

5.9 DECOMMISSIONING IMPACTS

The U.S. Nuclear Regulatory Commission (NRC) requires that a nuclear facility be decommissioned per NRC regulations after cessation of operations by safely removing it from service and reducing residual radioactivity to a level that permits release of the property and termination of the operating license. NRC regulation Title 10 of the Code of Federal Regulations (10 CFR) 50.82 specifies the actions that NRC and a licensee must take to decommission a nuclear power facility. The radiological criteria to be met for license termination are specified in 10 CFR 20, Subpart E.

The NRC prohibits licensees from performing decommissioning activities that result in significant environmental impacts not previously reviewed under 10 CFR 50.82. The NRC has indicated that licensees for existing reactors can rely on the information in NUREG-0586, *Generic Environmental Impact Statement (GEIS) on Decommissioning of Nuclear Facilities*, Supplement 1, to determine the environmental impacts of decommissioning existing nuclear power reactors. Supplement 1 was published in 2002 with the original NUREG-0586 published in 1988. Because decommissioning plans are required by the NRC after a decision has been made to cease operation of a licensed nuclear unit, detailed analyses of decommissioning alternatives are not prepared until cessation of operations. As such, this section addresses only general environmental impacts of decommissioning.

NRC regulation 10 CFR 50.75, which establishes the financial requirements for providing reasonable assurance that adequate funds for performing decommissioning are available at the end of facility operations, does not apply to early site permit applications.

5.9.1 NRC GEIS on Decommissioning of Nuclear Facilities

The Decommissioning GEIS (NUREG-0586, Supplement 1) describes decommissioning regulatory requirements, the decommissioning process, and environmental impacts of decommissioning of nuclear facilities. Before presenting impacts, the Decommissioning GEIS describes the NRC process for evaluating impacts. Activities and impacts that NRC considered to be within the scope of the Decommissioning GEIS include:

- Activities performed to remove the facility from service once the licensee certifies that the facility has permanently ceased operations
- Activities performed in support of radiological decommissioning, including decontamination and dismantlement of radioactive structures, systems, and components (SSCs) and any activities required to support the decontamination and dismantlement process
- Activities performed in support of dismantlement of nonradiological SSCs, such as diesel generator buildings and cooling towers
- Activities performed up to license termination and their resulting impacts as provided by the definition of decommissioning

- Human health impacts from radiological and nonradiological decommissioning activities.

The Decommissioning GEIS evaluates the environmental impact of the following three decommissioning methods:

- DECON: The equipment, structures, and portions of the facility and site that contain radioactive contaminants are removed or decontaminated to a level that permits termination of the license shortly after cessation of operations. DECON comprises four distinct periods of effort: (1) pre-shutdown planning/engineering, (2) facility deactivation and transition (no activities are conducted during this period that will affect the safe operation of the spent fuel pool), (3) decontamination and dismantlement with concurrent operations in the spent-fuel pool until the pool inventory is zero, and (4) license termination.
- SAFSTOR: The facility is placed in a safe stable condition and maintained in that state (safe storage) until it is subsequently decontaminated and dismantled to levels that permit license termination. During SAFSTOR, a facility is left intact, but the fuel is removed from the reactor vessel and radioactive liquids are drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thus reducing the quantity of contaminated and radioactive material that must be disposed of during the decontamination and dismantlement of the facility at the end of the storage period.
- ENTOMB: This alternative involves encasing radioactive SSCs in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license.

As stated in the Decommissioning GEIS, decommissioning a nuclear facility that has reached the end of its useful life generally has a positive environmental impact. The air quality, water quality, and ecological impacts of decommissioning are expected to be substantially smaller than those of nuclear facility construction or operation because the level of activity and the releases to the environment are expected to be smaller during decommissioning than during construction and operation. The major environmental impact, regardless of the specific decommissioning option selected, is the commitment of small amounts of land for waste burial where the offsite disposal facility is located (onsite disposal is not considered for the DECON option). Socioeconomic impacts of decommissioning would result from the demands on, and contributions to, the community by the workers employed to decommission a nuclear facility.

The Decommissioning GEIS assesses the impacts from decommissioning reactor facilities of various types and sizes including pressurized water reactors (PWR) in the 1130 megawatt electric (MWe) to 1825 MWe range. The description of decommissioning a PWR in the original Decommissioning GEIS (NUREG-0586) states that, while SMALL, the major environmental consequence of decommissioning is the commitment of land area to the disposal of radioactive waste. Because the waste volume from decommissioning can be correlated to the size of the reactor facility as provided in Table 4-7 of Decommissioning GEIS (NUREG-0586, Supplement 1), it can be concluded that the impacts of decommissioning small PWRs at the CRN Site with a

combined electrical power of 800 MWe (Table 3.1-2, Item 16.6) are bound by the impacts of the larger reference reactor described in Decommissioning GEIS.

According to Section 5.9 of NUREG-1555, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan*, studies of social and environmental effects of decommissioning large commercial power generating units have not identified any significant impacts beyond those considered in the Decommissioning GEIS. NUREG 1555 also describes that decommissioning experience with commercial scale nuclear power facilities has shown that the occupational exposures during the decommissioning period are comparable to those associated with refueling and facility maintenance when a facility is operational. Each potential decommissioning alternative would have radiological impacts from the transport of materials from the facility to their disposal sites. The expected impact from this transportation activity would not be significantly different from normal operations.

The NRC identified some of the differences between SMR designs and previously licensed reactors in SECY-11-0181, such as the following:

- Reduced size and quantity of components and equipment to be disposed
- Reduced area to be decontaminated (depending on the number of modules)
- Possible difficulty with accessibility for decontamination because of the small size of the components
- Possible difficulties related to the decommissioning of modules while other modules are in operation (Reference 5.9-1)

SECY-11-0181 also acknowledges the expected differences between the SMRs and large LWRs would lead to differences in the cost of decommissioning a nuclear facility.

5.9.2 Conclusions

Projected physical facility inventories associated with SMR designs are expected to be less than those for currently operating nuclear reactors due to advances in technology, the smaller size of SMR reactor facility footprints, and simplified maintenance regimes for SMRs. Based on this comparison, Tennessee Valley Authority (TVA) has concluded that the environmental impacts identified in the Decommissioning GEIS are bounding for an SMR facility constructed and operated at the CRN Site. TVA has not identified any significant new information during this environmental review that would indicate the potential for decommissioning impacts not previously reviewed. Therefore, TVA does not anticipate adverse effects from the decommissioning process for the SMRs at the CRN Site and the impact would be SMALL.

5.9.3 References

Reference 5.9-1. Johnson, Michael R., "Policy Issue Information," SECY-11-0181, December 22, 2011.