



POLICY ISSUE **(Information)**

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SECY-19-0064

FOR: The Commissioners

FROM: Margaret M. Doane
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SUBJECT: STAFF'S STATEMENT IN SUPPORT OF THE UNCONTESTED
HEARING FOR ISSUANCE OF AN EARLY SITE PERMIT FOR CLINCH
RIVER NUCLEAR SITE

PURPOSE:

The staff of the U.S. Nuclear Regulatory Commission (NRC or the Commission) has completed its review of the Tennessee Valley Authority (TVA) early site permit (ESP) application. In its application, TVA proposes to use the Clinch River Nuclear (CRN) Site in Roane County, TN, as a site for two or more small modular reactors (SMRs). An ESP is a Commission approval of a site for one or more nuclear power facilities. The ESP would not authorize construction or operation of a nuclear power plant. The ESP relates only to site suitability.

This paper serves as the staff's primary prefiled testimony for the uncontested (mandatory) hearing on whether to issue the ESP for the CRN Site. This paper and its references also provide information to support the Commission's determination that the staff's review has been adequate to support the findings specified in Title 10 of the *Code of Federal Regulations* (10 CFR) 52.24, "Issuance of early site permit," and 10 CFR 51.105, "Public hearings in proceedings for issuance of construction permits or early site permits; limited work authorizations."

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The staff presents this information paper consistent with the Internal Commission Procedures, dated March 24, 2016.¹ Issuance of this paper follows the publication of the CRN Site ESP final safety evaluation report (FSER) on June 14, 2019 (ADAMS Accession No. ML19162A157). The NRC issued the final environmental impact statement (FEIS) for the CRN Site ESP in April 2019 (NUREG-2226, Volumes 1 and 2 (ADAMS Accession Nos. ML19073A099 and ML19073A109)). This Commission paper references a draft ESP for the CRN Site and a draft record of decision (ADAMS Accession Nos. ML19107A159 and ML19070A028, respectively).

Consistent with the Internal Commission Procedures, this paper focuses on nonroutine matters concerning areas of particular importance in supporting the findings specified in 10 CFR 52.24(a) and 10 CFR 51.105(a). Nonroutine matters are those that relate to any unique features of the site or novel issues that arose in the review process.

SUMMARY:

This paper addresses each of the findings in 10 CFR 52.24(a) and 10 CFR 51.105(a) and provides an adequate basis for the Commission to conclude that each of these findings can be made for the CRN Site ESP application. This paper also focuses on nonroutine matters such as unique features of the site or novel issues that arose in the review process. This paper does not address routine aspects of the safety and environmental review process.

BACKGROUND:

I. Application History

Application, Ownership, and Location

In a May 12, 2016, letter, TVA submitted an ESP application for the CRN Site located in Oak Ridge, TN (ADAMS Accession No. ML16139A752). Following interactions with the NRC staff, by letter dated August 11, 2016, TVA identified aspects of the application for which it intended to provide supplemental information (ADAMS Accession No. ML16224B143). Responding to TVA in a letter dated August 19, 2016, the NRC informed TVA that its application would remain in a tendered but not docketed status until all supplemental information was provided (ADAMS Accession No. ML16225A667). By December 15, 2016, TVA had provided the supplemental information, and by letter dated January 5, 2017, the NRC staff informed TVA that its application, as supplemented, was acceptable for docketing and detailed technical review (ADAMS Accession No. ML16356A226).

TVA most recently updated the ESP application for the CRN Site on January 18, 2019 (ADAMS Accession No. ML19030A485). The publicly available portions of the application are available in ADAMS and on the NRC Web site at <https://www.nrc.gov/reactors/new-reactors/esp/clinch-river.html>.

¹ Previous mandatory hearings associated with ESP applications have been conducted by an Atomic Safety and Licensing Board (ASLB). See Staff Requirements—SECY-15-0088 – Selection of Presiding Officer for Mandatory Hearings Associated with Early Site Permit Applications and Construction Permit Applications for Medical Isotope Production and Utilization Facilities (August 15, 2015) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15238B093). The Commission determined to conduct this mandatory hearing itself. Memorandum to E. Roy Hawkins, Atomic Safety and Licensing Board Panel, from Annette L. Vietti-Cook, Secretary of the Commission, "Mandatory Hearing to Consider the Application of [TVA] for an [ESP] for the [CRN Site], Docket No. 52-047" (August 23, 2018) (ADAMS Accession No. ML18235A386).

TVA is the United States' largest public power provider. Congress established TVA in 1933 to improve navigation on the Tennessee River, reduce the damage from destructive floodwaters within the Tennessee River system and downstream on the lower Ohio and Mississippi Rivers, further the economic development of TVA's service area, and sell the electricity generated at the facilities TVA operates, among other purposes. TVA's service territory, which includes most of Tennessee and parts of Alabama, Georgia, Kentucky, Mississippi, North Carolina, and Virginia, serves more than nine million people. TVA sells electricity to 155 local power company customers and directly serves approximately 52 large industrial facilities and 8 Federal facilities. TVA currently operates Browns Ferry Nuclear Plant, Units 1, 2, and 3; Sequoyah Nuclear Plant, Units 1 and 2; and Watts Bar Nuclear Plant, Units 1 and 2. TVA's mission also includes technological innovation.

The CRN Site is located in the City of Oak Ridge, TN, adjacent to the Clinch River arm of the Watts Bar Reservoir. The site is approximately 935 acres within a 1,200-acre property owned by the United States and managed by TVA. The U.S. Department of Energy's Oak Ridge Reservation borders the site to the north. The geology, seismology, meteorology, and hydrology of the CRN Site are well characterized from past site characterization performed when the site was the location of the proposed and later canceled, Clinch River Breeder Reactor Project.

The Early Site Permit Review

TVA seeks an ESP that could be referenced as part of a future application to construct and operate a nuclear plant at the CRN Site. In its site safety analysis report (SSAR), TVA presents information on the following topics:

- The characteristics of the proposed site, including geography; demography; nearby industrial, transportation, and military facilities; meteorology; hydrology; and geology. This information is evaluated in FSER Chapter 2.
- Potential aircraft hazards near the site, which are evaluated in FSER Chapter 3.
- Liquid and gaseous effluent releases, exposure pathways, and projected offsite doses. This information is evaluated in FSER Chapter 11.
- Emergency planning, which is evaluated in FSER Section 13.3. As permitted by 10 CFR 52.17(b), the applicant proposed major features of the emergency plans for the site, rather than complete and integrated emergency plans. The staff reviewed this information in consultation with the Federal Emergency Management Agency of the U.S. Department of Homeland Security, as required by 10 CFR 52.17(b)(2). In accordance with 10 CFR 52.17(b), the applicant also (1) addressed whether there are physical characteristics of the site that could significantly impede the development of emergency plans; (2) described contacts and arrangements made with Federal, State, and local government agencies with emergency planning responsibilities; and (3) addressed whether any certifications from these agencies had been obtained (no certifications had been obtained).
- Information demonstrating that the site characteristics allow adequate security plans and measures to be developed. This information is evaluated in FSER Section 13.6.
- The radiological consequences of design basis accidents, including determination of the proposed exclusion area boundary and low-population zone for the site. As stated in

SSAR Section 15.1, the applicant analyzed a broad spectrum of representative postulated design basis accidents to determine the bounding radiological consequences that affect the safe design and siting of the reactor technologies being considered for the CRN Site. This information is evaluated in FSER Chapter 15.

- The applicant's quality assurance plan, which is evaluated in FSER Chapter 17.

The SSAR analyses depend, in part, on the design of the reactor(s) that could be located at the CRN Site. As allowed by 10 CFR Part 52, TVA did not select a specific reactor design in the ESP application. Rather, TVA's application defined the plant-site interface through a set of postulated design parameters known as a plant parameter envelope (PPE). The PPE bounds the parameters of the reactors that might be deployed at the CRN Site and provides sufficient design detail to support both the NRC safety and environmental review of the ESP application. The PPE is based on construction and operation of two or more SMRs with a maximum rated power of 800 megawatts thermal for a single reactor core, and a maximum rated power for the site not to exceed 2,420 megawatts thermal (800 megawatts electric). In developing the PPE, TVA used available information on the following reactor designs:

- BWX Technologies, Inc. mPower™ (Generation mPower LLC design)
- NuScale (NuScale Power, LLC, design)
- SMR-160 (Holtec SMR, LLC, design)
- Westinghouse SMR (Westinghouse Electric Company, LLC, design)

Appendix A to the FSER identifies the proposed permit conditions, site characteristics, and bounding design parameters that the staff recommends be imposed if an ESP is issued to the applicant. Appendix A to the FSER also includes certain site-related items ("COL action items") that will need to be addressed in the combined license (COL) or construction permit (CP) application if TVA later applies for a COL or CP and references the CRN Site ESP in its application. The staff concluded that the COL action items do not need to be resolved as part of the ESP review and that they are more appropriately addressed when the applicant has applied for a CP or COL.

The applicant's environmental report (ER) and the staff's FEIS evaluated the environmental impacts at the site from the construction and operation of two or more new units with design characteristics bounded by the PPE. The ER and FEIS also include an evaluation of whether there are obviously superior alternatives to the proposed site or system designs. In accordance with 10 CFR 51.50(b)(2), TVA chose not to include an assessment of the benefits or the costs of the proposed action or an evaluation of alternative energy sources in the ER. In accordance with 10 CFR 51.75(b), the FEIS does not address these topics because TVA did not address them in its ER. In addition, neither the ER nor the FEIS includes an evaluation of severe accident mitigation design alternatives because such an evaluation requires design information that is not available for this ESP application.

If the ESP is issued, the matters resolved during this ESP proceeding would be treated as resolved in a subsequent proceeding on a CP or COL application referencing the ESP, subject to the limitations in 10 CFR 52.39, "Finality of early site permit determinations." A COL or CP applicant referencing the ESP must seek NRC approval to vary from the SSAR or from the design parameters, site characteristics, or terms and conditions of the ESP, as required by 10 CFR 52.39(d). Also, a CP or COL applicant referencing the ESP must, in accordance with 10 CFR 52.39(b), update the emergency preparedness information in the ESP SSAR and discuss whether the updated information materially changes the bases for compliance with

applicable NRC requirements. Finally, as required by 10 CFR 51.50(c), a COL applicant must identify whether there is new and significant information on issues resolved in the ESP FEIS and provide information to resolve any significant environmental issues not considered in the ESP proceeding.

Advisory Committee on Reactor Safeguards

To support the Advisory Committee on Reactor Safeguards (ACRS) in its independent review and report to the Commission on the ESP application for the CRN Site, the staff presented the results of its safety review to the subcommittee on Regulatory Policies and Practices on May 15, August 22, October 17, and November 14, 2018. The staff presented the results of its review of the ESP application for the CRN Site to the ACRS Full Committee on December 7, 2018. The ACRS issued its final report on the CRN Site ESP application on January 9, 2019 (ADAMS Accession No. ML19009A286). This report is discussed further below.

II. Outreach

Public Meetings

Before submission of the ESP application for the CRN Site, the staff held a public outreach meeting in Oak Ridge, TN, on April 12, 2016, to discuss the safety and environmental review of the anticipated ESP application, to describe opportunities for public participation in the review process, and to take questions from the public. On May 15, 2017, the staff held a scoping meeting in Oak Ridge, TN, to discuss the environmental scoping process and to give members of the public a chance to comment on environmental issues that the NRC should consider during its review of the application. After issuing the draft EIS (DEIS) in April 2018, the staff held two public meetings in Kingston (Roane County), TN, on June 5, 2018, to present an overview of the DEIS and to accept comments on the document.

While reviewing the application, the staff conducted approximately 12 public meetings and public conference calls with the applicant.

Federal Register Notices

The NRC published *Federal Register* (FR) notices, as required, for key milestones of the licensing process as follows:

- After the NRC received the ESP application on May 12, 2016, the agency published notice of this receipt in the FR on June 23, 2016 (81 FR 40929).
- The NRC published a notice of docketing of the ESP application in the FR on January 12, 2017 (82 FR 3812).
- On April 4, 2017, the NRC published a notice of hearing and opportunity to petition for leave to intervene (82 FR 16436).
- On April 13, 2017, the NRC published a notice of intent to prepare an environmental impact statement (EIS) and conduct scoping (82 FR 17885).
- On April 26, 2018, the NRC published a notice of the availability of the DEIS for public comment and notice of public meetings to present an overview of the DEIS and accept

public comments (83 FR 18354). On May 30, 2018, the NRC published a correction to the notice of availability of the DEIS (83 FR 24832).

- On April 8, 2019, the NRC published a notice of availability of the FEIS for the CRN Site ESP (84 FR 13975).
- On May 17, May 24, May 31, and June 7, 2019, the NRC published notice of the ESP application in accordance with Section 182c. of the Atomic Energy Act of 1954, as amended (AEA), and 10 CFR 50.43(a)(3) (84 FR 22523, 84 FR 24185, 84 FR 25310, 84 FR 26707).

Consultations

In accordance with Section 657 of the Energy Policy Act of 2005, the NRC staff contacted the U.S. Department of Homeland Security (DHS) to initiate consultation for the ESP application review on January 12, 2017; the staff supplemented this letter on May 24, 2019. By letter dated February 8, 2017, DHS staff informed the NRC staff that DHS would defer engaging in Section 657 consultation for the TVA CRN Site until the NRC receives a future COL application. By email dated May 30, 2019, DHS confirmed that it will conduct consultation once the COL application has been received by the NRC. As part of its environmental review in accordance with the National Environmental Policy Act (NEPA) and other applicable statutes, including the Endangered Species Act and the National Historic Preservation Act, the staff consulted with and obtained input from the appropriate Federal, State, local, and Tribal organizations.

Adjudicatory Actions

On April 4, 2017, the NRC published in the *Federal Register* (82 FR 16436) a notice of hearing and opportunity to petition for leave to intervene in the TVA Clinch River ESP application proceeding. On June 12, 2017, two organizations jointly submitted an intervention petition that included three contentions for admission. On the same date, a third organization submitted a separate intervention petition that included one contention.

In its October 10, 2017, decision (LBP-17-8, ADAMS Accession No. ML18289A832), the ASLB granted the former of these two petitions and admitted two of the three contentions submitted therein. The first contention (Contention 2), was an environmental contention of omission alleging that the ER failed to consider the consequences of a spent fuel pool fire. The second contention (Contention 3), was an environmental contention alleging that TVA's ER contained an impermissible discussion of energy alternatives and need for power.

On October 20, 2017, the two intervenor groups that submitted the two admitted contentions (Intervenors) submitted a motion for partial reconsideration of the ASLB's rejection in LBP-17-8 of Intervenors' Contention 1. In Contention 1, Intervenors had claimed that TVA's request in its ESP application for an exemption from the NRC emergency planning requirements regarding a 10-mile plume exposure pathway emergency planning zone (EPZ) was inadequate. In LBP-17-8, the ASLB determined that Contention 1 was inadmissible due to its failure to challenge the proposed methodology in TVA's ESP application for sizing emergency planning zones that could be used in a future COL application to establish a plume exposure pathway EPZ. In its November 9, 2017, Memorandum and Order (ADAMS Accession No. ML17313A050), the ASLB denied Intervenors' motion, finding that Intervenors failed to establish compelling circumstances to reconsider the ASLB's decision in LBP-17-8 not to admit Contention 1, and also reiterated its

view that Intervenor's concern regarding the application of TVA's methodology may be proffered by a future COL applicant if and when the methodology might be used to establish an EPZ.

TVA appealed LBP-17-8 on November 6, 2017. In its May 3, 2018, Memorandum and Order (CLI-18-5, ADAMS Accession No. ML19130A239), the Commission ruled on TVA's appeal of LBP-17-8, affirming the ASLB's admission of Contention 2 regarding the omission of an analysis of spent fuel pool fires impacts, and reversing the ASLB's admission of Contention 3, in which Intervenor had alleged the ER contained improper discussion of energy alternatives and need for power. The Commission reversed the ASLB's admission of Contention 3 because TVA's ER expressly deferred a discussion of need for power and energy alternatives until the COL application, as permitted by 10 CFR 51.50(b)(2). The Commission observed that, should TVA file a COL application in the future, the intervenors would have the opportunity at that time to raise any concerns that they might have with, among other things, TVA's discussion of need for power and energy alternatives.

On April 26, 2018, the NRC published in the *Federal Register* (83 FR 18354) a notice of availability of the draft environmental impact statement (DEIS) associated with the Clinch River ESP Application. In the DEIS, the NRC staff provided an analysis of the impacts of spent fuel pool fires. Based on the staff's publication of the DEIS, Intervenor submitted a Motion for Leave to File Contentions 4 and 5 on May 21, 2018. In Contention 4, Intervenor alleged that the DEIS analysis of the impacts of spent fuel pool fires was insufficiently conservative and therefore inadequate. In Contention 5, Intervenor claimed (as they had in Contention 3) that the DEIS contained an impermissible discussion of energy alternatives and need for power.

On June 11, 2018, the NRC staff moved to dismiss Contention 2 as moot, opposed admission of Intervenor's Contentions 4 and 5, and argued that because no contentions were admissible the Board should terminate the proceeding. In its July 31, 2018, Memorandum and Order (LBP-18-4, ADAMS Accession No. ML18212A148), the ASLB granted the NRC staff's motion to dismiss Contention 2 as moot, denied Intervenor's motion to admit Contentions 4 and 5, and, with no remaining admitted or pending contentions, terminated the contested adjudication.

Intervenor did not appeal LBP-18-4, and on November 29, 2018, the Secretary of the Commission issued a memorandum (ADAMS Accession No. ML18333A231) informing the litigants that the Commission declined further review of LBP-17-8 and LBP-18-4, and that these decisions therefore became final agency action on November 28, 2018. Therefore, all contested issues in this proceeding have been resolved.

III. Review Process/Methodology

The key processes and methodologies used to ensure quality, consistency, and completeness in the preparation of the FSER and FEIS are described below.

NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light Water Reactor] Edition." The principal purpose of the Standard Review Plan (SRP) is to ensure the quality and uniformity of staff safety reviews. The staff routinely relies upon the SRP as a tool for evaluating the safety of nuclear power plant designs. Each section of the SRP outlines the specific regulations that must be met when the review is complete, including the general design criteria from Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

NUREG-1555, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan." This guidance includes environmental SRPs that the staff uses when conducting environmental reviews of applications related to nuclear power plants, in accordance with NEPA and the NRC's regulations for implementing NEPA in 10 CFR Part 51.

Review Standard (RS)-002, "Processing Applications for Early Site Permits," dated May 4, 2004 (ADAMS Accession No. ML040700094). The objective of this review standard is to ensure that staff reviews of applications for ESPs and the associated ERs are effective, efficient, and consistent and that the reviews result in high-quality products.

NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," issued September 2014 (ADAMS Accession No. ML14198A440). The NRC prepared a final generic EIS that establishes a regulatory basis for the final rule entitled "Continued Storage of Spent Nuclear Fuel." In accordance with 10 CFR 51.23(b), the impacts assessed in NUREG-2157 are deemed to be incorporated in an EIS for an ESP application.

Regulatory Guides. Regulatory guides (RGs) provide guidance to licensees and applicants on implementing specific parts of the NRC's regulations, techniques used by the staff in evaluating specific problems or postulated accidents, and data needed by the staff in its review of applications for permits or licenses. Chapter 1, Table 1.9-1, "Conformance with Regulatory Guides," of the applicant's SSAR identifies the RGs associated with the ESP application for the CRN Site and notes whether the applicant conformed to or departed from each RG.

Interim Staff Guidance. For areas where there is a need for staff review guidance that is in addition to, or differs from, guidance in the SRPs, the staff prepared and used interim staff guidance (ISG) documents, found at <http://www.nrc.gov/reading-rm/doc-collections/isg/>. The staff used the following ISGs to review the CRN Site ESP application:

- DC/COL-ISG-1, "Interim Staff Guidance on Seismic Issues Associated with High Frequency Ground Motion in Design Certification and Combined License Applications," dated May 19, 2008 (ADAMS Accession No. ML081400293)
- DC/COL-ISG-7, "Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures," dated June 23, 2009 (ADAMS Accession No. ML091490565)
- DC/COL-ISG-13, "Assessing the Radiological Consequences of Accidental Releases of Radioactive Materials from Liquid Waste Tanks for Combined License Applications," issued January 2013 (ADAMS Accession No. ML12191A325)
- DC/COL-ISG-14, "Assessing the Radiological Consequences of Accidental Releases of Radioactive Materials from Liquid Waste Tanks in Ground and Surface Waters for Combined License Applications," January 2013, ADAMS Accession No. ML12191A330)
- COL/ESP-ISG-26, "Interim Staff Guidance on Environmental Issues Associated with New Reactors," dated September 8, 2014 (ADAMS Accession No. ML13347A915)
- COL/ESP-ISG-27, "Interim Staff Guidance on Specific Environmental Guidance for Light Water Small Modular Reactor Reviews," dated September 8, 2014 (ADAMS Accession No. ML14100A153)

- JLD-ISG-2013-01, "Guidance for Assessment of Flooding Hazards Due to Dam Failure," dated July 29, 2013 (ADAMS Accession No. ML13151A153)
- NSIR/DPR-ISG-01, "Emergency Planning for Nuclear Power Plants," dated November 20, 2011 (ADAMS Accession No. ML113010523)

Office Instructions. In its review, the staff followed administrative guidance from a number of office instructions. These internal documents address a range of procedural matters, including the staff's process for issuing requests for additional information; handling audits; ensuring the qualification and training of technical staff and managers; ensuring consistency between staff offices; and overseeing interactions with applicants, intervenors, and public stakeholders.

IV. *Advisory Committee on Reactor Safeguards Report*

The ACRS review of the Clinch River ESP application culminated with a letter to the Commission, dated January 9, 2019 (ADAMS Accession No. ML19009A286). The letter presented the following conclusions and recommendations:

- SMRs with design characteristics within the PPE used by TVA in developing its CRN Site ESP application can be constructed and operated without undue risk to the health and safety of the public.
- The staff's safety evaluation report (SER) on the TVA ESP application should be issued.
- The ESP for the CRN Site should be issued.

The staff responded to the ACRS in a letter dated February 4, 2019 (ADAMS Accession No. ML19022A306). The staff thanked the ACRS for its time and efforts and agreed with the ACRS conclusions and recommendations.

DISCUSSION:

I. Exemptions

Exemptions from NRC Regulations

In ESP application Part 6, TVA identified exemption requests, pursuant to 10 CFR 52.7, "Specific exemptions," from various requirements for onsite and offsite emergency plans associated with plume exposure pathway EPZs. In accordance with 10 CFR 52.7, these exemption requests are governed by 10 CFR 50.12, "Specific exemptions." The exemption requests, and the staff's basis for concluding that they satisfy 10 CFR 50.12, are discussed below in Section II.

II. Nonroutine Matters, Unique Site Features, or Novel Issues

Safety Matters: Emergency Planning Zone Size Methodology

The staff's evaluation in FSER Section 13.3 addresses the plans, design features, facilities, functions, and equipment necessary for radiological emergency planning that must be considered in an ESP application that includes proposed major features of the emergency plans. The ESP application must include information meeting the pertinent requirements of 10

CFR 52.17; 10 CFR 50.33, "Contents of applications; general information," 10 CFR 50.47, "Emergency plans," and Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50.

The FSER discusses the NRC staff's evaluation of two alternative major-features emergency plans (i.e., ESP Plan 5A and 5B). ESP Plan 5A is based on a plume exposure pathway EPZ at the site boundary. ESP Plan 5B is based on a plume exposure pathway EPZ with a 2-mile radius. The NRC is not being asked to approve a specific plume exposure pathway EPZ as part of the ESP application. Instead, SSAR Section 13.3, "Emergency Preparedness," includes a methodology and radiological dose-related criteria that could be used by a future COL or CP applicant to support a specific plume exposure pathway EPZ size in the COL or CP application. The COL or CP applicant would select a specific SMR technology and implement the methodology using the design characteristics of this technology to determine whether the conditions for a 2-mile EPZ or a site boundary EPZ are met. The NRC staff's evaluation of this methodology is discussed below and in the FSER.

In addition, the staff evaluated TVA's request for two sets of exemptions from the regulatory requirement for a 10-mile plume exposure pathway EPZ and related requirements: one set of 25 exemptions to support ESP Plan 5A based on a site boundary plume exposure pathway EPZ, and one set of two exemptions to support ESP Plan 5B based on a 2-mile plume exposure pathway EPZ. The staff's evaluation of the requested exemptions considered the proposed methodology in SSAR Section 13.3 that a COL or CP applicant referencing the ESP would use to confirm the adequacy of the proposed plume exposure pathway EPZ size.

TVA is not requesting an exemption related to the ingestion exposure pathway EPZ size requirement. The ingestion exposure pathway EPZ for the CRN Site will be described in a possible future COL or CP application.

If the proposed sets of exemptions are approved as part of the ESP, they will be accompanied by a permit condition that specifies the circumstances under which they can be used in the COL or CP application. Exemptions approved in the ESP could be used in a future COL or CP application referencing a specific SMR design, to support an exemption from the current NRC requirement for a 10-mile plume exposure pathway EPZ.

The NRC staff evaluated TVA's proposed methodology for determining the plume exposure pathway EPZ size, proposed major-features emergency plans, and exemption requests to determine whether they meet NRC requirements. Approval of TVA's ESP application and requested exemptions would not establish a specific plume exposure pathway EPZ size for the CRN Site. Instead, the NRC would be approving TVA's methodology for determining the appropriate plume exposure pathway EPZ size for the site. The plume exposure pathway EPZ size will not be determined until a COL or CP application that references a specific SMR design is submitted for the CRN Site.

Dose-Based, Consequence-Oriented Emergency Planning Zone Size Concept for Small Modular Reactors

Following public meetings with industry and stakeholders, the staff issued SECY-11-0152, "Development of an Emergency Planning and Preparedness Framework for Small Modular Reactors," dated October 28, 2011 (ADAMS Accession No. ML112570439). This paper discusses the staff's intent to develop a technology-neutral, dose-based, consequence-oriented emergency planning framework for SMR sites, which considers the various designs, modularity,

and co-location with industrial facilities, as well as the size of the EPZ. SECY-11-0152 also states that the “staff will work with stakeholders to develop general guidance on calculating the offsite dose, and is anticipating that the industry will develop and implement the detailed calculation method for review and approval by the staff.”

In SECY-15-0077, “Options for Emergency Preparedness for Small Modular Reactors and Other New Technologies,” dated May 29, 2015 (ADAMS Accession No. ML15037A176), the staff proposed a consequence-oriented approach to establish requirements commensurate with the potential consequence to public health and safety and the common defense and security at SMR and other-new-technology (ONT) facilities. The staff stated that the need to establish an emergency planning framework for SMRs and ONTs is based on the projected offsite dose in the unlikely occurrence of a severe accident. In the staff requirements memorandum (SRM) for SECY-15-0077, dated August 4, 2015 (ADAMS Accession No. ML15216A492), the Commission directed the staff to proceed with rulemaking. The Commission also directed that, for any SMR reviews conducted before the establishment of a rule, the staff should be prepared to adapt an approach to EPZs for SMRs under existing exemption processes, in parallel with its rulemaking efforts. As discussed in SECY-11-0152, a scalable method for determining the EPZ for SMRs is based on offsite dose considerations.

Method for Determining Plume Exposure Pathway Emergency Planning Zone Size

Since the emergency planning rulemaking for SMRs and ONTs is ongoing, the staff considered the applicant’s requested exemptions, consistent with SRM-SECY-15-0077. The staff evaluated the reasonableness of the applicant’s proposed methodology for supporting an plume exposure pathway EPZ size determination using NUREG-0396, “Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants,” issued November 1978 (ADAMS Accession No. ML051390356), and other regulatory guidance on accident assessment (listed in Section 13.3.3 of the FSER).

TVA’s plume exposure pathway EPZ size methodology considers the use of the existing emergency planning regulatory framework, including the dose saving criteria in NUREG-0396. Specifically, the applicant proposed the following technical criteria for determining the size of the plume exposure pathway EPZ:

- The plume exposure pathway EPZ should encompass those areas in which projected dose from design basis accidents could exceed the U.S. Environmental Protection Agency (EPA) early-phase protective action guidelines (PAGs).
- The plume exposure pathway EPZ should encompass those areas in which consequences of less severe core melt accidents could exceed the EPA early-phase PAGs.
- The plume exposure pathway EPZ should be large enough to provide for substantial reduction in early severe health effects from more severe core melt accidents.

TVA defines “less severe core melt accidents” as including “intact-containment, [beyond-design-basis accident] scenarios and accident scenarios with a mean Core Damage Frequency (CDF) $>1 \times 10^{-6}$ per reactor-year (rx-yr).” TVA defines the “more severe core melt accidents” as “postulated containment failure/bypass accidents with the potential for higher consequences with mean CDF $> 1 \times 10^{-7}$ [per reactor year].”

NUREG-0396 provides the technical basis for the regulatory requirement of a plume exposure pathway EPZ size of about 10 miles in radius for power reactors. The analyses described in NUREG-0396 used criteria similar to those proposed by the applicant. As described below, the staff found these technical criteria to be acceptable because they are consistent with NUREG-0396.

The applicant proposed dose criteria derived from the technical criteria for design basis accidents, less severe accidents, and more severe core melt accidents that are based on the same reasoning used as the technical basis for the plume exposure pathway EPZ distance codified in NRC regulations. Specifically, the dose criterion for design basis accidents and less severe accidents provides that the dose in areas outside the plume exposure pathway EPZ would not exceed the lower end of the EPA early-phase PAG, which is 1 rem total effective dose equivalent (TEDE) for a 96-hour exposure period. Also, the dose criterion for more severe accidents provides that the conditional probability of an acute whole body dose exceeding 200 rem is less than 10^{-3} per reactor-year for areas outside the plume exposure pathway EPZ, which is similar to the NUREG-0396 criterion that the probability of exceeding a whole body acute dose is small and decreasing rapidly at the plume exposure pathway EPZ distance. Because the applicant's proposed dose criteria are based on the same reasoning used as the technical basis for the plume exposure pathway EPZ distance codified in NRC regulations, the staff finds that the applicant's proposed dose criteria are acceptable for use in analyses that form the technical basis for the plume exposure pathway EPZ size.

Similar to the analysis in NUREG-0396, the applicant's proposed method to determine plume exposure pathway EPZ size relies on consequence analyses for a range of potential accidents, including design basis accidents and severe accidents. Although the applicant discussed qualitatively the likelihood that the surrogate design used in the ESP application PPE would meet the proposed criteria, a COL or CP applicant that references the CRN Site ESP would determine whether the applicable EPZ size criteria are met based on the selected reactor design. Therefore, for the ESP application, the staff did not review or approve a specific plume exposure pathway EPZ size associated with a specific SMR technology. The staff evaluated the reasonableness of the applicant's proposed method for determining the plume exposure pathway EPZ that the COL or CP applicant may use as justification for the plume exposure pathway EPZ in the COL application (COLA).

The applicant's method includes the following steps:

- (1) selection and categorization of accident scenarios;
- (2) development of fission product release to the environment as a function of time (radiological release source term);
- (3) for design basis accidents and less severe accidents, calculation of projected dose consequences at a distance and comparison to dose criteria; and
- (4) for more severe accidents, calculation of the probability of dose exceedance at distance and evaluation of the criterion on substantial reduction in early health effects.

The dose criteria discussed above aid in determination of EPZ size. If the dose criteria are not exceeded by the projected consequences of potential accidents for average meteorological conditions at the site (i.e., mean value of meteorological conditions), then areas outside the

plume exposure pathway EPZ would not require early protective actions, such as evacuation, to ensure public health and safety.

Consistent with the NUREG-0396 analysis, the applicant proposed to evaluate a range of accidents to determine the plume exposure pathway EPZ size. The applicant stated that design-basis-accident radiological release source terms will be the same as defined for postulated accidents in a COLA FSAR Chapter 15. The severe accident radiological release source terms will be determined based on an NRC-accepted methodology. The applicant stated that a COLA will include detailed information on the Level 2 probabilistic risk assessment (PRA) for the selected reactor technology to be constructed and operated at the CRN Site. The Level 2 PRA information is used to define severe accident fission product releases. If a CP applicant references the ESP, the CP applicant would also need to perform these activities, as required by Permit Condition 7.

The analyses will calculate the TEDE for the following exposure pathways: external exposure to the cloud (plume), inhalation, ground shine, and resuspended ground contamination. The TEDE will be calculated for a 4-day period, consistent with the discussion in the PAG Manual for use of the early-phase PAGs. The analyses will also use site-specific information on meteorology to develop average expected (50th percentile) dispersion characteristics and plant-specific radiological release source terms. The dose results will be compared to the dose criteria.

The staff finds that the applicant's description of the method to perform the consequence analyses to support the determination of the plume exposure pathway EPZ size is reasonable and consistent with the analyses described in NUREG-0396. The staff is not making a final determination of the acceptability of the plume exposure pathway EPZ size at this time and will review the consequence analyses in more detail when the analyses of the plume exposure pathway EPZ size basis are evaluated as part of a COL or CP application review.

TVA stated that it does not intend that the exemption requests be applicable only to a specific design, so TVA established a source term for atmospheric accident releases that is not design-specific and will ensure the appropriate application of the exemption requests to support a site-specific plume exposure pathway EPZ at the CRN Site. TVA's generic accident atmospheric release source term describes the bounding isotopic releases for a 4-day release from the surrogate plant described in the ESP application PPE, for the purposes of determining the plume exposure pathway EPZ size using the TVA sizing methodology.

The staff assessed TVA's assumptions and determined that they are reasonable. The staff finds that this analysis provides assurance that, if the releases from the specific plant chosen for a COLA are bounded by those in TVA's accident atmospheric release source term, the COLA evaluation of EPZ size would support the use of either set of emergency planning exemptions, provided that the relevant dose criteria are met. Therefore, based on its evaluation of the applicant's information, the staff finds that TVA's accident atmospheric release source term is reasonable.

The staff is proposing Permit Condition 5 related to the EP exemption requests. This permit condition requires that a COL or CP applicant referencing the ESP demonstrate in the COL or CP application that the design-specific accident release source term it uses in the TVA sizing methodology is bounded by the accident release source term in the ESP. If the CP or COL applicant intends to use the exemptions approved in the ESP, the COL or CP application must

show that this permit condition is met and provide an analysis using the methodology and criteria in SSAR Section 13.3 to justify the plume exposure pathway EPZ size.

The staff concluded that the applicant's proposed analysis methodology (described in SSAR Section 13.3) for supporting the plume exposure pathway EPZ size determination is reasonable and consistent with the analyses that form the technical basis for the current regulatory requirement of a plume exposure pathway EPZ with about a 10-mile radius for large LWRs. Therefore, the proposed methodology is acceptable for determining the appropriate size of the plume exposure pathway EPZ for the CRN Site, subject to approval of the exemptions.

Exemptions from Emergency Planning Regulations

For the site boundary plume exposure pathway EPZ major-features emergency plan in ESP Plan 5A, Tables 1-1 and 1-2 of Part 6 of the ESP application identify the specific requirements in 10 CFR 50.33(g), 10 CFR 50.47(b), 10 CFR 50.47(c)(2), and Appendix E to 10 CFR Part 50, from which TVA is requesting exemptions. For the 2-mile plume exposure pathway EPZ major-features emergency plan in ESP Plan 5B, Table 1-3 of Part 6 of the ESP application identifies the specific requirements in 10 CFR 50.33(g) and 10 CFR 50.47(c)(2) from which TVA is requesting exemptions.

Pursuant to 10 CFR 50.12(a), the Commission may grant the exemptions if (1) the exemptions are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security; and (2) special circumstances are present.

The staff concludes that the exemptions are authorized by law because they are not contrary to the AEA or any other legal requirement. The exemptions will not present an undue risk to the public health and safety and are consistent with the common defense and security, because, as discussed below, TVA's methodology provides a basis for establishing a plume exposure pathway EPZ in the COL or CP application that maintains the same level of protection in the environs of the CRN Site as that which exists at the 10-mile plume exposure pathway EPZ for large LWRs.

In 10 CFR 50.12(a)(2), the NRC identifies six kinds of special circumstances, including 10 CFR 50.12(a)(2)(ii), where "[a]pplication of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule." TVA's request supports a conclusion that the identified requirements are not necessary to achieve the underlying purpose of the rule. Specifically, in ESP application Part 6, Section 1.3.4, TVA stated that special circumstances exist at the CRN Site because the enhanced safety features in the design of SMRs significantly enhance nuclear safety and provide considerable additional confidence in the protection of public health and safety. TVA also stated that it used risk-informed considerations in developing the exemption requests with the understanding that the SMR designs evaluated under the PPE for the CRN ESP application include enhanced safety features.

The staff finds that the basis for the establishment of a plume exposure pathway EPZ in the COL or CP application maintains the same level of protection (i.e., dose savings) in the environs of the CRN Site, as that which exists at the 10-mile plume exposure pathway EPZ for large LWRs, as discussed above. Therefore, compliance with the identified regulations is not necessary to achieve the underlying purpose of the rule.

For the reasons given above, the staff concludes that the proposed exemptions specified in ESP application Part 6, Tables 1-1, 1-2, and 1-3, are acceptable and should be granted.

Environmental Matters

The NRC staff issued the FEIS for the CRN Site ESP in April 2019. The staff's review, documented in NUREG-2226, found no novel issues for the environmental review of the ESP application for the CRN Site.

III. Early Site Permit Findings

10 CFR 52.24(a):²

- The applicable standards and requirements of the AEA and the Commission's regulations have been met.

The staff reviewed the ESP application for the CRN Site and evaluated it against the applicable regulations in 10 CFR Parts 20, 50, 51, 52, 73, and 100. The staff performed this evaluation using relevant portions of the SRP, ISG documents, RGs, bulletins, NUREGs, and generic letters. Based on its review, documented in the FSER and FEIS, the staff concludes that, for the purpose of issuing an ESP for the CRN Site, the applicant has met the relevant standards and requirements of the AEA and the Commission's regulations.

- Any required notifications to other agencies or bodies have been made.

The NRC took the actions required by Section 182c. of the AEA and 10 CFR 50.43(a). In April 2017, the NRC published notices of the application in the local newspapers: The Oak Ridger, Roane County News, and Knoxville Sentinel about the CRN project. TVA is the regulatory agency that has jurisdiction over the rates and service incident to the proposed activities as noted in 10 CFR 50.43(a)(1). In addition, the 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).

Based on the staff's completion of notifications to regulatory agencies and the public described above, the staff concludes that, for the purposes of issuing an ESP for the CRN Site, all required notifications to other agencies or bodies have been duly carried out.

- There is reasonable assurance that the site is in conformity with the provisions of the AEA and the Commission's regulations.

The staff reviewed the ESP application for 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 SRP, ISG documents, RGs, bulletins, NUREGs, and generic letters. Based on the staff's review, documented in the FSER and FEIS, the staff concludes that, for the purpose of issuing an ESP for the CRN Site, the site characteristics are acceptable and

² The requirements in 10 CFR 52.24(a)(5) and (a)(7) are not addressed in this paper because (1) TVA did not propose inspections, tests, analyses, and acceptance criteria, as permitted by 10 CFR 52.17(b)(3), and (2) TVA did not request a limited work authorization under 10 CFR 52.17(c).

the applicable standards and requirements of the AEA and the Commission's regulations have been met.

- The applicant is technically qualified to engage in any activities authorized.

With respect to the activities necessary to prepare the ESP application, the applicant demonstrated its technical qualifications. In Chapter 17 of the FSEER, the staff concluded that the applicant's Quality Assurance Program Description satisfies all applicable NRC requirements regarding preparation of the application. In addition, the applicant has extensive experience as a nuclear plant owner and operator of the TVA nuclear fleet (Sequoyah, Watts Barr and Browns Ferry nuclear generating stations). Therefore, for all these reasons, the applicant is technically qualified under 10 CFR 52.24(a)(4).

- Issuance of the permit will not be inimical to the common defense and security or to the health and safety of the public.

Because the staff finds that the applicant complies with all applicable regulatory requirements, the proposed issuance of the license is presumed not to be inimical to the common defense and security or the public health and safety. Also, the staff is not aware of any information presenting inimicality concerns, and TVA is a corporate agency and instrumentality of the United States.

- The findings required by Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," of 10 CFR Part 51 have been made.

As discussed below, the staff concludes that the environmental review has been adequate to support the findings required for an ESP by 10 CFR 51.105(a).

10 CFR 51.105(a):

- Determine whether the requirements of Sections 102(2) (A), (C), and (E) of NEPA and the regulations in Subpart A of 10 CFR Part 51 have been met.

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), ISG documents, and RGs.

In accordance with NEPA Section 102(2)(A) (42 U.S.C. § 4332(2)(A)), the staff prepared the FEIS for the CRN ESP, based on its independent assessment of the information provided by the applicant and information developed independently by the staff, including through consultation with other agencies. The staff's technical analysis used a systematic, interdisciplinary approach to integrate information from many fields, including the natural and social sciences.

In accordance with NEPA Section 102(2)(C)(i-v) (42 U.S.C. § 4332(2)(C)(i-v)), 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 staff's interactions with other Federal agencies during the preparation of these documents. As supported by all of these documents, the staff concludes that it fulfilled the requirement of NEPA Section 102(2)(C) by consulting with and obtaining comments from other Federal agencies with jurisdiction by law or special expertise (*see* 42 U.S.C. § 4332(2)(C)). The U.S. Army Corps of Engineers fully participated with the NRC in preparing this 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.

The staff concludes that the 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)(E) (42 U.S.C. § 4332(2)(E)). The alternatives considered in the FEIS include the no-action alternative, alternative sites, and system design alternatives.

For the reasons given above, the staff also concludes that its review meets the NRC's requirements in 10 CFR Part 51, Subpart A. The staff concludes that the environmental findings in the FEIS constitute the "hard look" required by NEPA and have reasonable support in logic and fact.

- 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.

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 considered is environmentally preferable to the CRN Site.

- 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.

TVA did not address the balance of benefits and costs in its ESP application for the CRN Site, because such an assessment is not required for an ESP application according to 10 CFR 51.50(b)(2). In accordance with 10 CFR 51.75(b), the EIS for an ESP does not address the balance of costs and benefits if the applicant did not address this matter. If the NRC issues an ESP for the CRN Site, and a CP or COL application that references such an ESP is docketed, the EIS prepared in connection with the review of that CP or COL application will consider these matters.

In the FEIS, the staff considered reasonable alternatives to the proposed action and determined that none were obviously superior. Based on that analysis, the staff recommends that the ESP be issued. The staff based its recommendation on (1) the Clinch River ESP application ER, supplemental submittals by the applicant, 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.

- Determine, in an uncontested proceeding, whether the NEPA review conducted by the staff has been adequate.

The staff conducted an independent evaluation of the application; developed independent, reliable information; and conducted a systematic, interdisciplinary review of the potential impacts of the proposed action on the human environment and reasonable alternatives to the applicant's proposal. Before developing the DEIS, the staff issued a notice of intent and invited public participation. The staff also provided opportunities for governmental and public participation during the public meeting on the DEIS and used publicly available guidance in the development of its FEIS.

The 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 impacts of alternatives with those of the proposed action. The staff considered any adverse environmental effects that could not be avoided if the proposed action is implemented, the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources that would be involved in the proposed project.

The NRC filed the DEIS with the EPA for its review, consistent with the requirements in Section 309 of the Clean Air Act (see 42 U.S.C. § 7609). The staff considered all comments received on the DEIS and, in Appendix E to the FEIS, described the disposition of each comment.

On these bases, the staff concludes that, for the purpose of issuing the ESP, it conducted a thorough and complete environmental review sufficient to meet the requirements of NEPA and adequate to inform the Commission's action on the ESP application.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection.

Sincerely,



Margaret M. Doane
Executive Director
for Operations

STAFF'S STATEMENT IN SUPPORT OF THE UNCONTESTED HEARING FOR ISSUANCE OF AN EARLY SITE PERMIT FOR CLINCH RIVER NUCLEAR SITE, MONTH 21, 2019

ADAMS Accession No.: ML19107A241

*** via email**

SECY-012

OFFICE	NRO/DLSE/LB3	NRO/DLSE/LB3	NRO/DLSE/LB3	NRO/DLSE/LB3
NAME	MSutton	TDozier	SGreen	AFetter
DATE	4/5/19	4/12/19	4/25/19	4/26/19
OFFICE	Tech Editor	NRO/DLSE/LB3	OGC	NSIR/DPCP
NAME	JDougherty	JRankin	MASpencer (NLO)	SHelton
DATE	4/22/19	5/21/19	6/4/19	5/28/19
OFFICE	NSIR/DPR	NRO/DLSE	NRO/DLSE	NRO
NAME	MScott	ABradford	RTaylor	FBrown (VOrdaz for)
DATE	5/28/19	6/3/19	6/12/19	6/12/19
OFFICE	OEDO			
NAME	MDoane			
DATE	6/ 21 /19			

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