincerely,

/RA/

Jeanne A. Dion, Project Manager
Watts Bar Special Projects Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosures:

1. Supplemental Information Related to Human Factors
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