

Readiness Assessment Trip Report: Clinch River  
Early Site Permit Application  
Tennessee Valley Authority

October 7 - 8, 2014

AGENDA

**DAY 1 – OCTOBER 7**

MCL Inc. Heritage Center

200 Heritage Center Blvd, 2010 Highway 58

Oak Ridge, Tennessee

- 0900 U.S. Nuclear Regulatory Commission (NRC)/Pacific Northwest National Laboratory (PNNL) staff arrive at the MCL Inc. Heritage Center
- Introductions
  - Tennessee Valley Authority (TVA) Welcome
  - NRC Introductory Remarks
- 0915–0945 Site/project briefing
- 0945–1145 Environmental resource area summary (limited to resource areas investigated, maps of sampling locations, site orientation)
- 1145–1200 Safety briefing
- 1145–1230 Lunch
- 1230–1600 Travel to Clinch River site for walkdowns/tours
- All – General Orientation - major site features

**Tours**

1400 Site tour

Barge area

Terrestrial and Wetlands Tour, including met tower, Grassy Creek Habitat Protection Area, offsite noise/transportation sites, intake area (from the aquifer pump test site), and the discharge area

Aquatic, Surface Water, Groundwater Model Development, including barge area (site only; not a river tour), walk to the intake area (from the aquifer pump test site), and the discharge area

Cultural / Historical Tour

1600–1630 Wrap-up and preview of day 2

## Day 2 – OCTOBER 8

TVA – Knoxville Offices

400 W. Summit Hill Drive

Knoxville, TN 37902-1401

West Tower – Plaza Level, Auditorium, and Room 407

0830–0900 NRC/PNNL Arrive Knoxville Office Complex

0900–0930 Orientation to Day’s Activities (TVA/NRC)

0930–1130 Document Examination and Discussion of Plant Parameter Envelope (PPE)

1130–1230 Lunch

1230–1430 Document Examination and Resource Area Discussions

- Resource Area Breakout Sessions

- Surface Water

- Cultural and Historic Resources

- Terrestrial and Aquatic Ecology and Land Use

- Socioeconomics and Environmental Justice

- Environmental Report (ER) Development

- Developing Design Basis Accidents/Accident Analysis Approach/PPE Development

- Meteorological Program

1430–1600 NRC/PNNL and TVA/AECOM/Bechtel internal discussions (separate)

1600–1645 Wrap-up and next steps (re-assemble in auditorium)

1645–1700 Discussion of plans for upcoming meetings/visits

1700 Adjourn

## **Attendees at Readiness Assessment Activity**

Meeting attendee's sign-in sheet for October 7, 2014 is provided in Attachment 1.

Meeting attendee's sign-in sheet for October 8, 2014 is provided in Attachment 2.

## **Summary of Observations, Issues, and Concerns**

The following provides a brief summary of the NRC staff observations of TVA's readiness in developing its Environmental Report (ER) for a future early site permit (ESP) application by TVA. TVA has not selected a reactor design for the proposed nuclear station and it plans to take the plant parameter envelope (PPE) approach for its ESP application.

The staff was offered an opportunity to examine TVA's online in-progress sections of the ER. The following sections, listed by discipline, describe the staff observations based on its examination of the available information.

### *Plant Parameter Envelope:*

The TVA provided the NRC/PNNL team with the same basic presentation given during the September 11, 2014, public meeting. The PPE is being developed using input from the four major small modular reactor (SMR) vendors in the United States: mPower, NuScale, Holtec, and Westinghouse. The PPE will assume 2 to 12 units installed, depending on the design chosen, and a total installed capacity of up to 800 megawatts electric (MW(e)). Currently, TVA does not anticipate the need for construction of offsite transmission lines.

### *Purpose and Need:*

The TVA outlined several different purposes for the project. These include demonstrating the deployment of SMR technology, installing SMRs incrementally to follow load growth, ability to dispatch SMRs to follow changes in demand, meeting Federal greenhouse gas emission goals, providing secure power to Federal facilities following loss of offsite power, fuel diversity, and increased safety due to the passive cooling systems in SMR designs. However, as the intent of an ESP is to determine if a site is suitable for the construction and operation of a nuclear reactor(s), the staff needs to discuss these proposed purposes further. These discussions would include the U.S. Army Corps of Engineers (USACE or Corps) to determine if the proposed purposes meet the Corps' needs. A Purpose and Need Statement focused on the ESP action was not available for staff examination.

### *Accidents:*

There were discussions between the NRC technical staff and their counterparts representing the prospective applicant and its contractor regarding the analysis of accidents. There were no sections of the ER available to examine regarding accidents. The prospective applicant stated that it would use the PPE to analyze design basis accidents, but for severe accidents, an analysis for each reactor design would be conducted. Draft sections are expected to be developed in the next four months. Progress on these materials suggests that TVA should not have any problems meeting its September submittal date.

### *Alternative Site Analysis:*

The TVA provided a draft copy of its siting report that followed the basic approach suggested by the NRC Regulatory Guide 4.2, "*Preparation of Environmental Reports for Nuclear Power Stations*," and Environmental Standard Review Plan, Section 9.3, "*Alternative Sites*," screening from a region of influence (ROI), to candidate areas (CA), and down to potential sites. TVA defined the ROI as matching its service area, which encompasses all of Tennessee, and parts of Kentucky, Mississippi, Alabama, Georgia, North Carolina, and Virginia. This is similar to the approach of other utilities. However, in screening to CAs, rather than applying a list of exclusionary criteria to the ROI, TVA narrowed the ROI to CAs by applying a single criterion—on or adjacent to the largest U.S. Department of Energy (DOE) and U.S. Department of Defense (DOD) power users within the ROI—to narrow the field to six Federal facilities. The use of such a criterion is novel and will warrant additional discussion to ensure that its use comports with NRC requirements and guidance. TVA derived this criterion from its purpose and need statement, which included four basic objectives: (1) enhance nuclear safety and security with nuclear technology, (2) deploy multiple SMR units incrementally to meet demand, (3) assist Federal facilities (including TVA) in meeting carbon reduction objectives mandated by Executive Order, and (4) supply Federal mission-critical loads with reliable power from generation and transmission that is less vulnerable to disruption from intentional destructive acts and natural phenomena. The six CAs include (1) Oak Ridge Reservation (DOE), (2) Redstone Arsenal (DOD), (3) Fort Campbell (DOD), (4) Arnold Air Force Base (DOD), (5) Naval Service Area Mid-South (DOD), and (6) Columbus Air Force Base (DOD). Fort Campbell and Naval Service Area Mid-South were dismissed due to seismic risk, and Columbus Air Force Base was dismissed because of its location within a floodplain. Twenty-three potential sites identified within the three remaining CAs were screened against a list of criteria that were also subjected to scoring and weighting. The highest ranking sites included the preferred site and two other sites on the Oak Ridge Reservation, and one site at Redstone Arsenal. Preliminary TVA discussions with Redstone suggest that there may be two other sites within Redstone that DOD would prefer but that were not considered by TVA. Consequently, TVA is reassessing its scoring and ranking of potential sites based on new information provided by DOD, and anticipates having a new draft of its screening report by the end of calendar year (CY) 2014 and a final report by early CY 2015. Progress on these materials suggests that TVA should not have any problems meeting its September submittal date.

### *Aquatic Ecology:*

The TVA has done one year of aquatic sampling to characterize baseline resources in the Clinch River at locations associated with the intake and discharge. A draft section on site characterization was available for examination. Further sampling may be necessary at the proposed barge location and in the Grassy Creek area in addition to surveys onsite and in the Clinch River for crayfish species. No information was provided on construction, operation, cumulative effects, or alternative sites. Progress on these materials suggest that TVA should not have any problems meeting its September submittal date.

### *Historical and Cultural Resources:*

The TVA has several reports and records available for examination regarding onsite historic and cultural resources. Additional surveys will be completed in the fall of 2014 and potentially winter 2015. Chapter 2 has been drafted. Building activities have the potential to adversely affect eligible properties onsite. TVA has ongoing consultations concerning Section 106 of the National Historic Preservation Act (NHPA). A draft Programmatic Agreement (PA) has been developed by TVA, but not executed. The NRC staff is concerned that the timing of the final executed PA could impact the NRC's ability to finalize Section 106 consultation for the ESP undertaking. The staff intends to revisit the site during low pool to view cultural resources that will be impacted. Low pool will occur December 1, 2014, to April 1, 2015. The staff intends to visit the State Historic Preservation Office (SHPO) to identify SHPO concerns at the pre-application stage, discuss the PA status, and explain the NRC ESP process. Progress on these materials suggest that TVA should not have any problems meeting its September submittal date.

### *Environmental Justice:*

A draft of Section 2.5.4 was available for examination. Current progress on the development of this ER section did not suggest any technical issues and would not indicate any issue with TVA completing the rest of the related ER sections within the expected timeframe. Progress on these materials suggests that TVA should not have any problems meeting its September submittal date.

### *Hydrology:*

No draft ER sections were available for examination. Documents provided by TVA for examination by the NRC staff were a summary of shallow groundwater quality sampling conducted in 2011 and reports on the hydrothermal analysis for evaluating thermal impacts on the river from the proposed plant discharge. TVA data will be available to characterize historic Clinch River flows. TVA and TVA contractor staff described the activities completed to characterize onsite water bodies, wetlands, subsurface geology, groundwater and surface water quality, and offsite groundwater use. No reports on these resource areas were available for NRC staff to examine. Based on the information provided, NRC staff does not see any impediments to TVA completing the water-related ER sections as planned.

*Land Use:*

No draft ER sections were available for examination. A survey of local land-use resources was provided for examination. No description of the existing transmission corridors or summary of land covers on the site, vicinity, or region have been developed. Progress on these materials did not suggest any technical issues and would not indicate any issue with TVA completing the rest of the related ER sections within the expected timeframe.

*Meteorology/Air Quality:*

A draft ER section was available for examination. The Clinch River site has had three meteorological towers. Two were temporary, supplementary, while one was the primary tower. The primary meteorology tower was in operation from April 21, 2011, through July 9, 2013, and has since been removed. Data from the two-year period June 1, 2011, through May 31, 2013, was used for ER input. Wind speed, wind direction, dew point, and temperature measurements were collected at 10-m and 60-m levels. The rain gauge on the primary tower had problems, so TVA plans to use the National Weather Service Automated Surface Observing Station at Oak Ridge which is about 12 miles (mi) from the Clinch River site. TVA believes this gauge gives a reasonable representation of rain at the Clinch River site. TVA indicated their program conforms with NRC Regulatory Guide 1.23, Rev 1, "*Meteorological Monitoring Programs for Nuclear Power Plants (Safety Guide 23)*," without specifying which aspects of the program conform. In general, there are three gaps for wind flow over the site: along the river, through gaps in the hills bordering the river to the south, and to the northwest. Typical wind speeds are less than 5 miles per hour (mph), often less than 3 mph. Stagnation conditions are often observed, and F and G stability is common. TVA site staff had no information on non-attainment regions within Roane County. The staff did not identify any issues concerning TVA completing the Meteorology/Air Quality sections within the expected timeframe.

*Need for Power:*

The TVA plans no formal discussion of the need for power at the ESP application stage as need for power is not required by regulation (Title 10 of the *Code of Federal Regulations* (CFR) 51.50 (b)(2)) to be included in an ESP application. However, TVA indicated Oak Ridge National Laboratory (ORNL) anticipates a need for 120 MW of additional power, and the other 680 MW of power would generally meet demand in the TVA service area. TVA also anticipates ORNL and other Federal facilities will be interested in "secure power," which is a new class of power TVA is developing. The new class of power relies on islanding<sup>1</sup> the SMR facility and building hardened underground transmission lines to the Oak Ridge site. This in turn relies on direct adjacency of the site to the Federal customer's property, so any alternative site would require this adjacency. Currently, NRC regulations require two sources of offsite power and do not permit islanding nuclear facilities.

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<sup>1</sup> Islanding is a term to describe when a reactor, without external sources of electrical power, is producing electrical power for a dedicated customer.

### *Socioeconomics:*

A draft of Section 2.5.1 was available for examination. A transportation study covering site access and a survey of local recreation resources were also provided for examination. These materials would contribute to subsections of ER Section 2.5. Progress on these materials did not suggest any issues with TVA completing the rest of the related ER sections in order to meet its September submittal date.

### *Radiological Health:*

There were no draft sections to examine regarding the radiological health sections of the ER for the radiological environmental monitoring program, radiological waste systems, dose to construction workers, or radiological impacts from normal operations. The radiological environmental monitoring program will be described in the ER; however, the actual monitoring systems will not be installed and initiated until the COL phase. Regarding dose to construction workers, TVA and its contractors described an approach that would be used to assess dose to construction workers that should account for multiple modules. Regarding Radiological Impacts of Normal Operation, TVA and its contractors discussed the effluent release points for liquid and gaseous effluents based on a composite radionuclide release from the four vendor designs. Draft sections are expected to be drafted in the next four months. Progress on these materials suggests that TVA should not have any problems meeting its September submittal date.

### *Terrestrial Ecology:*

TVA has done one year of sampling to characterize baseline terrestrial ecological resources on the Clinch River site. Surveys included mist net and acoustic sampling for bats; botanical surveys for rare plants, invasive plants, and habitat type delineation (two separate kinds of habitat delineation were completed, one for plant physiognomy and one for wildlife ecology); wetland delineation; and amphibian, reptile, bird, and mammal surveys. Two Federally listed bat species (Indiana bat [*Myotis sodalis*] and gray bat [*Myotis grisescens*]) and one species proposed for Federal listing (northern long-eared bat [*Myotis septentrionalis*]) have been detected onsite. TVA has coordinated with U.S. Fish and Wildlife Service on bat surveys and with the USACE on wetland delineation. Per USACE staff also present at the meetings, the USACE jurisdictional determination will likely be issued early in CY 2015. TVA consulted the State Natural Heritage Program database to facilitate searches for rare amphibians, reptiles, birds, and mammals.

There are up to five caves onsite that may serve as bat hibernacula. These have not yet been surveyed. TVA plans to survey at least three of the five caves, depending on accessibility and human safety. TVA also plans to conduct requisite terrestrial ecological sampling (any of the above types of sampling that would apply) in any areas where roads and intersections would be expanded and in the newly identified barge area along the river. A 161-kilovolt (kV) transmission line located onsite may be relocated (possibly along the existing 500-kV line onsite). TVA also plans to conduct requisite terrestrial ecological sampling in any new or expanded transmission line corridors. During the site visit TVA provided no information that led the staff to believe that expansion of transmission line corridors would occur off-site.

The above-noted completed and planned survey information has been and will be compiled into background reports that would support production of the terrestrial ecology sections of an ER. All necessary surveys and background reports have not yet been completed, and no ER sections have been written. No footprint for construction and operation disturbance is available currently, and no information was provided on construction, operation, cumulative effects, or alternative sites. Progress on these materials, based on the completion of the baseline terrestrial ecology resource surveys and coordination efforts with other Federal agencies, suggests that TVA should not have any problems meeting its September submittal date.

*Transportation:*

The methods and data used to estimate transportation impacts in the ER were discussed with TVA. The prospective applicant stated that a full and complete analysis of transportation impacts would be performed, and that incident-free and accident impacts will be estimated in the ER, as well as radiological and nonradiological impacts, for unirradiated fuel, spent nuclear fuel, and radioactive waste. TVA further stated that the impacts will be based on the methods, data, and impacts presented in the Virgil C. Summer Nuclear Station (V.C. Summer) ER and final environmental impact statement, with appropriate adjustments made to reflect site-specific differences (e.g., the difference in location between the Clinch River site and V.C. Summer and the differences in population densities along transportation routes from the Clinch River site versus V.C. Summer). TVA stated that these adjustments would be based on ratios of parameters such as distances, and that TVA did not anticipate running the RADTRAN or TRAGIS computer codes. TVA stated that it would use a similar approach for alternative sites evaluated in the Clinch River ER. The staff noted to TVA the requirements of 10 CFR 51.52(b) and that their proposed methodology has not been applied in any previous new reactor ER. Development of the PPE values for MW(e) and capacity factor for estimating transportation impacts also were discussed with TVA. Draft sections are expected to be developed in the next four months. Progress on these materials suggests that TVA should not have any problems meeting its September submittal date.

*Driving Tour of the Local Site Vicinity:*

The morning of Wednesday, October 8, 2014, the staff drove a portion of the surroundings of the site. The driving tour served several objectives, which are described below.

- It permitted staff to gain geographic familiarity with the local communities potentially affected by development of the site.
- It provided staff the opportunity to informally survey areas where potential environmental justice populations might be encountered.
- It also provided the opportunity to establish a reconnaissance-level context for general economic conditions that could be observed visually.

During the drive the staff visited and observed the following communities:

- Friendsville
- Lenoir City

- Louden
- Midway
- Kingston
- Midtown
- Rockwood
- Harriman
- Olive Springs
- Oak Ridge

The staff did not identify any particular socioeconomic or environmental issues. The communities appeared to be generally active with commercial enterprises, and nothing was observed to suggest economic weakness or other development issues. No specific environmental justice communities or related resources were observed during the cursory driving tour. In a future stage, specific community resources or stakeholders will be engaged to provide additional information and context.

*Benefits and Costs:*

Not discussed.

*Nonradiological Health:*

Not discussed.

*Conclusions:*

Based on its examination of information during the October 7 - 8, 2014, visit, the staff did not find any significant issues that should preclude TVA from completing its ER by September 2015.

The staff's main areas of concern for readiness of the application to meet September submittal are the following: the implementation of the Programmatic Agreement with the SHPO, the potential for offsite connected actions, the development of a first-of-a-kind accident analysis, the basis for 800-MW(e) capacity, the timely conduct of additional ecological surveys, development of a focused Purpose and Need Statement, and the development of appropriately conservative values for the PPE.

TVA proposed that the ecology and cultural resource staff revisit the site and take a boat tour to observe stream and shore habitats and cultural sites during the low pool period, which will occur December 1, 2014, to April 1, 2015.