



UNITED STATES
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MEMORANDUM TO: Jennivine Rankin, Acting Chief
Licensing Branch 3
Division of New Reactor Licensing
Office of New Reactors

FROM: Mallecia A. Sutton, Project Manager **/RA/**
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Office of New Reactors

SUBJECT: SUMMARY REPORT FOR THE REGULATORY AUDIT OF
CLINCH RIVER NUCLEAR EARLY SITE PERMIT APPLICATION
– PART 6 EXEMPTIONS AND DEPARTURES, EMERGENCY
PLANNING EXEMPTIONS

By letter dated May 12, 2016, the Tennessee Valley Authority (TVA) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for an early site permit (ESP) for the Clinch River Nuclear (CRN) Site located in Oak Ridge, Tennessee. TVA subsequently provided supplemental information in support of the application and the NRC staff accepted the application for docketing and detailed review on December 30, 2016. A notice of NRC's docketing decision was published in the *Federal Register* on January 12, 2017 (82 FR 3212).

As part of the NRC staff's review of the emergency planning exemptions requested in Part 6 of the CRN Site ESP application, the NRC staff conducted an audit of the calculations supporting TVA's response to the staff's request for additional information Letter No. 7, eRAI-8885, received by letter dated August 24, 2017. The audit plan used to support these interactions is located in the NRC's Agencywide Documents Access and Management System under Accession No. ML17311A908.

The audit began November 15, 2017, and ended on February 8, 2018. The audit summary report is enclosed.

Docket No.: 52-047

Enclosure:
Audit Summary Report

cc w/encl.: See next page

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SUBJECT: SUMMARY REPORT FOR THE REGULATORY AUDIT OF CLINCH RIVER
NUCLEAR EARLY SITE PERMIT APPLICATION – PART 6 EXEMPTIONS AND
DEPARTURES, EMERGENCY PLANNING EXEMPTIONS

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**TENNESSEE VALLEY AUTHORITY CLINCH RIVER NUCLEAR
EARLY SITE PERMIT APPLICATION
SUMMARY REPORT OF AUDIT
REGARDING EMERGENCY PLANNING EXEMPTIONS
NOVEMBER 15, 2017 – FEBRUARY 8, 2018**

1.0 BACKGROUND AND PURPOSE

The Tennessee Valley Authority (TVA) submitted requests for exemption from certain emergency planning requirements to the U.S. Nuclear Regulatory Commission (NRC) in Part 6 of the Clinch River Nuclear (CRN) Site Early Site Permit (ESP) Application. As part of its review of the exemption requests, the staff issued a request for additional information (RAI) for clarifying information. By letter dated August 24, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17237A175), TVA submitted its response to RAI Letter No. 7, eRAI-8885. In this letter, TVA described a representative analysis done to show that the technical basis criteria for the plume exposure pathway emergency planning zone (EPZ) size determination given within CRN Site in Site Safety Analysis Report (SSAR) Section 13.3.3 can be met for one small modular reactor (SMR) design included in the ESP application plant parameter envelope (PPE). Based on questions raised in its review of the RAI response, the staff subsequently issued supplemental RAI Letter No. 10, eRAI-9206 (ADAMS Accession No. ML17313B185) to get additional information on the representative analysis information and its relationship to the ESP application PPE.

The audit was performed to examine and evaluate non-docketed information such as calculations and analysis worksheets to gain a better understanding of the analyses that support TVA's August 24, 2017, response to RAI Letter No. 7, eRAI-8885, Question 2. The staff also performed the audit to identify any information which would be required to be placed on the docket to support the basis for a finding of reasonable assurance of no undue risk to the public health and safety, related to the proposed exemptions to emergency preparedness requirements.

2.0 AUDIT REGULATORY BASES

A regulatory audit is a planned, license or regulation-related activity that includes the examination and evaluation of primarily non-docketed information. A regulatory audit is conducted with the intent to gain an understanding, verify information, and/or identify information that will require docketing to support the basis of the licensing or regulatory decision. The NRC staff conducted an audit of non-docketed radiological consequence analyses and supporting information to aid in its understanding of the response to staff questions and assist in the review of the CRN Site ESP application request for exemptions.

Specifically, this regulatory audit is based on the following:

- NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)"
- Regulatory Guide (RG) 1.206, "Combined License Applications for Nuclear Power Plants"

Enclosure

- Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, “Standards for Protection Against Radiation”
- 10 CFR 50.33(g), “Contents of applications; general information”
- 10 CFR 50.47(b) and (c)(2), “Emergency Plans”
- 10 CFR Part 50, Appendix E, “Emergency Planning and Preparedness for Production and Utilization Facilities”
- 10 CFR 52.7, “Specific exemptions”
- Methodology from NUREG-0396, “Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants,” December 1978

3.0 AUDIT OBJECTIVES

The NRC staff’s objective in conducting this audit was to gather information on the applicant’s bases for the request for exemption from requirements to have a plume exposure pathway EPZ of around 10 miles in radius, including calculations and analyses that support the response to eRAI-8885, with the following goals:

- Determine how the representative analysis described in TVA’s response to RAI Letter No. 7, e-RAI-8885, Question 2, implements the CRN Site in SSAR Section 13.3 methodology;
- Observe the representative design vendor-related information used as input to the analysis;
- Gain understanding of the selection of severe accident scenarios used in the representative analysis;
- Observe the vendor-supplied information on design basis and severe accident releases used to develop the ESP application PPE; and
- Gain understanding of the representative analyses and identify the need for any RAIs.

4.0 SCOPE OF THE AUDIT AND AUDIT ACTIVITIES

The audit was conducted November 15, 2017, through February 8, 2018, by reviewing documents available to the NRC staff in TVA's Electronic Reading Room (eRR). In addition, the staff had the opportunity to gain an overview of the audited information and get further clarifications during two face-to-face meetings between the staff and TVA, (including their contractor NuScale), on November 15 and December 13, 2017. The NRC staff conducted the audit in accordance with the Office of New Reactors (NRO) Office Instruction NRO-REG-108, "Regulatory Audits" (Reference 1).

Members of the audit team, listed below, were selected based on their detailed knowledge of design basis accident (DBA) radiological consequence assessment and severe accident consequence assessment; their experience supporting previous ESP reviews; their knowledge of the regulatory framework regarding exemptions; and their knowledge regarding implementation of the review framework for SMRs. Audit team members included:

- Michelle L. Hart, Sr. Reactor Engineer (NRO/DSEA/RPAC)
- Mallecia A. Sutton, Project Manager (NRO/DNRL/LB3)

On November 15, 2017, an entrance meeting was conducted and on December 13, 2017, a clarification meeting was held at the NuScale office in Rockville, Maryland, to review key elements of the audit plan (ADAMS Accession No. ML17311A908). The documents reviewed by the staff during the audit are listed below:

Filename	Description
9.1.1 0-2 hr at EAB(1).pdf	PPE worksheet information: TVA consolidation of vendor information on exclusion area boundary (EAB) atmospheric dispersion (χ/Q) values and distance. Revision 6 dated 2016
9.1.1.a 0-2 hr at EAB (vendor value)(1).pdf	PPE worksheet information: TVA consolidation of vendor information on EAB χ/Q values and distance. Revision 3 dated 2015
9.1.2 0-8 hr at LPZ(1).pdf	PPE worksheet information: TVA consolidation of vendor information on low population zone (LPZ) χ/Q values for 0-8 hr period and distance. Revision 6 dated 2016
9.1.2.a 0-8 hr at LPZ (vendor value)(1).pdf	PPE worksheet information: TVA consolidation of vendor information on LPZ χ/Q values and distance for 0-8 hr period. Revision 3 dated 2015
9.1.3 8-24 hr at LPZ(1).pdf	PPE worksheet information: TVA consolidation of vendor information on LPZ χ/Q values for 8-24 hr period and distance. Revision 6 dated 2016

9.1.4 1-4 day at LPZ(1).pdf	PPE worksheet information: TVA consolidation of vendor information on LPZ χ/Q values for 1-4 day period and distance. Revision 6 dated 2016
9.3.2 Post-Accident(1).pdf	PPE worksheet information: TVA consolidation of vendor information on DBA dose results. Includes determination of bounding dose results at EAB and LPZ and identification of related vendor. Revision 3 dated 2015
CRN ESP Emergency Preparedness Audit Information.pdf	TVA Table providing relationship of documents provided in the electronic reading room for audit related to RAI 9206 questions. (undated)
ECN-P030-5908 V01 Signed.pdf	NuScale engineering change notice "Additional Dose Results and Methodology Comparison," Revision 1, (undated) provided to TVA to add information to previously provided example calculation (ER-P030-5335). Added 50 percentile doses to mean and 95 percentile results, added appendix to describe how the calculation compares to the CRN SSAR 13.3 methodology. Provided to support audit and TVA response to eRAI-9206, Question 2.
ER P030 00005335 01 Site Boundary Dose Estimate for Clinch River Site (3).pdf	NuScale calculation package "Site Boundary Dose Estimate for Clinch River Site", Revision 1 provided to TVA to give example of implementation of EPZ size methodology and show that analyses for the NuScale SMR would support plume exposure pathway EPZ at site boundary and at 2 miles. Dated 7/10/2017
List of References.pdf	TVA list of references used to develop "Draft SE Language with SMR definition.pdf" and "Special Circumstances Substantiation 1.23.pdf." All references are publically available.
NSIR RAI 11 Draft Response.pdf	Draft responses to eRAI-9227, Question 2, to remove exemptions related to ingestion pathway EPZ – which is to be addressed at combined license application.
PPE 9.5.2 R7(1).pdf	PPE worksheet information: TVA consolidation of vendor information on limiting accident gaseous activity releases (DBA source term release to environment), includes assessment of margin to dose criteria, assessment of pool decontamination factor. Revision 7 dated 2017
Radiation Protection Supplemental Information(1).pdf	Information developed by TVA to address health physics audit information needs. Includes markup of ESP application SSAR sections to clarify basis for annual liquid and normal

	gaseous radioactive effluent releases in PPE. (staff determined not needed for this audit)
Special Circumstances Substantiation 1.23.pdf	TVA overview discussion of the special circumstances that justify a unique emergency planning approach for SMRs at the CRN Site. (undated)

During the audit, the staff contacted TVA staff to address staff questions while reviewing documents. An audit exit meeting was held February 8, 2018, by telephone to discuss feedback items between the TVA staff and the NRC staff. The staff's summary of observations is given below and is based on the notes taken by the NRC staff during the audit. The NRC staff did not acquire any documents during the audit.

5.0 SUMMARY OF OBSERVATIONS

Based on the NRC staff's audit of the applicant's documentation of representative plume exposure pathway EPZ size determination analysis and related calculations and analyses, the staff observed the following:

1. The staff was able to understand more fully the representative analysis described in TVA's response to eRAI-8885 from the information provided in the eRR. The staff observed that the NuScale calculation packages used design information consistent with the information provided for the NuScale design certification review (Docket No. 52-048), and the analysis is consistent with the methodology in CRN Site in SSAR Section 13.3 to determine the estimated dose at the CRN exclusion area boundary. Therefore, based on the staff's improved understanding of the representative analysis, this audit item is closed.
2. The staff observed that if the applicant would provide the 50th percentile dose results for the representative analysis on the docket in the response to eRAI-9206, this would provide additional context with respect to the margin to the EPZ size dose criteria, as stated in SSAR 13.3. TVA agreed to consider adding this information in the response to eRAI-9206. TVA's second partial response to eRAI-9206, dated March 30, 2018 (ADAMS Accession No. ML18089A605), included this information as supplemental information not related to eRAI-9206. Therefore, based on the docketing of the requested information, this audit item is closed.
3. The staff informed TVA that clarifying information is required to be docketed to summarize information from the representative analysis calculation package which demonstrates how the NuScale calculation methodology compares to the EPZ size analysis methodology in CRN Site in SSAR Section 13.3. TVA agreed to provide additional information on the docket. TVA's first partial response to eRAI-9206, dated March 9, 2018 (ADAMS Accession No. ML18068A732), included this information. Therefore, based on the docketing of the requested information, this audit item is closed.
4. The staff discussed with TVA the need to provide a set of plant parameters, similar to the SSAR PPE accident source term used as a basis for the SSAR Chapter 15, "Accident Analysis," DBA analysis. A plant parameter release source term which formed

the basis for the representative analysis, or a generalization of the release source term to encompass other SMRs, should be provided on the docket to provide the basis for staff to determine whether there is reasonable assurance that an SMR chosen in the combined license application could justify a plume exposure pathway EPZ size less than required in the regulations, thereby supporting exemption from that requirement. This topic was not fully resolved during this audit and is instead further being explored in a separate related regulatory audit performed in April 2018. The audit plan for this second audit is in ADAMS Accession No. ML18095A083.

5. The staff noted that information for Turkey Point, as a medium-sized 3 Loop PWR, could be added to the tables comparing parameters for SMRs to large light-water reactors in the response to eRAI-8885, Question 1, should be provided on the docket for additional context to show how SMR compares to a range of currently operating reactors. TVA agreed to consider adding this information. TVA's second partial response to eRAI-9206, dated March 30, 2018, included this information. Therefore, based on the docketing of the requested information, this audit item is closed.
6. The staff determined that additional RAIs were not needed. Other than Item 4 above, which was included in the subsequent audit, there are no unresolved issues related to this audit.

6.0 **REFERENCES**

1. NRO Office Instruction, NRO-REG-108, "Regulatory Audits," Revision 0, dated April 2009.
2. CRN Site in SSAR Section 13.3, Revision 1 (ADAMS Accession No. ML18003A369)
3. August 24, 2017, TVA response to RAI Letter No. 7, eRAI-8885 (ADAMS Accession No. ML17237A175)

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(Revised 04/22/2018)

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