



UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of

TENNESSEE VALLEY AUTHORITY

(Clinch River Nuclear Site Early Site Permit
Application)

Docket No. 52-047-ESP

Hearing Exhibit

Exhibit Number:

Exhibit Title:

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

Before the Commission

In the Matter of)
)
Tennessee Valley Authority) Docket No. 52-047-ESP
)
Clinch River, Early Site Permit)

**APPLICANT’S PRE-FILED TESTIMONY
IN SUPPORT OF THE MANDATORY HEARING FOR THE
CLINCH RIVER NUCLEAR SITE EARLY SITE PERMIT**

I. WITNESS FOR THE UNCONTESTED HEARING

Q1. Please State your full name.

A1. My name is Daniel Stout. I am the Director, Nuclear Technology Innovation for the Tennessee Valley Authority (“TVA”). I have overall responsibility for the development of the Clinch River Nuclear (“CRN”) Site Early Site Permit Application (“ESPA”) and other State and Federal permits and approvals. My business address is 1101 Market Street, Chattanooga, Tennessee 37402.

Q2. Please describe your educational and professional background.

A2. I have over 34 years of experience in the nuclear energy sector. At TVA I am responsible for the scope, schedule, budget and business planning associated with licensing and potential deployment of small modular reactors, life extension of the nuclear fleet, and identification and implementation of nuclear innovations. Prior to joining TVA, I served as Director, Nuclear Fuel Recycling, at the Department of Energy and was responsible for planning and policy development regarding nuclear fuel recycling, and earlier I worked in the uranium enrichment industry with responsibility for research and development, engineering, and licensing of

advanced uranium enrichment technologies and facilities. I served in the United States Navy as a nuclear submarine officer from 1985-1991, and the Naval Reserves in the Naval Special Warfare community from 1991-2007, retiring as a Commander. I earned a Bachelor of Science degree in Oceanography from the U.S. Naval Academy, and a Master of Science degree in Engineering Management from the National Technological University. I serve on the Board of the Nuclear Industry Council and as Chairman of SMR Start. I am an adviser to the Oak Ridge National Laboratory and an active member of the American Nuclear Society and the Nuclear Energy Institute. My *curriculum vitae* is provided as Exhibit CRN-002.

Q3. What is the purpose of your testimony?

A3. The purpose of my testimony is to support the findings that the Commission must make as part of the mandatory hearing on uncontested issues for the CRN Site ESPA proceeding.

II. BACKGROUND

Q4. Please briefly describe TVA's Early Site Permit Application for the CRN.

A4. TVA filed its ESPA for the CRN Site on May 12, 2016. The CRN Site ESPA has been updated and revised since the initial filing, most recently on January 18, 2019. The CRN Site ESPA seeks an Early Site Permit ("ESP") under 10 C.F.R. Part 52, Subpart A, for approval of the CRN Site for a Small Modular Reactor ("SMR") nuclear facility, as further described in TVA's application, separate from the filing of an application for a construction permit or combined license for the facility. TVA developed its ESPA using the Plant Parameter Envelope (PPE) approach. TVA used technical information from various SMR reactor designs to develop parameters that bound the proposed SMR facility in order to evaluate the suitability of the CRN Site for future construction and operation.

Q5. Please describe the ownership of the CRN Site.

A5. The CRN Site is owned by the United States of America and managed by TVA.

Q6. Can you briefly describe how the CRN Site ESPA is organized?

A6. The CRN Site ESPA is composed of six parts. Each of these is identified below, along with the current revision of each part:

- Part 1 – Administrative Information (Revision 1)
- Part 2 – Site Safety Analysis Report ("SSAR") (Revision 2)
- Part 3 – Environmental Report ("ER") (Revision 2)
- Part 5 – Emergency Planning (Revision 1)
- Part 6 – Exemptions and Departures (Revision 2)
- Part 7 – Withheld Information (Revision 2)

TVA is not pursuing a "Part 4 – Limited Work Authorization" in its ESPA.

Q7. Does the CRN Site ESPA contain any exemption requests from NRC regulations?

A7. Yes. The ESPA contains two sets of exemption requests for an approximate 2-mile Plume Exposure Pathway (“PEP”) Emergency Planning Zone (“EPZ”), referred to as the “2-mile EPZ,” and a PEP EPZ established at the site boundary, referred to as the “Site Boundary EPZ.” These exemption requests are discussed in Part 6, Section 1 of the ESPA, “Clinch River Nuclear Site Exemptions Requests,” and described in the following tables from Part 6:

- Table 1-1 – Exemptions Requested from 10 C.F.R. 50.33(g), 50.47(b), and (c)(2) for the Site Boundary EPZ Emergency Plan
- Table 1-2 – Exemptions Requested from 10 C.F.R. 50, Appendix E for the Site Boundary EPZ Emergency Plan
- Table 1-3 – Exemptions Requested from 10 C.F.R. 50.33(g), 50.47(b), and (c)(2) for the 2-Mile EPZ Emergency Plan

The two distinct Emergency Plans and the two sets of exemption requests are based on the distance at which the selected SMR technology is able to demonstrate that it meets the criteria set forth in SSAR Section 13.3. The applicability of any exemption would be based on the SMR design selected for a possible future Combined License Application (“COLA”) or Construction Permit Application (“CPA”). These exemptions are justified in Part 6, Section 1.3 of the ESPA, and evaluated and accepted by the NRC staff in Section 13.3.3.4 of the Final Safety Evaluation Report (“FSER”), and are included in the staff’s draft ESP.

Q8. Does the CRN Site ESPA contain any departure requests?

A8. No. A departure is a plant-specific deviation from design information in a standard design certification. Because TVA has not selected a SMR design, departures from a reference Design Control Document (DCD) cannot be identified.

Q9. Was there a review of the CRN Site ESPA by the Advisory Committee on Reactor Safeguards?

A9. Yes. The Advisory Committee on Reactor Safeguards (“ACRS”) provided an independent review and report to the Commission regarding the CRN Site ESPA. On January 9, 2019, the ACRS issued a letter on its review of the ESPA, concluding that:

1. Small modular reactors with design characteristics within the plant parameter envelope used by TVA in developing its Clinch River Nuclear Site early site permit application can be constructed and operated without undue risk to the health and safety of the public.
2. The staff’s safety evaluation report of the TVA early site permit application should be issued. The staff accepted TVA’s plume exposure pathway emergency planning zone sizing methodology; two major features emergency plans (one plan for a site boundary plume exposure pathway emergency planning zone and a second plan for an approximate 2-mile radius plume exposure pathway emergency planning zone); and associated exemption requests. The safety evaluation report also identified a number of items that are treated either as permit conditions or as action items that must be addressed at the operating license stage.
3. The early site permit for the Clinch River Nuclear Site should be issued.

ACRS, “Early Site Permit – Clinch River Nuclear Site,” p. 1 (January 9, 2019).

Q10. Did the NRC staff document its safety and environmental reviews?

A10. Yes. The NRC staff documented its safety review in the FSER and concluded that “the CRN Site ESP may be referenced in an application to construct and operate two or more small modular nuclear power reactors with a maximum thermal power that does not exceed 800 MWt for a single unit or 2,420 MWt (800 MWe) for two or more units at the CRN Site, subject to the terms and conditions of the permit.” NRC, “Final Safety Evaluation Report for the Early Site Permit Application for the Clinch River Nuclear Site” at 21-1. (June 2019). The NRC staff documented its environmental review in the Final Environmental Impact Statement (“FEIS”) and recommended that “an ESP should be issued for the CRN Site.” NUREG-2226, “Environmental Impact Statement for an Early Site Permit at the Clinch River Nuclear Site: Final Report” at 10-22 (April 2019).

Q11. What safety findings must the Commission make under Part 52 in order to issue an ESP to TVA?

A11. Under 10 C.F.R. § 52.24, the Commission may issue the ESP if it finds that:

- The applicable standards and requirements of the Atomic Energy Act (“AEA”) and the Commission’s regulations have been met;
- Any required notifications to other agencies or bodies have been duly made;
- There is reasonable assurance that the site is in conformity with the provisions of the AEA and the Commission’s regulations;
- The applicant is technically qualified to engage in any activities authorized;
- Issuance of the permit will not be inimical to the common defense and security or to the health and safety of the public; and
- The findings required by Subpart A of 10 C.F.R. Part 51 have been made.

Q12. What are the environmental findings required by Part 51?

A12. Under 10 C.F.R. § 51.105(a), the Commission must:

- Determine whether the requirements of Sections 102(2) (A), (C), and (E) of the National Environmental Policy Act (“NEPA”) and the regulations in Subpart A of 10 C.F.R. Part 51 have been met;
- Independently consider the final balance among conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken;
- Determine, after weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, whether the ESP should be issued, denied, or appropriately conditioned to protect environmental values; and
- Determine, in an uncontested proceeding, whether the NEPA review conducted by the staff has been adequate.

Q13. Does the CRN Site ESPA, and the NRC staff’s review of the ESP, meet the standards identified above?

A13. Yes. The safety and environmental findings required under 10 C.F.R. §§ 52.24 and 51.105(a) are described in the Discussion section below.

III. DISCUSSION

10 C.F.R. § 52.24(a)(1)

Q14. Have the applicable standards and requirements of the AEA and the Commission’s regulations been met?

A14. Yes. The CRN Site ESPA is based on NRC regulations and applicable portions of relevant Standard Review Plans (“SRP”), Interim Staff Guidance (“ISG”), Regulatory Guides (“Reg. Guides”), bulletins, generic letters, and other NUREGs. Before submission, TVA evaluated the ESPA against the applicable regulations in 10 C.F.R. Parts 20, 50, 51, 52, 73, and 100. The primary SRPs for the review were NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR [Light Water Reactor] Edition)” (safety review) and NUREG-1555, “Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan” (environmental review). The NRC staff considered applicable portions of the SRPs, ISGs, Reg. Guides, bulletins, generic letters, and other NUREGs. Based on the ESPA and the NRC staff’s review, documented in the FSER and the FEIS, the staff concluded that the applicant has sufficiently met the applicable standards and requirements of the AEA and the Commission’s regulations and the NRC should issue the CRN Site ESP.

10 C.F.R. § 52.24(a)(2)

Q15. Have the required notifications to other agencies or bodies been duly made?

A15. Yes. As required by Section 182(c) of the AEA and 10 C.F.R. § 50.43(a), the NRC published notices in the *Oak Ridger*, *Roane County News*, and the *Knoxville News Sentinel* in April 2017. TVA is the regulatory agency that has jurisdiction over the rates and services incident to the proposed activities. In addition, the NRC staff published a notice of the application in the Federal Register on May 17, May 24, May 31, and June 7, 2019 (84 FR 22523, 84 FR 24185, 84 FR 25310, and 84 FR 26707).

10 C.F.R. § 52.24(a)(3)

Q16. Is there reasonable assurance that the site is in conformity with the provisions of the AEA and the Commission's regulations?

A16. Yes. The staff reviewed the ESPA for the CRN Site and the site characteristics described therein and evaluated it against the applicable regulations in 10 CFR Parts 20, 50, 51, 52, 73, and 100. The staff performed this evaluation using applicable portions of the SRPs, ISGs, Reg. Guides, bulletins, NUREGs, and generic letters. Based on the staff's review, documented in the FSER and FEIS, the staff concluded that the site characteristics are acceptable and the applicable standards and requirements of the AEA and the Commission's regulations are met for the purpose of issuing an ESP for the CRN Site.

10 C.F.R. § 52.24(a)(4)

Q17. Is the applicant technically qualified to engage in any activities authorized?

A17. Yes. TVA has demonstrated the technical qualifications to engage in the activities described in the ESPA. In Chapter 17 of the FSER, the NRC staff concluded that the applicant's Quality Assurance Program Description satisfies all applicable NRC requirements for the ESPA. In addition, TVA has extensive experience as a nuclear plant owner and operator of its nuclear fleet (Sequoyah, Watts Barr, and Browns Ferry nuclear generating stations). Therefore, TVA is technically qualified under 10 CFR 52.24(a)(4).

10 C.F.R. § 52.24(a)(6)

Q18. Is issuance of the permit not inimical to the common defense and security or to the health and safety of the public?

A18. The NRC staff found that TVA complies with all applicable regulatory requirements, as described above. Therefore, the proposed issuance of the ESP is presumed not inimical to the common defense and security or the public health and safety, and the NRC staff has also indicated no awareness of any other information presenting inimicality concerns, and TVA is a corporate agency and instrumentality of the United States.

10 C.F.R. § 52.24(a)(8)

Q19. Have the findings required by Subpart A of 10 C.F.R. Part 51 been made? How does the NRC staff ensure that the bases for its reasonable assurance finding will be maintained in the future?

A19. As discussed below, the NRC staff concluded that the environmental review is adequate to support the findings required for an ESP by 10 CFR 51.105(a). The NRC staff also developed license conditions and Combined License (COL) action items in the event TVA applies for a license for construction and operation of a SMR at the CRN Site. The conditions are included in the NRC staff's draft ESP, and are listed along with the COL Action Items in Appendix A of the FSER.

10 C.F.R. § 51.105(a)

Q20. Has the NRC staff's review been adequate to support the findings set forth in 10 C.F.R. § 51.105(a)?

A20. Yes, as discussed in the sections below, the NRC staff's environmental review has been adequate to support the findings set forth in 10 C.F.R. § 51.105(a) for the purpose of issuing the ESP for the CRN Site.

10 C.F.R. § 51.105(a)(1)

Q21. Have the requirements of Sections 102(2)(A), (C), and (E) of NEPA and the regulations in subpart A of 10 C.F.R. Part 51 been met?

A21. Yes, these requirements of NEPA have been met by the NRC staff's preparation of the FEIS, which evaluated the environmental impacts of issuing an ESPA for the CRN Site. The staff reviewed the application and evaluated it against the applicable regulations in 10 CFR Parts 50, 51, 52, and 100. The staff performed this evaluation using applicable portions of the environmental SRP (NUREG-1555), ISGs, and Reg. Guides using the comprehensive guidance in the environmental SRP.

Q22. How did the NRC staff meet Section 102(2)(A) of NEPA?

A22. The NRC staff prepared the FEIS based on its independent assessment of the information provided by TVA and information they developed independently, including thorough consultation with other State and Federal agencies. As required by Section 102(2)(A) of NEPA, the staff used a systematic, interdisciplinary approach to integrate information from many fields, including the natural and social sciences. The NRC staff's findings in the FEIS reflect the "hard look" required by NEPA and have support in logic and fact.

Q23. How did the NRC staff meet Section 102(2)(C) of NEPA?

A23. As required by Section 102(2)(C) of NEPA, the FEIS addresses (1) the environmental impact of the proposed action; (2) any unavoidable adverse environmental effects; (3) alternatives to the proposed action; (4) the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and (5) any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented.

Appendix F to the FEIS presents correspondence related to the NRC staff's interactions with other Federal agencies during the preparation of these documents. Based on these documents, the NRC staff concluded that the requirements of NEPA Section 102(2)(C) were fulfilled by consulting with and obtaining comments from other Federal agencies with statutory jurisdiction or special expertise. The U.S. Army Corps of Engineers ("USACE") fully participated in preparing the EIS as a cooperating agency and participated collaboratively on the review team under the Commission's Memorandum of Agreement with the Corps. The staff did not identify any other Federal agencies as cooperating agencies in preparation of the FEIS.

Q24. How did the NRC staff meet Section 102(2)(E) of NEPA?

A24. The NRC staff's FEIS demonstrates that the staff adequately considered alternatives to the proposed action to the extent that it involves unresolved conflicts concerning alternative uses of available resources, consistent with the requirements of NEPA Section 102(2)(C). The alternatives considered in the FEIS include the no-action alternative, alternative sites, and system design alternatives.

10 C.F.R. § 51.105(a)(2)

Q25. Has the NRC staff independently considered the final balance among conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken?

A25. Yes. As discussed in Chapters 1 and 10 of the FEIS, an ESP does not authorize construction and operation of a nuclear power plant, and therefore the NRC's issuance of an ESP does not result in any environmental costs. However, site suitability encompasses construction and operation parameters. Therefore, the FEIS includes an analysis of impacts as if reactors and associated facilities were to be built and operated at the CRN Site in order to resolve environmental issues in the ESP. The benefits of the ESP process are early resolution of site safety and environmental issues and determination of site suitability for one or more nuclear

power facilities. The staff's comparison of alternative sites in the FEIS considered the conflicting factors for site suitability. The staff found that none of the alternative sites are environmentally preferable to the CRN Site.

10 C.F.R. § 51.107(a)(3)

Q26. After weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, should the ESP be issued?

A26. Yes. The NRC staff found that the ESP should be issued and there are no reasonable alternatives to the proposed site that are obviously superior. The NRC staff's recommendation is based on (1) TVA's ER, supplemental submittals by TVA, and responses to staff requests for additional information; (2) consultation with Federal, State, Tribal, and local agencies; (3) the staff's own independent review; (4) the staff's consideration of public comments related to the environmental review; and (5) the assessments summarized in the FEIS, including the mitigation measures identified.

TVA chose not to address the balance of benefits and costs (e.g. need for power) in its ESPA, as allowed under 10 CFR 51.50(b)(2). Therefore, in accordance with 10 C.F.R. 51.75(b), the FEIS does not address the balance of costs and benefits. If the NRC issues an ESP for the CRN Site, and later docket a CPA or COLA that references that ESP, the NRC staff will consider the balance of costs and benefits in a new EIS specific to the CPA or COLA.

Q27. How does the NRC staff's conclusion relate to the findings that the USACE must make for activities within its jurisdiction?

A27. The Nashville District, Regulatory Division, USACE, a cooperating agency with the NRC, verified that the information presented in this EIS is adequate to support a Department of the Army ("DA") permit application if TVA submits one in the future. The USACE cooperated in the preparation of the EIS to streamline regulatory review processes, avoid unnecessary duplication of effort, and ensure issues and concerns related to impacts on waters of the United States and navigable waters of the United States are identified and addressed early in the NRC's review process.

10 C.F.R. § 51.105(a)(4)

Q28. Has the NRC staff's review been adequate?

A28. Yes. The NRC staff conducted an independent environmental evaluation of the ESPA. The NRC obtained additional information as needed through TVA responses to RAIs and site visits, where appropriate. The NRC staff developed independent, reliable information and conducted a systematic, interdisciplinary review of the potential environmental impacts of and reasonable alternatives to the proposed action. The NRC staff considered the purpose of and need for the proposed action, the environment that could be affected by the action, and the consequences of the proposed action, including mitigation that could reduce impacts. The FEIS considered the no-action alternative, alternative sites, and system design alternatives. The FEIS compared the alternatives to the proposed action. The NRC staff considered any adverse environmental effects that could not be avoided should the proposed action be implemented, the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity, and the irreversible or irretrievable commitments of resources that would be involved in the proposed project.

Q29. Was the public permitted to participate in the environmental review process?

A29. Yes. At the start of the environmental review, the NRC staff issued a notice of intent to prepare an FEIS and invited the public to provide any information relevant to the environmental review (the NEPA scoping process). The NRC staff also provided opportunities for governmental and general public participation during the public meeting on the draft Environmental Impact Statement (“DEIS”) and sought, received, and responded to comments on the DEIS from the public. Those responses are documented in the FEIS and its supplement.

Q30. Do you agree with the NRC staff’s conclusions?

A30. Yes. The NRC should issue an ESP under 10 C.F.R. Part 52, Subpart A, approving the CRN Site for a SMR nuclear facility, separate from the potential filing of an application for a CP or COL for the facility.

IV. CONCLUSION

Q31. What are your overall safety conclusions regarding issuance of the ESP?

A31. With respect to safety issues, the application and the record of the permit review contain sufficient information, and the review of the application by the NRC staff has been adequate, to support the findings to be made by the Commission, with respect to the standards set forth in the Hearing Notice and the applicable standards in NRC regulations. Issuance of an ESP will not be inimical to the common defense and security or to the health and safety of the public, and the requested permit should be issued.

Q32. What are your overall environmental conclusions regarding issuance of the ESP?

A32. Based upon the entire record of this proceeding, the environmental review conducted by the NRC staff pursuant to 10 C.F.R. Part 51 has been adequate; the requirements of Sections 102(2)(A), (C), and (E) of NEPA have been satisfied; an independent weighing and balancing of the environmental, technical, and other costs and benefits of the CRN Site ESP supports the issuance of the permit; and the requested permit should be issued.

Certification

I, Daniel Stout, certify that the testimony above was prepared by me or under my direction, and I adopt this testimony as my sworn testimony in this proceeding. I hereby certify under penalty of perjury that the testimony above is true and correct to the best of my knowledge, information, and belief.

Executed in Accord with 10 C.F.R. § 2.304(d)

Director, Nuclear Technology Innovation

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Dated at Chattanooga, TN
this 26th day of July, 2019

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

Before the Commission

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CERTIFICATE OF SERVICE

I certify that on July 26, 2019, a copy of the “Applicant’s Pre-Filed Testimony in Support of the Mandatory Hearing for the Clinch River Nuclear Site Early Site Permit,” with accompanying Certification, and the *curriculum vitae* of Daniel Stout, were served through the E-Filing system on the participants in the above-captioned proceeding.

/signed electronically by/
Ryan C. Dreke