



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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July 9, 2018

MEMORANDUM TO: Jennivine Rankin, Acting Chief
Licensing Branch 3
Division of Licensing, Siting, and Environmental Assessment
Office of New Reactors

FROM: Mallecia A. Sutton, Project Manager */RA/*
Licensing Branch 3
Division of Licensing, Siting, and Environmental Assessment
Office of New Reactors

SUBJECT: SUMMARY REPORT FOR THE SECOND REGULATORY AUDIT OF
CLINCH RIVER NUCLEAR SITE 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 3812).

As part of the staff's review of the emergency planning exemptions requested in Part 6 of the CRN early site permit application, the Radiation Protection and Accident Consequences Branch conducted an audit of the calculations supporting TVA's response to the staff's Request for Additional Information Letter No. 10, eRAI-9206, received by letters dated March 9 and March 30, 2018. The audit plan used to support these interactions is located in NRC's Agencywide Documents Access and Management System under Accession No. ML18095A083.

The audit began April 12 and ended on April 27, 2018. The audit summary report is enclosed.

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Docket No.: 52-047

Enclosures:
Audit Summary Report

cc w/encl.: See next page

SUBJECT: SUMMARY REPORT FOR THE SECOND REGULATORY AUDIT OF CLINCH RIVER NUCLEAR SITE EARLY SITE PERMIT APPLICATION – PART 6 EXEMPTIONS AND DEPARTURES, EMERGENCY PLANNING EXEMPTIONS DATED JULY 9, 2018

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(Revised 05/21/2018)

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TENNESSEE VALLEY AUTHORITY CLINCH RIVER NUCLEAR
EARLY SITE PERMIT APPLICATION
SUMMARY REPORT OF SECOND AUDIT
REGARDING EMERGENCY PLANNING EXEMPTIONS
APRIL 12 – 27, 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 Application (ESPA). 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 ESPA plume exposure pathway (PEP) emergency planning zone (EPZ) size determination given within CRN Site Safety Analysis Report (SSAR) Section 13.3.3, "Emergency Planning Zones," can be met for one small modular reactor (SMR) design included in the ESPA 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 further information on the representative analysis information and its relationship to the ESPA PPE. TVA's response to eRAI-9206 was provided in two documents dated March 9 and March 30, 2018 (ADAMS Accession Nos. ML18068A732 and ML18089A605, respectively).

The audit was performed to examine and evaluate non-docketed information such as calculations and analysis worksheets to gain a better understanding of TVA's responses to the questions in RAI Letter No. 10, eRAI-9206, including development of plant parameters related to the evaluation of plume exposure pathway EPZ size to support the exemption requests. As described in the summary of observations in Section 5.0, the staff also identified information included in the audit 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 the non-docketed and proprietary 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 ESPA request for exemptions.

Enclosure

Specifically, this regulatory audit is based on the following:

- NUREG-0800, “Standard Review Plan”
- Regulatory Guide (RG) 1.206, “Combined License Applications for Nuclear Power Plants”
- Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, “Standards for Protection Against Radiation”
- 10 CFR 50.12(a)(1), “with regards to undue risk to public health and safety”
- 10 CFR 50.12(a)(2)(ii), “with regards to demonstrating special circumstances”
- 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 eRAI-9206, with the following goals:

- Gain a better understanding of the representative radiological consequence analyses supporting TVA’s March 30, 2018, response to RAI Letter No. 10, eRAI-9206.
- Gain a better understanding of the applicant’s development of design basis and severe accident releases for the non-design-specific plant parameters related to the EPZ exemption requests as presented in Enclosure 1 of TVA’s March 30, 2018, response to RAI Letter No. 10, eRAI-9206.
- Develop any needed RAIs to clarify understanding of analyses.

4.0 SCOPE OF THE AUDIT AND AUDIT ACTIVITIES

The audit was conducted April 12 through April 27, 2018, through review of documents available to the staff in TVA’s electronic reading room (eRR). In addition, the staff had the opportunity to gain an overview of the audited information and also get further clarifications during one face-to-face meeting between the staff and TVA, including their contractor NuScale, on April 12, 2018.

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 early site permit 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 April 12, 2018, an entrance meeting was held at the NuScale office in Rockville, MD, to review key elements of the audit plan (ADAMS Accession No. ML18095A083). The document reviewed by the staff during the audit is listed below:

- NuScale calculation ER-P030-5335, Revision 2, "Site Boundary Dose Estimate for Clinch River Site"

During the audit, the staff contacted TVA staff to address staff questions while reviewing documents. An audit exit meeting was held May 7, 2018, by telephone to discuss feedback from the TVA staff and the NRC staff. The staff's summary of observations given below 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 PEP EPZ size determination analysis, determination of related plant parameter accident release source terms, and related calculations and analyses, the staff observed the following:

1. Through review of the proprietary NuScale calculation package in the eRR, the staff was able to understand more fully the inputs, assumptions and methodology used in the representative analysis of the consequences of accidents at the site boundary for the NuScale design. The staff noted that the NuScale analysis used design information that is consistent with the current state of the NuScale design certification review, and conformed to the methodology presented in CRN SSAR 13.3 for evaluation of the EPZ size. The NuScale calculation also included sensitivity analyses that varied modeling assumptions and inputs related to atmospheric transport and dispersion and CRN site specific information. The analysis showed that for the current information for the NuScale design, which is evaluated as a representative SMR within the ESPA PPE, the dose consequences of design basis and more probable severe accidents would be less than the TVA SSAR Section 13.3 EPZ size dose criteria at the CRN site boundary. Therefore, based on the staff's improved understanding of the representative analysis that supported TVA's response to RAI Letter No. 10, eRAI-9206, Question 1, this audit item is closed.
2. NuScale calculation ER-P030-5335 was updated in Revision 2 to include updated NuScale design information and add Appendix G to describe the development of a non-design-specific plant parameter atmospheric release source term related to assessment of the EPZ size exemptions. This plant parameter source term was presented in

Table 5, "EPZ PPE Source Term," in Enclosure 1 of TVA's response to RAI Letter No. 10, eRAI-9206, Question 1, dated March 30, 2018. The staff's review of Appendix G focused on the explanation of the development of non-design-specific plant parameter atmospheric release source term.

The staff observed that the development of the non-design-specific plant parameter source term included accident isotopic release information (three source terms) from different sources; (1) the PPE bounding SSAR Chapter 15 DBA atmospheric release source term, and (2) DBA and severe accident atmospheric releases for the NuScale design used to evaluate EPZ size taken from the main body of NuScale calculation ER-P030-5335 (i.e., the representative analysis). The staff observed that the method used to develop the non-design-specific plant parameter atmospheric release source term was consistent with the description in Enclosure 1 of TVA's response to RAI Letter No. 10, eRAI-9206, Question 1, dated March 30, 2018. The analysis determined a composite 96-hr total activity per nuclide release source term based on the maximum per nuclide release from three source terms described above, with an additional margin of 25 percent (TVA composite + 25% source term). Then, the TVA composite + 25 percent was used as the basis for input to a series of input cases to the MELCOR Accident Consequence Code System (MACCS) radiological consequence code to determine a maximized atmospheric release source term that would meet the EPZ size methodology dose criteria at the site boundary. Through review of the MACCS analysis cases, the staff noted that the nuclide activity release inputs were adjusted to ensure that the total nuclide release activities in MACCS analysis Case D that was chosen as the "EPZ PPE Source Term" was bounding for the TVA composite + 25 percent atmospheric release source term. The staff noted that the MACCS analysis cases added additional release margin, while remaining below the EPZ size dose criteria at the site boundary, by approximately 10 percent for the selected Case D.

The staff observed that the MACCS Case D released activity from containment reported in ER-P030-5335, Revision 2, Appendix G, is the same as was provided in Table 5 in Enclosure 1 of TVA's response to RAI Letter No. 10, eRAI-9206, Question 1, dated March 30, 2018. The staff notes that the method used to develop the "EPZ PPE Source Term" considered accident release information from a range of accidents (both DBAs and severe accidents) and from a range of SMR designs considered in the CRN ESPA, including the smallest core power (NuScale) and the largest core power (Westinghouse SMR, as the ESPA PPE accident source term). The staff also notes that the method used to develop the "EPZ PPE Source Term" included conservatism both in the amount of activity assumed to be released to the atmosphere and in the margin to the EPZ size dose criteria at the site boundary. Therefore, based on the staff's improved understanding of the development of the non-design-specific plant parameter atmospheric release source term related to the EPZ exemption requests, this audit item is closed.

3. The staff determined that additional RAIs were not needed. There are no unresolved issues related to this audit.

6.0 REFERENCES

1. NRO Office Instruction, NRO-REG-108, "Regulatory Audits," Revision 0, April 2009
2. CRN ESPA SSAR Section 13.3 (ADAMS Accession No. ML18003A369)

3. August 24, 2017, TVA response to RAI Letter No. 7, eRAI-8885 (ADAMS Accession No. ML17237A175)
4. March 9, 2018, TVA partial response to RAI Letter No. 10, eRAI-9206 (ADAMS Accession No. ML18068A732)
5. March 30, 2018, TVA partial response to RAI Letter No. 10, eRAI-9206 (ADAMS Accession No. ML18089A605)