NRC Meeting

TVA Clinch River Project

Construction Permit Application Submittal Status

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Construction Permit Application (CPA)

CPA Submittal Schedule Constraints

- Seismic analyses for the Reactor Building to validate statements in Preliminary Safety Analysis Report (PSAR) Ch 3.7, Ch 3.8, and to populate Chapter 3 Appendices B – H.
- Aircraft Impact Analysis are in progress to demonstrate compliance with 10 CFR 50.150, performed in accordance with NEI 07-13, “Methodology for Performing Aircraft Impact Assessments for New Plant Designs.”
- Resolution of NRC questions about BWRX-300 compliance with the dose limits in 10 CFR 50.34(a)(1)(ii)(D) for containment performance and 10 CFR 50 General Design Criteria 19, Control Room, based on a Hypothetical Accident Source Term.

CPA Submittal Schedule Risk

1. **Focus will be on managing CPA submittal Constraints**
2. **Goal = Submit CPA by June 2025**

Seismic and Structural Appendices 3B - 3H

CPA Chapter/Section 3.7/3.8

The requirements from Section 3.7 and 3.8 of RG 1.70 for the PSAR focus on the seismic and structural methodology and design criteria for Seismic Category I structures:

- PSAR Sections 3.7 and 3.8 describe the seismic and structural methodology and design criteria for the BWRX-300 Seismic Category I structures.

CPA Chapter 3 Appendices

10 CFR 50.34(a)(4) requires a preliminary analysis and evaluation of the design of SSCs with the objective of assessing the risk to public health and safety resulting from operation of the facility.

- Chapter 3 Appendices 3B through 3H provide a *summary of the preliminary analyses* that demonstrate how the design of the Seismic Category I structures and associated foundation comply with the design criteria.

Seismic and Structural Appendices 3B - 3H

1. **CPA Chapter/Section 3.7/3.8 will be included in initial PSAR submittal.**
2. **CPA Chapter 1.5 will provide details on the scope of deferred information and schedule to provide a CPA supplement addressing Chapter3 appendices 3B – 3H**
3. **Goal = Provide CPA supplement prior to end of FY2025**

Aircraft Impact Assessment (AIA)

10 CFR 50.150(b), requires "For applicants identified in paragraph (a)(3) of this section, the preliminary or final safety analysis report, as applicable, must include a description of:

(1) The design features and functional capabilities identified in paragraph (a)(1) of this section; and

(2) How the design features and functional capabilities identified in paragraph (a)(1) of this section meet the assessment requirements in paragraph (a)(1) of this section."

10 CFR 50.150(a)(1) states, in part, "Each applicant ... shall perform a design-specific assessment of the effects on the facility of the impact of a large, commercial aircraft. Using realistic analyses, the applicant shall identify and incorporate into the design those design features and functional capabilities to show that, with reduced use of operator actions:

(i) The reactor core remains cooled, or the containment remains intact; and

(ii) spent fuel cooling or spent fuel pool integrity is maintained."

Strategy for Providing the Aircraft Impact Assessment

PSAR Chapter 3, Appendix 3O includes AIA performed as part of the design-specific assessment includes:

- Local damage analysis of the integrated RB structure based upon the methodology in NEI 07-13 to determine if the RB would suffer local damage, including perforation
- A shock-induced vibration analysis to evaluate functional effects on critical SSCs

More time is needed for a global analysis to evaluate the global effects on the RB structure to be performed

- Scenarios involving the global analysis, such as design and modeling of the juncture between the reactor building walls, roof, and floor, require more research and development.

To allow for that time:

- NRC is requested to review and issue the construction permit pursuant to 10 CFR 50.35(a)
- 10 CFR 50.150(b) will be addressed by a CP amendment to update Appendix 3O with the results of the global analysis, which will be provided prior to completion of construction of the proposed facility.

Justification for 10 CFR 50.35(a)

The TVA PSAR, including plans to address 10 CFR 50.150(b) prior to completion of construction of the proposed facility, satisfies the criteria identified in 10 CFR 50.35(a):

1. The PSAR describes the proposed design of the facility, including the principal architectural and engineering criteria established for the design, most applicably the civil engineering criteria in Chapter 3 that ensure the robustness of the BWRX-300 containment, and has identified the major features or components incorporated therein for the protection of the health and safety of the public.
2. Further technical and design information is needed to complete the safety analysis, specifically the aircraft impact assessment global analysis based on preliminary design. Addressing 10 CFR 50.150(b) can reasonably be left for later consideration, because the PSAR demonstrates that the BWRX-300 civil and structural design is robust and meets or exceeds required criteria. As such, there is no increased risk to the health and safety of the public by allowing more time for this evaluation, which will be supplied in a licensing submittal, no later than FSAR, prior to facility operation.
3. Research and development of the methods and analyses required to address the requirements of 10 CFR 50.150(b) needs to be completed, including further development of design details for the reactor building including junctures between floors, walls, and the roof. Completion of this research and further design development will be implemented in a safeguards information global analysis available for NRC review to resolve any safety questions associated with the AIA. Appendix 3O will be updated to summarize the analysis results.
4. Based on the conclusions of criteria 1 through 3, there is reasonable assurance that: (i) the global analysis to address 10 CFR 50.150(b) will be completed with time for NRC review at or before the latest date stated in the application for completion of construction of the proposed facility, and (ii) the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public.

Proposed PSAR Language

TVA is planning to include this information in Section 3O.1 of Appendix 3O:

Analyses performed as part of this design-specific assessment include:

- *Local damage analysis of the integrated RB structure based upon the methodology in Section 2 of NEI 07-13 (Reference 3O-1), to determine if the RB would suffer local damage including perforation*
- *A shock-induced vibration analysis to evaluate functional effects on critical SSCs*

Additional research and design development are needed to address 10 CFR 50.150(b).

While a local damage analysis and shock-induced vibration analysis have been completed, more time is needed for conducting research and development of a global analysis to evaluate the global effects on the RB structure, including further development of design details for the reactor building such as junctures between floors, walls, and the roof. Completion of this research and further design development will be implemented in a safeguards information global analysis available for NRC review prior to completion of construction of the proposed facility in accordance with 10 CFR 50.35(a).

10 CFR 50.150(b)

1. PSAR Appendix 3O will address AIA local damage analysis and shock vibration analysis and will identify the global analysis as being deferred in accordance with 10 CFR 50.35(a)
2. 10 CFR 50.35(a) Approach Is Justified for Construction Permit Application
3. Appendix 3O will be updated with the global analysis results and submitted to the NRC in a CP amendment

10 CFR 50.34(a)(1)(ii)(D)

As part of the LIC -116 Readiness Assessment, TVA received feedback in two observations (Chapter 3 and 15) related to conformace with 10 CFR 50.34(a)(1)(ii)(D).

*10 CFR 50.34(a)(1)(ii)(D) requires in part "…**analysis of the postulated fission product release**, using the expected demonstrable containment leak rate and any fission product cleanup systems intended to mitigate the consequences of the accidents… to evaluate the offsite radiological consequences." (Emphasis added)*

*"**applicant shall assume a fission product release[3] from the core into the containment…**"*

*Footnote [3] says "The fission product **release assumed for this evaluation should be based upon a major accident, hypothesized for purposes of site analysis or postulated from considerations of possible accidental events**. Such accidents have generally been **assumed to result in substantial meltdown of the core** with subsequent release into the containment of appreciable quantities of fission products." (Emphasis added)*

Strategy for Addressing NRC Feedback

To address NRC feedback on 10 CFR 50.34(a)(1)(ii)(D) adequately, more time is needed for:

- Conduct of additional research and development to address the regulation, including development of methods for determining appropriate accident source terms and development of required dose and dispersion models with appropriate consideration of regulatory guidance applicable to a small modular reactor
- Further technical and design information to be completed. While plant systems and functions that prevent and/or limit the effects of a severe accident have been identified, the detailed design performance characteristics of these features are still being established.

To allow for that time:

- NRC is requested to review and issue the construction permit pursuant to 10 CFR 50.35(a)
- 10 CFR 50.34(a)(1)(ii)(D) will be addressed by GEH's Licensing Topical Report (LTR), NEDC-33913P, BWRX-300 Source Term Methodology
- TVA expects to incorporate LTR results and address any limitations and conditions (if applicable) into the Final Safety Analysis Report (FSAR) as part of the Operating License Application (OLA) prior to plant operation

Justification for 10 CFR 50.35(a)

The TVA PSAR, including plans to address 10 CFR 50.34(a)(1)(ii)(D) prior to completion of facility construction, satisfies the criteria identified in 10 CFR 50.35(a):

1. The PSAR describes the proposed design of the facility, including the principal architectural and engineering criteria established for the design. The PSAR describes the enhanced safety features and functions that provide for defense-in-depth along with the reliable and robust barriers of the design that prevent or minimize the release of radioactive materials, thereby providing for the protection of the health and safety of the public.
2. Further technical and design information is needed to complete the safety analysis, including details for how the plant will respond to severe accidents and development of analytical methods. Addressing 10 CFR 50.34(a)(1)(ii)(D) can reasonably be left for later consideration, because the PSAR demonstrates that the BWRX-300 design results in an extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products. As such, there is no increased risk to the health and safety of the public by allowing more time for this evaluation, which will be addressed in the FSAR prior to operation.
3. Research and development of the methods and analyses required to address the requirements of 10 CFR 50.34(a)(1)(ii)(D) needs to be completed, including further development of design details for severe accident response. Completion of this research and further design development will be documented in LTR NEDC-33913P for NRC review to resolve any safety questions associated with the evaluation.
4. Based on the conclusions of criteria 1 through 3, there is reasonable assurance that: (i) the evaluation to address 10 CFR 50.34(a)(1)(ii)(D) will be completed with time for NRC review prior to completion of construction of the proposed facility, and (ii) the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public, as the PSAR demonstrates that the BWRX-300 design results in an extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products.

Proposed PSAR Changes

TVA is planning to include a new paragraph at the end of Section 15.0:

> *Additional research and design development are needed to address 10 CFR 50.34(a)(1)(ii)(D). The inherent safety features of the BWRX-300 design, along with the systematic approach of the Safety Strategy, results in robust resiliency to PIEs and event sequences. Thus, events that could result in substantial meltdown of the core are extremely infrequent (i.e., DECs), and the BWRX-300 design demonstrates an "extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products" pursuant to 10 CFR 50.34(a)(1)(ii). Scenarios involving a hypothetical core melt and the methods to analyze them require more research and further technical design information to be developed in accordance with 10 CFR 50.35(a). Therefore, 10 CFR 50.34(a)(1)(ii)(D) will be satisfactorily resolved prior to completion of construction of the proposed facility and will be described in the FSAR*.

TVA is planning to include a new sentence in PSAR Section 3.1 under the PDC 19 evaluation:

> *As described in Section 15.0, 10 CFR 50.34(a)(1)(ii)(D) is the subject of further research and technical design development in accordance with 10 CFR 50.35(a).*

10 CFR 50.34(a)(1)(ii)(D)

1. 10 CFR 50.35(a) Approach Is Justified for Construction Permit Application

NRC Observation related to 10 CFR 50.34(a)(1)(ii)(D) is being addressed by updating PSAR Chapter 15 and Section 3.1 to identify the need for more time to develop further research and design information pursuant to 10 CFR 50.35(a)

2. LTR NEDC-33913P Will Address 10 CFR 50.34(a)(1)(ii)(D)

BWRX-300 Source Term Methodology LTR will address the requirement of 10 CFR 50.34(a)(1)(ii)(D), and the LTR results will be incorporated into the FSAR as part of the OLA prior to plant operation

Question /Comments


TVA
TENNESSEE
VALLEY
AUTHORITY