

August 20, 2002

Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNIT 1 — ENVIRONMENTAL ASSESSMENT
AND FINDING OF NO SIGNIFICANT IMPACT FOR INCORE IRRADIATION
SERVICES FOR THE U.S. DEPARTMENT OF ENERGY'S TRITIUM
PRODUCTION PROGRAM (TAC NO. MB1884)

Dear Mr. Scalice:

Enclosed is a copy of the Environmental Assessment and Finding of No Significant Impact related to your application for amendment of August 20, 2001, as supplemented by letters of October 29, November 14, November 21, December 7, December 19, 2001, and January 14, February 19, February 21, May 21, May 23, and July 30, 2002. The proposed amendment would allow Watts Bar Nuclear Plant, Unit 1, to insert up to 2304 tritium-producing burnable absorber rods into the reactor core each fuel cycle. The assessment is being forwarded to the Office of the Federal Register for publication.

Sincerely,

/RA/

L. Mark Padovan, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-390

Enclosure: Environmental Assessment

cc w/encl: See next page

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UNITED STATES NUCLEAR REGULATORY COMMISSION

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-390

WATTS BAR NUCLEAR PLANT, UNIT 1

ENVIRONMENTAL ASSESSMENT AND FINDING OF

NO SIGNIFICANT IMPACT

The U.S. Nuclear Regulatory Commission (NRC) is considering issuance of an amendment to Facility Operating License No. NPF-90 held by the Tennessee Valley Authority (TVA or the licensee) for operation of the Watts Bar Nuclear Plant (WBN), Unit 1, located in Rhea County, Tennessee. Therefore, as required by Title 10, *Code of Federal Regulations* (10 CFR), Section 51.21, the NRC is issuing this environmental assessment and finding of no significant impact.

ENVIRONMENTAL ASSESSMENT

Identification of the Proposed Action:

The proposed action would change WBN's Technical Specifications to allow TVA to irradiate up to 2304 tritium-producing burnable absorber rods (TPBARs) in WBN's reactor core. Irradiating the TPBARs in the reactor core supports the U.S. Department of Energy (DOE) in maintaining the nation's tritium inventory. TVA will insert the TPBARs into positions in the reactor core where conventional burnable poison rods would normally be (poison rods contain boron which reacts with neutrons making them unavailable for interacting with uranium atoms, thereby slowing fission and heat generation). TPBARs are not reactor fuel and do not generate thermal energy for generating electrical energy.

TPBARs use lithium rather than boron. Neutron irradiation in the reactor core converts

the lithium in the TPBARs into tritium. After one operating cycle, TVA would remove the fuel assemblies containing TPBARs from the WBN core and put them into the spent fuel pool. TVA would, after several weeks (based on plant schedules rather than decay considerations), remove the irradiated TPBARs from the fuel assemblies and consolidate them into shipping casks for DOE to transport to its tritium extraction facility at its Savannah River Site.

The proposed action is in accordance with the licensee's application of August 20, 2001, as supplemented by letters of October 29, November 14, November 21, December 7, December 19, 2001, and January 14, February 19, February 21, May 21, May 23, and July 30, 2002.

The Need for the Proposed Action:

The proposed action would allow WBN to provide irradiation services for DOE to maintain the nation's tritium supply as prescribed by Public Law (PL) 106-65. Section 3134 of PL 106-65 directs the Secretary of Energy to produce new tritium at TVA's Watts Bar power plant.

Environmental Impacts of the Proposed Action:

DOE's Environmental Impact Statement, DOE/EIS-0288, *Final Environmental Impact Statement (EIS) for the Production of Tritium in a Commercial Light Water Reactor*, dated March 1999, assessed the environmental impacts of producing tritium at WBN. TVA was a cooperating Federal agency in preparing this EIS and adopted the EIS in accordance with 40 CFR 1506.3(c) of the Council on Environmental Quality regulations. DOE also prepared a Tritium Production Core (TPC) Topical Report, NDP-98-181, Rev. 1, to address the safety and licensing issues associated with incorporating TPBARs in a reference pressurized-water reactor. The NRC used its Standard Review Plan (NUREG-0800) as the basis for evaluating the impact of the TPBARs on a reference plant. The NRC reviewed the TPC Topical Report

and issued a Safety Evaluation Report, NUREG-1672, in May 1999. NUREG-1672 identified 17 plant-specific interface issues that a licensee would have to address in support of a plant specific amendment to operate a tritium production core. TVA's application of August 20, 2001, and supplements, addressed these interface issues. NRC staff is reviewing TVA's amendment request and will issue a safety evaluation documenting its review.

1. Radiological Impact from Tritium Release to the Reactor Coolant System (RCS) Under Normal Plant Operations with 2304 TPBARs in the Core

Tritium levels in the RCSs of large pressurized-water reactors have ranged as high as 4000 curies per year (Ci/yr) without exceeding regulatory limits. TVA estimated, as discussed in its May 23, 2002, letter, that the tritium level in the RCS at WBN would increase from about 1826 Ci/yr to 3170 Ci/yr with 2304 TPBARs in the reactor. This increased tritium level could increase overall occupational exposure, but NRC data summarized in NUREG-0713, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities," dated 1995, indicate tritium exposure is not an important contributor to overall occupational exposure.

TVA stated that WBN does not expect this increased activity to affect normal RCS feed-and-bleed operation throughout the cycle, as discussed in its May 23, 2002, letter. The NRC staff finds no reason to disagree with TVA's conclusion. Thus, primary coolant discharge volumes should be similar to current volumes.

The staff concludes that the additional dose rate from operating WBN with 2304 TPBARs in the reactor will not have a significant impact on TVA's ability to control worker radiation doses and keep them well within regulatory limits using the controls and practices in WBN's existing Radiation Protection Program.

If increased RCS feed and bleed is required, it may be necessary to temporarily store the increased volume of tritiated liquid onsite, or to dilute the tritiated liquid to ensure that

10 CFR Part 20 discharge limits are met. WBN has sufficient storage tanks to accommodate this additional liquid waste.

2. Radiological Impact from Liquid Effluents Under Normal Plant Operations with 2304 TPBARs in the Core

The WBN facility has waste-treatment systems designed to collect and process waste that may contain radioactive material. The tritium in liquid effluents from WBN is diluted to a relatively low concentration before it reaches even the most highly exposed members of the public. TVA's submittal of May 23, 2002, shows that the total additional dose to the maximally-exposed members of the public within 50 miles of WBN from tritium in liquid effluents is estimated to be 0.01 millirem per year (mrem/yr). This total dose, considering the minimal increase from tritium production, is less than 1.0 percent of the NRC 3-mrem/yr guideline for effluent exposure to the public. The staff concludes that the potential radiological impact on plant workers, members of the public, and the environment from operation with the TPC complies with all regulatory dose limits.

3. Radiological Impact from Radioactive Gaseous Emissions Under Normal Plant Operations with 2304 TPBARs in the Core

A portion of the tritium might be released to the atmosphere. The amount would depend on plant conditions and the manner in which TVA operates WBN. Individuals could be exposed to tritium in a variety of pathways if it was released to the atmosphere. These pathways include inhalation and skin absorption, as well as consumption of meat, vegetables and milk.

According to TVA, in its submittal of May 23, 2002, the calculated tritium dose to the most highly-exposed members of the public through all pathways would be about 63 percent of the NRC annual exposure guideline for airborne effluents.

4. Radiological Impact from Solid Radioactive Waste Under Normal Plant Operations with 2304 TPBARs in the Core

Irradiation of TPBARs is expected to increase the number of curies and volume of solid radioactive waste, primarily because of disposal (offsite) of the associated base plates and thimble plugs, which become irradiated. The estimated increase in activity inventory is from approximately 1800 Ci/year to approximately 3500 Ci/yr. The estimated increase in volume is from 32,820 cubic feet/year to 32,853 cubic feet/year. The estimated resultant total worker dose resulting from handling the increased solid waste is approximately 1.1 percent of the dose assessment estimate of record. Offsite shipment and disposal would be in accordance with established agreements between TVA and DOE.

5. Radiological Impact to Workers in the Fuel Storage Area Under Normal Plant Operations with 2304 TPBARs in the Core

The proposed amendment is not expected to significantly affect the doses to the workers in the fuel storage area. The TPBARs are designed to have minimal effect on plant operations, including refueling operations. Unirradiated TPBARs will produce no increase in exposure, occupational or public, because they are essentially non-radioactive. Possible increases in tritium airborne activity may increase dose to workers handling and consolidating radioactive TPBARs. However, TVA stated, in its submittal of May 23, 2002, that WBN's station dose assessment of record bounds the expected increase.

6. Non-Radiological Impact with 2304 TPBARs in the Core

The proposal does not affect non-radiological plant effluents. The proposal does not result in any significant changes to land use or water use. It also does not result in any significant changes to the quantity or quality of effluents, and no effects on endangered or threatened species or on their habitat are expected. Therefore, no changes in, or different types of, non-radiological environmental impacts are expected as a result of the amendment.

7. Radiological Impact from Postulated Accidents with 2304 TPBARs in the Core

TVA's submittal of May 23, 2002, discussed the effects of TPBARs on the possible consequences of the following postulated accidents discussed in WBN's Updated Final Safety Analysis Report (UFSAR):

- fuel-handling accident
- design basis loss-of-coolant accident (LOCA)
- main steamline failure outside of containment
- steam generator tube rupture
- loss of normal alternating current power to plant auxiliaries
- waste gas decay tank failure
- rod ejection accident
- failure of small lines carrying primary coolant outside containment

Discussions of the postulated accidents with the greatest radiological consequences appear below.

a. Fuel-Handling Accident

This accident is defined as dropping a spent fuel assembly containing irradiated TPBARs resulting in rupture of the cladding on all the fuel rods. TVA's calculations conservatively assumed that 24 TPBARs (the maximum possible number) are in the dropped spent fuel assembly and that they all rupture and transfer their tritium to the spent fuel pool. Releasing this activity to the (1) control room boundary, (2) Exclusion Area Boundary over 2 hours, and (3) Low Population Zone over 30 days results in the doses to the thyroid, skin (beta), whole body (gamma), and Total Effective Dose Equivalent (TEDE), as defined in 10 CFR Part 20, that are small percentages of regulatory limits.

b. LOCA

This accident is defined as losing reactor coolant at a rate in excess of the capability of

the reactor coolant makeup system. LOCAs could occur from breaks in pipes in the reactor coolant pressure boundary up to and including a break equivalent in size to the double-ended rupture of the largest pipe in the RCS. TVA conservatively assumed that the entire tritium content of the 2304 TPBARs is released into containment during a postulated LOCA.

Releasing this activity to the (1) control room boundary, (2) Exclusion Area Boundary over 2 hours, and (3) Low Population Zone over 30 days results in doses to the thyroid, skin (beta), whole body (gamma), and TEDE that are small percentages of regulatory limits.

8. Post-LOCA Hydrogen Generation Inside Containment

TVA's submittal of August 20, 2001, stated that TPBARs could release additional hydrogen to the containment following a large-break LOCA (LBLOCA). WBN has emergency operating procedures in place to start a hydrogen recombiner train when the containment volumetric percentage of hydrogen reaches 3 percent. Previous analysis for a conventional (non-TPBAR) core in the WBN UFSAR indicated that for an LBLOCA, with no recombiners started, the containment hydrogen concentration reached 3.75 percent 4 days following event initiation. With additional hydrogen from the TPBARs, TVA's analysis indicated that the containment hydrogen concentration would only slightly increase 2 days following event initiation. If one recombiner train is started 24 hours after event initiation for the TPBAR core, the peak containment hydrogen concentration is limited to less than 4 percent for up to 6 days. Having up to 24 hours to place a recombiner train in service to maintain the containment hydrogen concentration below 4 percent is adequate in satisfying NRC Regulatory Guide 1.7. Accordingly, reactor operation with the TPBARs will not be a significant contributor to the post-LOCA hydrogen inventory, and will not have a significant impact on the total hydrogen concentration within the containment when compared to the values associated with the non-TPBAR core. The maximum containment hydrogen concentration can be maintained at less than the lower flammability limit of 4.0-volume-percent, with one recombiner train started at a

3-percent hydrogen concentration approximately 24 hours after an LBLOCA.

Summary

The Commission has completed its evaluation of the proposed action. The proposed action will not significantly increase the probability or consequences of accidents, no changes are being made in the types of effluents that may be released offsite, and there is no significant increase in occupational or public radiation exposure. Therefore, there are no significant radiological environmental impacts associated with the proposed action.

With regard to potential non-radiological impacts, the proposed action does not have a potential to affect historic sites. It does not affect non-radiological plant effluents and has no other environmental impact. Therefore, there are no significant nonradiological environmental impacts associated with the proposed action.

Environmental Impacts of the Alternatives to the Proposed Action:

As an alternative to the proposed action, the staff considered denial of the proposed action (i.e., the “no-action” alternative). Denial of the application would result in no significant change in current environmental impacts. However, because there are no significant environmental impacts associated with this action, and because PL 106-65 directs that DOE produce tritium at WBN or the Sequoyah Nuclear Plant, this is not considered a viable option.

Alternative Use of Resources:

DOE evaluated the action, including completing construction of one or both of the Bellefonte Nuclear Plant Units and construction of an accelerator facility at the Savannah River site and concluded that the proposed alternative has the least environmental impact of the options considered. The NRC has no reason to disagree with DOE’s decision.

Agencies and Persons Consulted:

On August 15, 2002, the staff consulted with the Tennessee State official, Debra Schults of the Tennessee Bureau of Radiological Health, regarding the environmental impact of

the proposed action. The State official had no comments.

FINDING OF NO SIGNIFICANT IMPACT

On the basis of the environmental assessment, the NRC concludes that the proposed action will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed action.

For further details with respect to the proposed action, see the licensee's letter dated August 20, 2001, as supplemented by letters dated October 29, November 14, November 21, December 7, December 19, 2001, and January 14, February 19, February 21, May 21, May 23, and July 30, 2002. Documents may be examined, and/or copied for a fee, at the NRC's Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the Agencywide Documents Access and Management System (ADAMS) Public Electronic Reading Room on the internet at the NRC Web site, <http://www.nrc.gov/reading-rm/adams.html>. Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS, should contact the NRC PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail to pdr@nrc.gov.

Dated at Rockville, Maryland, this 20th day of August 2002.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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