

ClinchRiverESPHFNPEm Resource

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To: Schiele, Raymond Joseph
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**AUDIT PLAN FOR AREAS COVERED IN SECTION 2.5 OF THE SITE SAFETY
ANALYSIS REPORT, CLINCH RIVER NUCLEAR SITE
EARLY SITE PERMIT APPLICATION**

APPLICANT: Tennessee Valley Authority (TVA)

DATES: May 8-9, 2017

LOCATIONS: TVA Knoxville Office Complex
400 West Summit Hill Drive
Knoxville, Tennessee 37902

Clinch River Nuclear Site
Oak Ridge, Tennessee

AUDIT TEAM: David Heeszal, Team Leader (NRO/DSEA/RGS)
Alice Stieve (NRO/DSEA/RGS)
Weijun Wang (NRO/DSEA/RGS)
Ricardo Rodriguez (NRO/DSEA/RGS)
Laurel Bauer (NRO/DSEA/RGS)

PROJECT MANAGER: Allen Fetter (NRO/DNRL/LB3)

BACKGROUND AND AUDIT OBJECTIVE

Tennessee Valley Authority (TVA) submitted geologic, seismic and geotechnical engineering characterization information to the U.S. Nuclear Regulatory Commission (NRC) as part of their Clinch River Nuclear Site (CRNS) Early Site Permit (ESP) application. In preparation for the audit, the NRC staff reviewed the data and information within Section 2.5 of the Site Safety Analysis Report (SSAR), as supplemented, and identified information needs that the staff requires to complete its review.

In conjunction with the information audit, which will take place at the TVA Knoxville Office, most members of the NRC staff will visit the CRN site and surrounding area in an effort to become familiar with the site layout, the surrounding geologic and tectonic features, and the site physiography. At the CRN Site, NRC staff will also have the opportunity to examine geologic core samples collected during site investigations. Both venues will provide the staff an opportunity to discuss the information needs identified during the staff's initial review of the application and associated SSAR sections with TVA's subject matter experts (SMEs), staff and contractors. During the audit, the staff will review and discuss probabilistic seismic hazard analysis evaluations methodology, and karst formation evaluation proposed in the SSAR, as well as associated calculation packages and supporting modeling documentation (as needed). The audit will allow the NRC staff to better understand the CRN site and applicant's modeling results. The audit will also assist the NRC staff in identifying any subsequent requests for additional information needed so that the staff can conduct a complete review of the CRNS ESP application and make appropriate safety conclusions concerning site characteristics and site suitability.

REGULATORY AUDIT BASES

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”
- 10 CFR 100.23, “Geologic and Seismic Siting Criteria”
- 10 CFR 52.17 Contents of Applications; Technical Information, subparts (a)(1)(ii) and (a)(1)(vi)
- 10 CFR Part 50, Appendix A, General Design Criterion 2

AUDIT ACTIVITIES AND SCHEDULE

The NRC staff will conduct the review over a period of two business days, May 8-9, 2017. If necessary, the audit can be extended until noon May 10, 2017. The need for an extension will be determined by the NRC staff responsible for the audit before the planned adjournment of the meeting on May 9th.

An agenda for the audit is presented in Attachment A. Attachment B contains specific information needs for each review section. If necessary, any circumstances related to the conductance of the audit will be communicated to the safety project manager, Allen Fetter (NRC), at 301 415-8556 or at allen.fetter@nrc.gov.

DELIVERABLES

The audit team plans to issue an audit report within 90 days after completing the audit.

¹SSAR and Electronic Reading Room documents should be available to facilitate discussion.

²Seismologists and Geotechnical Engineers only need to see prospective sites within the boundary.

AGENDA

**Tennessee Valley Authority (TVA) Clinch River Nuclear (CRN) Early Site Permit Site Audit
 Pertaining to the Review of the Clinch River Site Safety Analysis Report, Section 2.5
 TVA Knoxville Office, Knoxville, Tennessee
 TVA CRN Proposed Site, Oak Ridge, Tennessee**

Monday, May 8, 2017, MORNING SESSION: [AUDIT - Proprietary](#)

| | | |
|------------------------|--|-----------|
| 8:30 a.m. - 8:45 a.m. | Audit Entrance / Introduction | [NRC/TVA] |
| 8:45 a.m. - 12:00 p.m. | Documentation Review and Discussion: Methodology for seismic calculations and analysis, void formation evaluation and associated calculations ¹ | [NRC/TVA] |
| 12:00 p.m. - 1:00 p.m. | Lunch | |

Monday, May 8, 2017, AFTERNOON SESSION: [AUDIT - proprietary](#)

| | | |
|-----------------------|---|-----------|
| 1:00 p.m. - 4:30 p.m. | Documentation Review and Discussion continued and field trip for geology review | [NRC/TVA] |
| 4:30 p.m. - 4:45 p.m. | NRC Internal Caucus | [NRC] |
| 4:45 p.m. - 5:00 p.m. | Debrief Summary | [NRC/TVA] |
| 5:00 p.m. | Adjourn | |

Tuesday, May 9, 2017, MORNING SESSION: [AUDIT - proprietary](#)

| | | |
|------------------------|--|-----------|
| 9:00 a.m. - 12:15 p.m. | Site Tour Examinations of cores/samples, area/vicinity geologic features | [NRC/TVA] |
| 12:15 p.m.- 1:00 p.m. | Lunch | |

Tuesday, May 9, 2017, AFTERNOON SESSION: [AUDIT - proprietary](#)

| | | |
|-----------------------|--|-----------|
| 1:00 p.m. - 4:30 p.m. | Site Tour (area/vicinity geologic features continued) ² | [NRC/TVA] |
| 4:30 p.m. - 4:45 p.m. | NRC Internal Caucus | [NRC] |
| 4:45 p.m. - 5:00 p.m. | Audit Exit | [NRC/TVA] |
| 5:00 p.m. | Adjourn | |

Information Needs Specific To Site Safety Analysis Report Sections

2.5.1 Geologic Information

Field trip to visit features described in Site Safety Analysis Report (SSAR) text or illustrated in SSAR figures (if possible):

1. Visit the surface projection location of Shear Fracture Zone on site (Figure 2.5.1-65) and across the river if that location is accessible and currently exposed as indicated in CNL-16-162, p E1-36.
2. Visit location of Chestnut Ridge and Copper Creek faults in site location.
3. Visit Quaternary deposits and landforms (terraces) in site area.
4. Visit 2 Sinkhole clusters on site (northern boundary) and to the SE (as indicated on fig 2.5.1-46)
5. Visit pinnacle and cutter exposure near Copper Ridge Cave (fig 2.5.1-40), an abandoned phreatic cave within site area. Visit both the hillside exposure and the cave.

Examine specific core for:

1. Examples of shear fracture zone and other fracture zones (to distinguish the difference between shear fracture zones from fracture zones) in boreholes: 21 ft. in **MP 423** (718-697 ft. elev, runs 13,14,15,16,17,18); 18 and 6 ft in **MP 201** (644-626 ft elev, runs 27,28,29,30) and (497-491 ft elev, runs 56 & 57)); and 6 ft in **MP 101** (553-547 ft elev, runs 47, 48), based on information from Tables 2.5.1-16 and -17.
2. Examples of open voids in boreholes (information from ESP Table 2.5.1-11) MP 418 (void at ~ 756 and ~735 ft elev)
3. Examples of clay or soil filled voids as described in CNL-16-162:

CNL-16-162, pE2-17: A number of the cavities encountered in the boreholes were partially to completely filled with clay or soil.
4. Examples of Knox unconformity (Blackford/Knox contact) from borehole **MP 201**, suggest 305-315 ft depth, and **MP 423** suggest 275-280 ft depth, based on information in ESP SSAR Table 2.5.1-2

Discussion topics:

Discuss your evaluation of landslide hazard at the site location in consideration of SSAR Section 2.5.3.8.2.2 and regional scale Figures 2.5.1-22 & 2.4.9-5

Discuss information in Tables 2.5.1-16 and 2.5.1-17.

Information Needs Specific To Site Safety Analysis Report Sections

2.5.2 Vibratory Ground Motion

Discussion topics:

Discuss how rates and recurrence values for the Eastern Tennessee Seismic Zone (ETSZ) are considered in CEUS-SSC (Central and Eastern United States – Seismic Source Characterization) and how the treatment of the ETSZ distributed seismicity might impact the site-specific PSHA (Probabilistic Seismic Hazard Analysis)

Discuss development of 1-D site response analysis profiles in consideration of local geology (e.g. single velocity profile adjusted up or down vs depth or formation specific velocity profile).

Discuss total site variability considered in site response in comparison to the total observed variability in geophysical data collected at the site.

2.5.4 Geotechnical Engineering

Examine specific core/sample for:

Borings MP101, MP201, and MP202 with emphasis on shear fracture features

Discussion Topics:

Plaxis model calculation package

Bearing capacity and settlement packages

Discuss the material in Section 2.5.1.2.3.4 *Estimation of hypothetical large void* in consideration of the material in the Rizzo Report.

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