



Tennessee Valley Authority, 1101 Market Street, Chattanooga, TN 37402

CNL-17-090

October 19, 2017

10 CFR 52, Subpart A

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Clinch River Nuclear Site
NRC Docket No. 52-047

Subject: Response to Request for Additional Information Number 2 Regarding Physical Security in Support of Early Site Permit Application for Clinch River Nuclear Site

- References:
1. Letter from TVA to NRC, CNL-16-081, "Application for Early Site Permit for Clinch River Nuclear Site," dated May 12, 2016
 2. NRC Electronic Mail, "Issuance of RAI pertaining to Section 13.06 - Physical Security," dated September 19, 2017

By letter dated May 12, 2016 (Reference 1), Tennessee Valley Authority (TVA) submitted an application for an early site permit for the Clinch River Nuclear (CRN) Site in Oak Ridge, TN. By electronic mail dated September 19, 2017 (Reference 2), Nuclear Regulatory Commission (NRC) issued a request for additional Information (RAI), RAI number 2, eRAI-8735, regarding physical security associated with the CRN Site.

The Enclosure to this letter provide the response to the RAI, including Site Safety Analysis Report (SSAR) markups. The SSAR markups will be incorporated in a future revision of the early site permit application.

There are no new regulatory commitments associated with this submittal. If any additional information is needed, please contact Dan Stout at (423) 751-7642.

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I declare under penalty of perjury that the foregoing is true and correct. Executed on this 19th day of October 2017.

Respectfully,



J. W. Shea
Vice President, Nuclear Regulatory Affairs and Support Services

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cc: (Enclosure)

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NRC RAI 13.06.03-1 Question

In Part 2, Chapter 2 of the application, the applicant provided CRN site coordinates and indicated that a set of bounding plant parameter envelope (PPE) was identified based upon an evaluation of a number of small reactor designs technology to support the ESP application and that no specific reactor technology had been selected. As a result, the applicant stated that the power block area is only proposed as location of the reactor modules on the site. The applicant also identified a 28-acre land mass (Fig. 3.1-1) for the power block area within a 94-acre allocated for the plant area. The applicant stated that CRN land mass is sufficiently large to allow for the establishment of the security boundaries of the OCA, protected area (PA), vital area (VA), and protected area perimeter isolation zones, with sufficient distance between these security boundaries and vital areas, for the implementation of a physical protection program consistent with the requirements of 10 CFR 73.55 (See also 10 CFR 52.17). The staff considers the power block area specific coordinate important to demonstrate that the selected design is bounded by the PPE. Confirm that selection of any specific reactor designs technology discussed in Section 2 of the application will not invalidate the proposed location of the power block area.

TVA RAI 13.06.03-1 Response

As described in Part 1, "Administrative Information," Section 1.0, "Introduction and Purpose," of TVA's Clinch River Nuclear (CRN) Early Site Permit Application (ESPA) and as noted in NRC RAI question 13.06.03-1 above, the ESPA was developed using the plant parameter envelope (PPE) approach. The PPE approach is further described in Part 2, "Site Safety Analysis Report," Section 2.0, "Plant Parameter Envelope," as (emphasis added):

"Tennessee Valley Authority (TVA) is currently evaluating four light-water-cooled small modular reactor (SMR) technologies for deployment at the CRN Site. Because a technology has not yet been selected, for the Early Site Permit Application (ESPA) the plant-site interface is defined through a collection of site-related design parameters known as the PPE. The PPE approach provides sufficient design detail to support NRC review of the ESPA, while allowing sufficient flexibility for technical developments in new reactor technologies. The actual design selected for the CRN Site would be reviewed within a combined license application (COLA) to demonstrate that the design is bounded by the PPE, and differences would be reviewed for acceptability in the COLA. The PPE developed in support of the CRN Site ESPA is based on data from the four SMR designs under evaluation by TVA. Brief descriptions of these designs are provided in Section 1.11, Overview of Reactor Types."

The PPE is defined in NRC NUREG-0800, "Standard Review Plan," as follows (emphasis added):

"A plant parameter envelope (PPE) sets forth postulated values of design parameters that provide design details to support the NRC staff's review of an ESP application. A controlling PPE value, or bounding parameter value, is one that necessarily controls the value of a site characteristic. As the PPE is intended to bound multiple reactor designs, the actual design selected in a COL or CP application referencing an ESP would be reviewed to ensure that the design fits within the bounding parameter values. Otherwise, the COL or CP applicant would need to demonstrate that the design, given

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the site characteristics in the ESP, complies with the Commission's regulations. Should an applicant reference an ESP for a design that is not certified, the applicant would need to demonstrate that the design's characteristics fall within the bounding parameter values."

In addition, NRC Regulatory Guide (RG) 1.206, "Combined License Application for Nuclear Power Plants (LWR Edition)," Section C.III.2, "Information Needed for a Combined License Application Referencing a Certified Design and an Early Site Permit," C.I.1.8, "Site and Plant Design Interfaces and Conceptual Design Information," requires (emphasis added):

"The requirements of 10 CFR 52.79(d) specify that COL applications referencing a certified design must provide sufficient information to demonstrate that the characteristics of the site fall within the site parameters specified in the design certification and must contain information sufficient to demonstrate that the interface requirements established for the design under 10 CFR 52.47 have been met. In addition, Section IV of the appendices to 10 CFR Part 52 codifying the certified designs requires that COL applicants referencing the certified designs provide information that addresses the COL action items and reports on generic changes and plant-specific departures from the certified design. If not specifically discussed in Section 1.8 of the FSAR, COL applicants should provide a cross-referenced tabulation highlighting the specific FSAR sections that demonstrate how the site interface requirements identified in the certified design have been met. In addition, the COL applicant should demonstrate in this section (or reference to other more applicable sections of the FSAR) that the design of the facility falls within the site characteristics and design parameters specified in the ESP, including an ESP that uses the PPE approach. The COL applicant referencing an ESP that uses a PPE approach should demonstrate that the design of the facility falls within the site characteristics enveloped in the PPE."

Should TVA apply for a CRN Site COL referencing the early site permit, as noted in the underlined text of the three references above, TVA would review the actual design selected for the CRN Site COLA to demonstrate that the design is bounded by the PPE, and differences would be reviewed for acceptability in the COLA. This review would confirm that selection of any specific reactor designs technology discussed in Section 2 of the application will not invalidate the proposed location of the power block area.

Further, as discussed with the staff during the September 19, 2017 clarification call regarding this RAI, TVA understood the NRC staff was requesting confirmation that selection of any specific reactor designs technology used in the CRN PPE approach discussed in Section 2 of the application will not impact the development of the security plan. As stated in the RAI question above, the CRN Site power block area specific coordinates are bounded by the PPE. TVA confirms that the land mass corresponding to the selection of any specific reactor design technology discussed in Section 2 of the application will be sufficiently large to allow for the establishment of the security boundaries of the owner controlled area (OCA), protected area (PA), vital area (VA), and protected area perimeter isolation zones, with sufficient distance between these security boundaries and vital areas for the implementation of a physical protection program consistent with the requirements of 10 CFR 73.55 (See also 10 CFR 52.17).

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NRC RAI 13.06.03-2 Question

10 CFR 52.17(a)(1)(x) requires that the applicant provide information demonstrating that site characteristics are such that adequate security plan and measures can be developed. 10 CFR 73.55 and Part 73, Appendix C.II.B.3.b, require an applicant to discuss site characteristics (e.g., physical layout) that could impact the development of the security plan.

In Part 2, Chapter 2, Section 2.2.3.1.1.3, the applicant discussed the effects from explosion of the two natural gas transmission pipelines within the vicinity of the CRN site. It is not clear to the staff that the applicant-conducted pipeline assessment considered any physical protection implications, specifically the failure of East Tennessee Natural Gas Pipeline 1, with regard to the heat effect of thermal radiation from a sustained jet fire and from explosions. The applicant is requested to discuss how such an event, specifically the pressure induced by such an explosion and the heat flux induced by a jet fire, was considered in the future development of the security plan.

In Table 2.2.4, there appears to be missing information with regard to distances between isolation valves of both the East Tennessee Natural Gas Pipelines 1 and 2. Identify locations and distances of these valves as part of site specific characteristics.

Note: The information addressing specific details related to site impediments and security features may be safeguards information (SGI) and should be marked and protected in accordance with 10 CFR 73.21. The applicant should portion mark text in the response to this request for information (RAI) as appropriate to identify SGI that reveals the specific details of security impediments. The RAI responses supplementing the Part 2 document must be publicly available.

TVA RAI 13.06.03-2 Response

In accordance with NUREG-0800, Standard Review Plan, Section 2.2.1-2.2.2, the Site Safety Analysis Report (SSAR) includes a description of the nearby industrial, military, and transportation facilities, including pipelines, to establish whether the effects of potential accidents in the vicinity of the CRN Site should be used as design-basis events and the design parameters related to the selected accidents. As presented in SSAR Subsection 2.2.2.3 and Table 2.2-4, two natural gas pipelines, East Tennessee Natural Gas Pipelines 1 and 2, were identified for evaluation. SSAR Subsection 2.2.2.3 and Table 2.2-4 provide a description of the pipelines, including the pipe size, age, operating pressure, depth of burial, and product carried. As discussed in SSAR Subsection 2.2.2.3, the pipelines have various isolation (gate) valves located along the pipeline route which can be reached and operated within one hour of notification.

In accordance with NUREG-0800, TVA determined potential accidents to be considered as design-basis accidents and identified the potential effects of those accidents in terms of design parameters (e.g., overpressure, missile energies) or physical phenomena (e.g., concentration of flammable or toxic clouds). In SSAR Subsection 2.2.3.1.1.3, TVA presented evaluations of the potential effects from postulated design-basis accidents due to an explosion event involving the immediate detonation of natural gas occurring from each of the two identified natural gas transmission pipelines in the vicinity of the CRN Site. TVA also evaluated additional scenarios (accident categories) involving the rupture of the natural gas pipelines. These accident

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categories included: delayed ignition of a formed vapor cloud (flash fire and detonation); jet fire (immediate ignition of the released natural gas); and toxicity (asphyxiant). These evaluations, presented in SSAR Subsections 2.2.3.1.2.3, 2.2.3.1.3.3 and 2.2.3.1.4, include impacts related to the CRN Site in relation to the safe operation or shutdown of units within the CRN Site power block area (e.g., heat effect of thermal radiation from a sustained jet fire and overpressure effects from explosions). The analysis concluded that a jet fire or a flammable vapor cloud ignition or explosion from either a rupture in the East Tennessee Natural Gas Pipelines 1 or 2 will not adversely affect the safe operation or shutdown of units within the CRN Site power block area.

The worst-case scenario presented in the analyses considered the delayed ignition (detonation) of the released natural gas and assumed a one-hour maximum release. The isolation valves are in various locations along the pipeline's route, are manually operated, and can be shut-off within one hour of notification (SSAR Subsection 2.2.2.3). Thus, in performing the design-basis accident analyses with respect to the two East Tennessee Natural Gas pipelines, the isolation valves were not credited prior to one hour. Therefore, the specific locations and distances between the isolation valves are not used in the analyses.

The largest calculated safe distance, the minimum distance required for an explosion to have less than 1 psi peak incident pressure, for the East Tennessee Natural Gas Pipeline 1, is 1575 ft, which is less than the distance to the CRN Site power block area of 5800 ft (SSAR Tables 2.2-9 and 2.2-10). Similarly, the largest calculated safe distance for the East Tennessee Natural Gas Pipeline 2 is 4572 ft, which is less than the distance to the CRN Site power block area of 15,800 ft.

Based upon the distance to the CRN Site power block area being greater than the largest calculated safe distance for each of the East Tennessee Natural Gas Pipelines, it can be concluded that the impacts of identified gas pipeline explosions would not prohibit adequate security plans and measures from being developed in accordance with 10 CFR52.17(a)(1)(x) and NUREG-0800 Section 13.6.3.

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NRC RAI 13.06.03-3 Question

In Part 2, Section 2.2.2.2.2, the applicant stated that the transportation route I-40 corridor is the most significant and closest highway to the CRN site, which is just over 1 mile from the site power block area. The applicant also indicated that transportation route was evaluated for potential impact to ORNL. 10 CFR 73.55 and Part 73, Appendix C.II.B.3.b, require a licensee to discuss site characteristics which could impact the development of the security plan. Confirm that the impact assessment of transportation routes for ORNL is also bounded for CRN site and will not impact the ability to develop CRN specific security plan.

Note: The information addressing specific details related to site impediments and security features may be safeguards information (SGI) and should be marked and protected in accordance with 10 CFR 73.21. The applicant should portion mark text in the response to this request for information (RAI) as appropriate to identify SGI that reveals the specific details of security impediments. The RAI responses supplementing the Part 2 document must be publicly available.

TVA RAI 13.06.03-3 Response

NUREG-0800 requires an applicant to identify potential hazards in the site vicinity including the location of, and separation distances to, transportation routes. The products and materials likely to be transported along the identified transportation routes are then identified to determine any potential design basis events.

In SSAR Subsection 2.2.2.5, TVA identified I-40, located approximately 1 mile from the CRN Site power block area, as a bounding transport route in the vicinity of the CRN Site for evaluation. The I-40 transport route is used to establish whether the effects of potential accidents along this route should be used as design-basis events for plant design parameters. In determining the plausible chemicals that may be transported along the I-40 corridor, offsite chemical storage, including storage at ORNL, was first ascertained. As stated in SSAR Subsection 2.2.2.2.2, the chemicals at ORNL were conservatively assumed to be transported along I-40 at its nearest approach to the CRN Site, and thus included in the transport evaluation for the CRN Site. That is, the chemicals stored at the ORNL site were identified as plausible transport chemicals along the I-40 corridor specifically for the CRN Site impact assessment with respect to transport routes. The analysis concluded that potential accidents involving explosions, and flammable vapor clouds from materials transported along the nearby I-40 route would not adversely affect the safe operation or shutdown of units located within the CRN Site power block area. Therefore, the assessment of transportation routes demonstrates the ability to develop the CRN Site specific security plan is not impacted. This clarification is also applicable to the Kingston Fossil Plant, Oak Ridge WTP, Bull Run Fossil Plant, and Hallsdale Power Utility District Melton Hill WTP transportation route discussions and is being incorporated into SSAR Subsection 2.2.2.2.2 as indicated in the SSAR markups below. The SSAR markups will be incorporated in a future revision of the early site permit application.

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SSAR Markups

The second, sixth, tenth, fourteenth, and eighteenth paragraphs of SSAR Subsection 2.2.2.2.2, Subheading "ORNL (Battelle and URS)," are being revised as indicated. Underlines indicates text to be added. Strikeouts indicate text to be deleted.

2.2.2.2.2 Industrial Facilities

ORNL (Battelle and URS)

Second paragraph

The transportation route used for shipping and receiving supplies at the plant may vary, and unless a material is prohibited on a route, there are no restrictions that would prevent the driver from taking another route. ~~The~~Therefore, I-40 corridor is identified as; the most significant and closest highway to the CRN Site, ~~is evaluated as a potential transport route for supplies shipped to ORNL.~~ Therefore, it is conservatively assumed that the chemicals stored at ORNL are transported along the I-40 corridor, in close proximity to the CRN Site, and are included in the evaluation of potential accidents associated with nearby transport routes.

Sixth paragraph

The transportation route used for shipping and receiving supplies at the plant may vary, and unless a material is prohibited on a route, there are no restrictions that would prevent the driver from taking another route. ~~The~~Therefore, the I-40 corridor is identified as; the most significant and closest highway to the CRN Site, ~~was evaluated as a potential transport route for TVA Kingston Fossil Plant.~~ Therefore, it is conservatively assumed that the chemicals stored at TVA Kingston Fossil Plant are transported along the I-40 corridor, in close proximity to the CRN Site, and are included in the evaluation of potential accidents associated with nearby transport routes.

Tenth paragraph

The plant receives chlorine from its supplier by truck. The transportation route used for shipping and receiving supplies at the plant may vary, and unless a material is prohibited on a route, there are no restrictions that would prevent the driver from taking another route. ~~The~~Therefore, the I-40 corridor is identified as; the most significant and closest highway to the CRN Site, ~~is evaluated as a potential transport route for supplies shipped to Oak Ridge WTP.~~ Therefore, it is conservatively assumed that the chemicals stored at Oak Ridge WTP are transported along the I-40 corridor, in close proximity to the CRN Site, and are included in the evaluation of potential accidents associated with nearby transport routes.

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Fourteenth paragraph

TVA Bull Run Fossil Plant receives anhydrous ammonia from its supplier by truck. The transportation route used for shipping and receiving supplies at the plant may vary, and unless a material is prohibited on a route, there are no restrictions that would prevent the driver from taking another route. ~~The~~Therefore, the I-40 corridor is identified as, the most significant and closest highway to the CRN Site, ~~is evaluated as a potential transport route for supplies shipped to TVA Bull Run Fossil Plant.~~ Therefore, it is conservatively assumed that the chemicals stored at TVA Bull Run Fossil Plant are transported along the I-40 corridor, in close proximity to the CRN Site, and are included in the evaluation of potential accidents associated with nearby transport routes.

Eighteenth paragraph

The transportation route used for shipping and receiving supplies at the plant may vary, and unless a material is prohibited on a route, there are no restrictions that would prevent the driver from taking another route. ~~The~~Therefore, the I-40 corridor is identified as, the most significant and closest highway to the CRN Site, ~~is evaluated as a potential transport route for supplies shipped to Hallsdale Powell Utility District Melton Hill WTP.~~ Therefore, it is conservatively assumed that the chemicals stored at Hallsdale Powell Utility District Melton Hill WTP are transported along the I-40 corridor, in close proximity to the CRN Site, and are included in the evaluation of potential accidents associated with nearby transport routes.

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NRC RAI 13.06.03-4 Question

In Part 2, Section 13.6, the applicant stated that the characteristics of the new plant footprint are such that the applicable requirements of the following are met: 10 CFR 100.21(f) and 73.55. Confirm that selection of any specific reactor designs technology discussed in Section 2 of the application and will not impact the development of the security plan (e.g. site specific security, engineering designed features and monitoring equipment, and security methods for screening station operating personnel) as required per NRC Regulatory Guide 4.7, General Site Suitability Criteria for Nuclear Stations; NEI 03-12, Template for Security Plan and Training and Qualification Plan; EA-03-086, Revised Design Basis Threat Order, in addition to the requirements of 10 CFR 100, §100.21(f) and 10 CFR 73, §73.55.

TVA RAI 13.06.03-4 Response

As described in the response to RAI 13.06.03-1 above, should TVA apply for a COL referencing the early site permit, TVA would review the actual design selected for the CRN Site COLA to demonstrate that the design is bounded by the PPE, and differences would be reviewed for acceptability in the COLA. This review would confirm that selection of any specific reactor designs technology discussed in Section 2 of the application will not impact the development of the security plan such as site specific security, engineering designed features and monitoring equipment, and security methods for screening station operating personnel.