

Clinch River Nuclear Site Environmental Preapplication Audit Summary Report
November 9, 2022, Meeting

INTRODUCTION

The purpose of this report is to provide a summary of the environmental audit conducted as part of the Tennessee Valley Authority's (TVA) preapplication activity in anticipation of a Construction Permit Application for a reactor facility at the Clinch River Nuclear (CRN) site located in Oak Ridge, Tennessee. The audit was conducted to (1) identify potential information gaps in content expected to be included in the final application submittal, (2) identify potential technical or policy issues that may adversely impact the docketing or technical review of the application, and (3) become more familiar with the application, particularly in areas where new concepts or novel design features are proposed. Consistent with federal directives outlined in title 41 of the Fixing America's Surface Transportation Act, early and frequent pre-application interactions are a key component in streamlining the environmental review process.

AGENDA

Item	Time	Topic(s)
1	9:00 am	Overview of CRN site PEIS
2	10:00 am	BWRX-300 Overview
3	10:30 am	Bounding Value Approach
	11:30 am – 12:30 pm	Break
4	12:3– 2:30 pm	Annotated Outlines for Environmental Report Chapters
5	2:30 – 2:45 pm	Wrap Up/Additional Topics

ATTENDEES

Nuclear Regulatory Commission (NRC): Kenneth Erwin, Brian Glowacki, Donald Palmrose, Madelyn Nagel, Peyton Doub, Laura Willingham, Allen Fetter, Jordan Glisan, Gerry Stirewalt

TVA: Raymond Schiele, William Elzinga, Stephen Kimura, Ivan Zujovic, David Daigle, Philip John, Michael (Alex) Young, Veronica Kyles, Joel Klein, Kevin Casey, Dennis Petrarca, Kelvin Montague, Carol Freeman

General Electric (GE) Power Systems/GE Hitachi (GEH): Jesus Diaz-Quiroz, George Wadkins

SUMMARY OF DISCUSSIONS AND ISSUES

Discussions among the staff, TVA, and GE or GEH were related to the four primary topics as listed in the agenda above and described below.

Overview of CRN Site Programmatic EIS (PEIS)

TVA provided an overview of the PEIS developed for the CRN site, the status of the PEIS, and TVA's anticipated plan to use surveys, studies and information in the PEIS in support of potential future CRN site construction permit (CP) and operating license (OL) applications. For example, studies conducted for the PEIS have updated much of socio-economic studies that were performed for the Early Site Permit (ESP). This updated information will be used to inform the CRN site CP environmental report (ER).

As evaluated in the PEIS, TVA's purpose and need for the CRN site Advanced Nuclear Reactor Technology Park is two-fold. The first is to evaluate and demonstrate the feasibility of deploying advanced nuclear reactors to support TVA's mission of providing safe, clean, reliable, and low-cost energy to the Tennessee Valley. In the PEIS, TVA considered the potential environmental effects associated with the proposed construction, operation, and decommissioning of one or more advanced nuclear reactors, with a cumulative electrical output not to exceed 800 MWe at the CRN site. The second is to evaluate emerging nuclear technologies as part of technology innovation efforts aimed at developing future generation capacities. TVA anticipates consulting with required authorities on Federal regulations and laws including, but not limited to the Endangered Species Act; Bald and Golden Eagle Protection Act; Rare Species Protection and Conservation Act; National Historic Preservation Act; Clean Air Act; and Federal Clean Water Act. TVA anticipates seeking required permits or authorizations from the following governmental entities: the Nuclear Regulatory Commission; Federal Aviation Administration; U.S. Department of Transportation; Tennessee Department of Transportation; U.S. Army Corps of Engineers; U.S. Coast Guard; U.S. Environmental Protection Agency; Tennessee Department of Environment and Conservation; U.S. Fish and Wildlife Service; the City of Oak Ridge; Tennessee State Historic Preservation Officer; Tribal Historic Preservation Officers; and Texas Department of State Health Services, Radiation Control Program, Radiation Safety Licensing Branch. Most recently, TVA published a *Federal Register* Notice ([87 FR 59860](#)) to document their determination of the environmentally preferred alternative (Alternative D) for a CRN site Advanced Nuclear Reactor Technology Park (ANRTP) at area 1 and area 2. TVA noted that new surveys are underway, including those conducted under a Programmatic Agreement between TVA and the Tennessee State Historic Preservation Officer (SHPO). The TVA communications team noted ongoing discussions with permitting and authorizing agencies. NRC noted that, as the TVA communication plan for the PEIS authorizations and permits move forward with consultations, NRC would like to be aware of associated meetings and, NRC may participate in the meetings as appropriate.

This discussion between TVA and NRC was related to providing sufficient information in the ER for the staff's evaluation in anticipation of the ER being submitted before the Preliminary Safety Analysis Report (PSAR) per TVA's exemption requests (ML22238A098). NRC gave a brief update on the exemption request status and the review of that information, noting that long periods of time (e.g., greater than 10 months) between an ER and PSAR submittal could create challenges (e.g., a delay in docketing the application prior to a complete submittal, the potential

for an emergence of new and significant information during the period, hearing notices given a bifurcated application over a long period, etc.). TVA requested that a meeting be arranged for NRC and TVA management to discuss the issue.

Bounding Value Approach

NRC noted that the bounding value approach is considered in NUREG-2122 (ML13311A353), Regulatory Guide 4.2, Revision 3 (ML18071A400) and NUREG-1555. Staff also noted that assumptions used for such an approach should be bounding, reasonable, and sufficiently conservative to account for uncertainties in the CP ER given the potential lack of a complete PSAR at the time of the ER submittal. Any new and significant information from a completed CP PSAR may need to be provided in a supplement to the CP ER or evaluated for inclusion in the OL ER. Staff provided an example of a proposed bounding value approach for a CP application that was reviewed by staff and determined to be adequate based on pre-application discussions (ML21295A296).

As noted by staff, a CP application allows for preliminary information, but the level and sufficiency of the preliminary information is not clearly defined in guidance. Staff noted guidance currently in development (ML21165A157 and ML21190A012) for CP applications; however, TVA indicated that this guidance does not cover the environmental report, but only the safety issues. Subsequently, staff passed along TVA's comment to the Division of Advanced Reactors and Non-Power Production and Utilization Facilities (DANU) in the Office of Nuclear Reactor Regulation for consideration and TVA was invited to submit comments during the public comment period for ML21190A012, when it is issued as drafted which is expected in late 2022. Staff noted an action to have further discussions and alignment with TVA particularly for severe accident mitigation design alternatives and postulated accident scenario information that should be included in a CP application.

BWRX-300 Overview

TVA and GEH provided a synopsis of the current state of the reactor technology. GEH discussed how most of the design is in use at various plants around the world and that there is "operation experience" with many of the design features based on components of the Economic Simplified Boiling-Water Reactor (ESBWR) reactor technology. The BWRX-300 safety strategy is based on applying International Atomic Energy Agency safety standards (i.e., SSR-2/1, "Safety of Nuclear Power Plants: Designs").

Design features of the technology were shared in a presentation with GNF2 fuel anticipated to be at 5 percent enrichment for use in the BWRX-300. GEH noted that there is significant experience with this type of fuel across the operating fleet. GEH also noted that the BWRX has a robust safety system to make the emergency planning zone (EPZ) at the site boundary attainable. The ESP addressed only one methodology for reduced EPZ. GEH noted that the final design will refine the development of the EPZ for the CP application.

Reactor containment will be located primarily below ground and with an innovative construction technique using steel bricks. GEH provided information on the robustness of the steel bricks that are being used by GEH to line an excavation and house the reactor. A discussion ensued concerning safety structures, systems, and components as defined by NRC and safety components terminology being used by GEH. GEH indicated that further discussion with NRC

on this topic will occur as led by safety review staff with environmental coordination and participation. GEH topical reports are scheduled to be delivered to NRC during the first quarter of the next calendar year that will discuss this issue. The environmental project manager noted that the safety project manager will coordinate notification of the topical report submittals with the environmental reviewers and any associated NRC and TVA meetings.

NRC noted that there is a safety licensing condition for observation of the excavation at the CRN site as discussion of the use of the steel bricks in construction proceeded. For construction, the BWRX-300 containment would be placed inside steel brick structure that would line the excavation. Typically, the excavation would extend into bedrock where available with a depth of approximately 150 to 120 ft. The resulting steel brick structure would include any necessary water-proofing. Required foundation dewatering would be considered on a site-specific basis. GE Power Systems noted that the construction method greatly reduces the required excavation with very little engineered backfill and a smaller excavation area needed. The NRC staff noted the karstic conditions at the site and the desire to observe any excavations. TVA noted that there is a National Reactor Innovation Center demonstration project scheduled to take place early in the next calendar year at the CRN site and that NRC staff would be present to observe the excavation and steel brick placement demonstration.

Walk Through of Annotated Outline Chapters

TVA provided an overview of the development process for each of the annotated outlines for the ER chapters as posted to the ePortal for the staff's review. The sessions were interactive and open to comments and discussion by all staff during the discussions covering the following topics:

- Proposed Site and Affected Environment
- Plan and Project Description
- Environmental Impacts of Plant Construction
- Environmental Impact of Station Operation
- Fuel Cycle, Transportation and Decommissioning Impacts
- Cumulative Impacts
- Need for Power
- Alternatives to the Proposed Action
- Environmental Consequences of the Proposed Action

Staff noted that the project plan and project description in the ER should be focused on the chosen technology (BWRX-300) and little of this topic could be incorporated by reference from the ESP. Staff also noted that the CP application ER should sufficiently describe the proposed plant with an emphasis on plant major systems that interface with the environment.

Discussions continued regarding new and potentially significant information related to the transmission lines and, cooling water intake and discharge locations as a result of the new project. TVA indicated that some upgrades to the transmission lines may be required as a result of the development of the CRN site ANRTP and would not directly be tied to the actions considered for the CP application. TVA noted that the cooling water intake would be located as indicated in the ESP, but that the discharge location may be adjusted by approximately 50 ft depending on the final technology design. Staff noted that dredging required for construction of

intake and discharge structures could mobilize contaminated sediments. The staff noted that coordination with the Department of Energy and the state of Tennessee, as appropriate, would likely be needed, as well as consideration of the effects of the disturbance on the ecological systems and radiological health.

Regarding radiological topics, the NRC noted that the ESP should be bounding for radiological health and waste, uranium fuel cycle, transportation of radioactive material, and decommissioning given the fuel type and if the BWRX-300 power level is within the ESP criteria. Other radiological issues, such as postulated accidents, design basis and spent fuel pool accidents, and severe accident mitigation design alternatives must be derived from the safety analysis. Thus, there remains a risk that the staff will need information in the ER related to the analysis of PRA and postulated accidents because the application is expected to be bifurcated.

As acknowledged by TVA, staff noted that some surveys and consultations with the Fish and Wildlife Service (FWS), (among other agencies), will be required well in advance of a CP application submittal. TVA noted that Endangered Species Act (ESA) Section 7 consultations were not within the scope of the ESP and will be conducted at the CP application stage. NRC strongly suggested that TVA begin discussions with the FWS regarding necessary information and surveys of the site to support the consultations under ESA. Staff noted that both TVA and NRC will likely need to do a formal ESA consultation with FWS. TVA indicated that NRC will be informed of consultation actions prior to the CP application submittal.

NRC also stressed the importance of local, state and Federal outreach and coordination for the project, including with the U.S. Army Corps of Engineers (USACE). NRC encouraged TVA to reach out to the USACE, as this agency may be a cooperating agency for the CP application environmental reviews. Staff emphasized that the NRC and TVA need to understand the USACE requirements and requisite supporting information well in advance of the CP application to allow sufficient time for TVA to prepare an application for USACE permits and for NRC to account for the USACE requirements in the environmental impact statement.

Discussions concerning traffic studies noted that updates to previous ESP studies might be needed given the recent development and projects near the site (e.g., the East Tennessee Technology Park, the Kairos project, etc.). NRC encouraged TVA to coordinate any traffic studies with the Tennessee Department of Transportation (TDOT) as TDOT are subject matter experts with jurisdiction to determine the sufficiency of such a study.

TVA noted that cultural surveys were conducted during Phase I of the PEIS development and TVA consulted with the SHPO, Tribes, and community as reported in the PEIS. The phase 2 surveys are now complete and were done in coordination with the SHPO under a Programmatic Agreement. The report for the phase 2 surveys is currently under development and will be shared with the SHPO and Tribes when complete. The phase 2 surveys will be discussed in the CP application ER.

Lastly, TVA provided feedback to NRC on the draft Interim staff guidance (ML21165A157) being developed for CP applications. TVA noted the lack of detail in the draft ISG and mentioned that it would be helpful to provide more information and clarity on the level of preliminary environmental information required for CP application. This comment was forwarded to the

DANU project manager for the ISG. The project manager indicated that the ISG will be issued for comment by the end of 2022 and that TVA could submit the associated comment for the ISG.

Wrap Up/Additional Topics for Future Discussions

At the end of the audit the staff discussed additional topics for future meetings. These topics for future discussion included:

- Coordination of NRC safety and environmental reviews for BWRX-300 topical reports, including severe accidents and associated topical reports. GEH indicated that the topical reports are tentatively scheduled to be drafted early in the next calendar year.
- NRC safety and environmental staff coordination on the need for additional meteorological data and site visits for the excavation demonstration to take place early in the next calendar year.
- TVA indicated that future discussions on the bounding value approach (i.e., submitting the ER before the PSAR) including the level of detail needed in an ER for the CP application, would be helpful.
- TVA requested a future meeting with NRC management to discuss the title 10 of the *Code of Federal Regulation* part 2.101(a)(5) exemption request currently under review and the potential schedule implications related to a bifurcated application (e.g., public participation, hearing logistics, etc.)