1101 Market Street, Chattanooga, Tennessee 37402

CNL-15-077

April 28, 2015

10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Unit 1
Facility Operating License Nos. NFP-90
NRC Docket No. 50-390

Subject: **Correction to Application to Revise Technical Specification 4.2.1, "Fuel Assemblies" (WBN-TS-15-03)**

Reference: Letter From TVA to NRC, "Application to Revise Technical Specification 4.2.1, "Fuel Assemblies," (WBN-TS-15-03)," dated March 31, 2015

By letter dated March 31, 2015 (Reference), Tennessee Valley Authority (TVA) submitted a license amendment request (LAR) to revise Watts Bar Nuclear Plant (WBN), Unit 1 Technical Specification (TS) 4.2.1, "Fuel Assemblies," to increase the maximum number of Tritium Producing Burnable Absorber Rods (TPBARs) that can be irradiated per cycle from 704 to 1,792. The proposed change also revises TS 3.5.1, "Accumulators," Surveillance Requirement (SR) 3.5.1.4 and TS 3.5.4, "Refueling Water Storage Tank (RWST)," SR 3.5.4.3 to delete outdated information related to the Tritium Production Program.

TVA has subsequently determined that Enclosure 2, "Review of Radiological and Environmental Considerations for Production of Tritium at Watts Bar Nuclear Plant Unit 1 - 1,792 TPBAR Core," of the reference letter contained typographical errors. Specifically, the second paragraph of page E2 25 of 33 which states, "With respect to HTO (tritium in the form of water vapor) exposure, the concentration in air required to result in an exposure of 2.5 mrem was increased from 5×10^{-6} μCi/ml to 2×10^{5} μCi/ml; an increase of a factor of four," contains an incorrect exponential value. A factor of four increase from 5×10^{-6} μCi/ml results in a concentration of 2×10^{-5} μCi/ml, vice 2×10^{5} μCi/ml. This error was discussed with the NRC Project Manager for WBN, Unit 1 during a telephone call on April 9, 2015.

During an extent of condition review, TVA determined that Enclosure 2, page E2 12 of 33 of the reference letter contains two additional typographical errors. Specifically, the last sentence of the last paragraph under "Tritium Source Terms," stating, "This nominal value is

consistent with the 845 Ci/year unit average non-TPC tritium effluent total observed over the four year period (1997 – 2000) at WBN and Sequoyah (SQN)," provides an incorrect unit for the non-TPC tritium effluent total. The correct value and units are 845 Ci/year/unit, as shown in the first sentence of the subject paragraph. In addition, the first paragraph under "Tritium Source Term Definition and Discussion," refers to Regulatory Guide 1.1206. The correct reference is Regulatory Guide 1.206, as provided in the list of references provided in Enclosure 2 to the reference letter.

The enclosure to this letter provides replacement pages that have been revised to correct the typographical errors.

Consistent with the standards set forth in Title 10 of the *Code of Federal Regulations* (CFR), Part 50.92(c), TVA has determined that the additional information, as provided in this letter, does not affect the no significant hazards consideration associated with the proposed application previously provided in Reference 1.

Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and the enclosures to the Tennessee Department of Environment and Conservation.

There are no new regulatory commitments associated with this submittal. Please address any questions regarding this request to Mr. Edward D. Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 28th day of April 2015.

Respectfully,

J. W. Shea
Vice President, Nuclear Licensing

Enclosure: WBN-TS-15-03, Enclosure 2 Replacement Pages

Enclosure
cc (Enclosure):

NRC Regional Administrator - Region II
NRC Resident Inspector – Watts Bar Nuclear Plant
NRC Project Manager – Watts Bar Nuclear Plant
Director, Division of Radiological Health - Tennessee State Department of Environment and Conservation

ENCLOSURE

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT
UNIT 1

WBN-TS-15-03, Enclosure 2 Replacement Pages

effective dose-per-unit tritium intake is 1.73×10^{-11} Sv/Bq (0.064 mrem/μCi). Current NRC Regulations were developed prior to the latest ICRP recommendations and do not account for OBT.

Tritium Analysis

Because of the low beta energies, liquid scintillation counting is a convenient, reliable, and practical way of measuring tritium in the liquid phase. The technique consists of dissolving or dispersing the tritiated compound in a liquid scintillation cocktail, and counting the light pulses emitted from the interaction between the tritium betas and the cocktail. The light pulses are counted by a pair of photomultiplier tubes which, when coupled with a discriminator circuit, can effectively distinguish between tritium betas and those from other radioactive sources.

Tritium Source Terms

Regarding tritium sources, in a non-Tritium Production Core (non-TPC), the production of tritium in the RCS is primarily the result of tritium production/release from:

- Fuel Rods (Ternary fission and Integral Fuel Burnable Absorbers (IFBAs)),
- Control Rods,
- Secondary neutron source rods,
- Wet Annular Burnable Absorbers (WABAs),
- RCS Deuterium (Heavy Water) activation,
- RCS Boron activation, and
- RCS Lithium activation.

A review of Westinghouse PWR benchmark tritium data[23] indicates a nominal production/release tritium value of about 870 Ci/year/unit. This nominal value is consistent with the 845 Ci/year/unit average non-TPC tritium effluent total observed over the four year period (1997 – 2000) at WBN and Sequoyah (SQN).

Tritium Source Term Definition and Discussion

Following the review guidance in Chapter 11, "Source Terms," in NUREG-800 Standard Review Plan[24] , TVA uses two source terms for the effluent evaluations: radwaste system design basis source term and realistic source term. The definition of these two source terms is consistent with the description of the source terms found in Section C.I.11 of Regulatory Guide 1.206.[25]

> "*Provide two source terms for (1) the primary coolant and reactor steam for BWRs, and (2) primary and secondary coolants for PWR plants. The first source term is a conservative or Radwaste System Design Basis source term which assumes a Radwaste System Design Basis fuel defect level. Provide the Radwaste System Design Basis reactor primary and secondary coolant fission, activation, and corrosion product activities. The reactor core fission product inventories are determined based on time-dependent fission product core inventories that are calculated by the ORIGEN code. The first source term serves as a basis for:*
>
> *(1) Radwaste system design capability to process radioactive wastes at Radwaste System Design Basis fuel defect level and fission product leakage level,*

Occupational Exposure. The derived guides serve as the basis for regulations setting upper bounds on the inhalation and ingestion of, and submersion in, radioactive materials in the workplace. The report also includes tables of exposure-to-dose conversion factors for general use in assessing average individual committed doses in any population that is adequately characterized by Reference Man.

With respect to HTO (tritium in the form of water vapor) exposure, the concentration in air required to result in an exposure of 2.5 mrem was increased from 5×10^{-6} μCi/ml to 2×10^{-5} μCi/ml; an increase of a factor of four.

The Westinghouse design documentation[41] also predates the updated tritium dose factors. The Westinghouse recommended upper ranges for tritium are based on tritium data that Westinghouse collected in the 1970's from the Millstone, Ginna, and Connecticut Yankee Nuclear Stations and are predicated on the pre-1994 Maximum Permissible Concentration (MPC_a) values of 10 CFR Part 20.

Similarly, Regulatory Guide (RG) 8.32[42] was issued by the NRC in 1988 and as such does not reflect the updated dose factors promulgated in the revision to 10 CFR Part 20 (effective January 1994).

Applying the updated dose factors to the DOE and NRC tritium Control Value yields a revised recommended RCS tritium Control Value of **14** μCi/gm. The revised concern range is **12 to 16** μCi/gm.

The estimated RCS average tritium activity for the realistic model is **12** μCi/gm, a value less than the updated recommended Tritium Control Value. The estimated RCS average tritium activity for the Radwaste System Design model is **29.8** μCi/gm, a value in excess of the recommended Tritium Control Value.

As the estimated RCS average tritium activity for the realistic model is **12** μCi/gm, a value less than the updated Tritium Control Value, no additional action is required i.e.(no modifications to TVA's current boron-control feed and bleed methodologies (366,000 gallon cycle letdown)).

If in the unlikely event the estimated RCS average tritium activity was projected to exceed the recommended RCS tritium Control Value, TVA will take further action to minimize the onsite and offsite radiological impacts of abnormal RCS tritium levels. These actions may include, but not be limited to increased RCS feed and bleed operations, consistent with plant operational requirements, via the CVCS to liquid effluent pathway TWST.

From an in-plant and public dose ALARA perspective, it is preferable to operate with the mean RCS tritium concentrations below the recommended RCS tritium Control Values.

Real Time Performance Monitoring

To continually monitor TPBAR performance, TVA has established performance metrics with two tritium-based action levels. These action levels are cycle specific and are based on the difference between the total calculated tritium released to the RCS (current RCS inventory plus removed via letdown) from all sources minus the estimated tritium released to the RCS from the traditional non-TPBAR sources (boron, lithium, fuel rods, control rods, secondary source rods, WABAs, etc.), that is, the net estimated TPBAR tritium.

Action level 1 is triggered when the net cumulative estimated TPBAR tritium exceeds 1.5 the TPC estimated value. Action level 2 is triggered when the net cumulative estimated TPBAR tritium exceeds triple the TPC estimated value. The Action level 1 value of 1.5 is approximately the 95% confidence level of the total uncertainty in the net estimated TPBAR tritium value. That is, if