

4.0 RADIATION PROTECTION

4.1 REGULATORY REQUIREMENTS

The regulatory basis for this review of the Virgil C. Summer Nuclear Station Units 2 and 3 (VCSNS) radiation protection (RP) program applicable to the fresh fuel assemblies for the first reactor core prior to commencement of operation is contained in Title 10 of the *Code of Federal Regulations* (10 CFR) Parts 20 and 70. The purpose of this review is to determine whether the South Carolina Electric and Gas's (SCE&G) VCSNS, Units 2 and 3 proposed RP program is adequate to protect the radiological health and safety of workers, the public, and the environment during fresh fuel handling and storage operations under 10 CFR Part 70. This review is necessary in anticipation of the operation of the VCSNS AP1000 advanced pressurized light water reactors.

4.2 REGULATORY ACCEPTANCE CRITERIA

The applicable acceptance criteria for the U.S. Nuclear Regulatory Commission's (NRC's) Part 70 review of the VCSNS RP program are outlined in Section 4.4 of NUREG-1520, Rev. 1, *Standard Review Plan (SRP) for the Review of a License Application for a Fuel Cycle Facility* (NRC, 2010). While some portions of the acceptance criteria in the SRP, Section 4.4 (NRC, 2010) are relevant to this incremental review, other portions are not. For example, certain Regulatory Guides and other documents referenced in SRP, Section 4.4 (NRC, 2010) are specific to fuel cycle facilities and are not applicable to reactor reviews. Also, an Integrated Safety Analysis of accidents is conducted for fuel cycle facilities, not for reactors.

4.3 STAFF REVIEW AND ANALYSIS

The RP methods and estimated occupational radiation exposures to operation and construction personnel during normal operations and anticipated operational occurrences have previously been reviewed with respect to issuance of the combined operating license as documented in Chapter 12 of the Final Safety Evaluation Report (NRC, 2011) for the VCSNS's, Units 2 and 3 License Application. The review documented here is not applicable in determining the acceptability of the described program with respect to operations under 10 CFR Part 52. Operations pertaining to Part 70 include uncrating and inspection of fuel assemblies and storing them in the new fuel and spent fuel storage pool prior to loading into the reactor. As the fuel assemblies are effectively contained/sealed material with little associated external radiation, the radiological risks associated with this operation are considered minimal.

In general, the SRP's (NRC, 2010) acceptance criteria require descriptions to ensure the following topics will be adequately addressed at the facility: RP program implementation; radiation exposures as low as is reasonably achievable (ALARA); RP organization and qualifications; written procedures; training; ventilation and respiratory protection programs; radiation survey and monitoring programs; radiological risk associated with accidents; and additional programs normally impacting the RP function.

The applicant's Final Safety Analysis Report (FSAR) (SCE&G, 2011a), Appendix 12AA provides a description of the operational RP program. The program incorporates by reference NEI Template 07-03A, "Generic FSAR Template Guidance for Radiation Protection Program Description, Revision 0 (NEI, 2009a)," with site-specific supplements or substitutions included elsewhere in the FSAR (SCE&G, 2011a) or AP1000 Design Control Document (Westinghouse, 2011), as the operational RP Program description. NEI 07-03A is the final accepted version of

the NRC-reviewed NEI-07-03, Rev. 7. The NRC staff completed the review and safety evaluation of NEI 07-03, Rev. 7, as documented in the Safety Evaluation Regarding the Nuclear Energy Institute's Technical Report 07-03, "Generic FSAR Template Guidance for Radiation Protection Program Description, Revision 7" (NRC, 2009a).

The generic RP program template commits an applicant to NRC's regulatory requirements and guidance and to acceptance criteria listed in Regulatory Guide (RG) 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)" (NRC, 2007); and Section 12.5 of NUREG-0800 (NRC, 1987), "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition - Radiation Protection." While NUREG-0800 is not as prescriptive regarding the required information for an RP program as NUREG-1520, the staff believes that a program established to address Part 52 operations would adequately address Part 70 operations as well. The staff reviewed NEI 07-03A, as well as the modifications and supplements to that information described in the FSAR and found that it adequately addressed the topics of evaluation in Section 4 of the SRP (NRC, 2010) (Radiation Protection) with the exceptions of ALARA, ventilation, and radiological risk associated with accidents.

With respect to ALARA, the applicant states in Section 12.1 of its FSAR that it incorporates NEI 07-08A (NEI, 2009b), "Generic FSAR Template Guidance for Ensuring That Occupational Radiation Exposures are As Low As Is Reasonably Achievable (ALARA), Revision 0," with modifications or supplements as noted in the section. Similar to NEI 07-03A, the NRC staff previously reviewed NEI 07-08, Rev. 3, and found it acceptable as documented via letter (NRC, 2009b). The template, in conjunction with Template NEI 07-03A, generally describes operational policies, regulatory compliance, and operational considerations applicable to the ALARA program. Compliance with the template, when considering the minimal risks associated with storage and handling fresh fuel under Part 70, is adequate to assure operations will be ALARA. The applicant's RP program to achieve occupational doses ALARA also addresses regulatory requirements for RP found in 10 CFR 20.

Regarding ventilation, the NEI templates did not contain sufficient detail regarding the facilities ventilation program for staff to fully evaluate it. However, as mentioned previously, the materials of interest for this license are expected to be contained and pose little airborne potential or risk of internal exposure. For this reason, the staff found it unnecessary to evaluate the facility's ventilation systems.

The Integrated Safety Analysis requirements for control of radiological risk discussed in Section 4.4.8 of the SRP (NRC, 2010) are not applicable for the VCSNS Units 2 and 3 because the operations proposed are excluded from the list of engagements in 10 CFR Part 70.60 for which 10 CFR 70, Subpart H, applies. The applicant did submit an emergency plan (SCE&G, 2011b) that addresses response to accident situations involving potential radiological exposures. As stated previously, it is expected that the unirradiated uranium contained in the fuel poses little radiological risk for the operations pertaining to Part 70.

The staff also reviewed proposed License Condition 10(j) for the draft Units 2 and 3 combined operating license. This Condition will require applicable elements of the RP Program to be implemented prior to receipt of Part 70 materials. All remaining RP Program elements will be implemented prior to the initial loading of fuel into the reactor or shipment of radioactive waste, as applicable. This should ensure the applicant initiates the RP Program in an appropriate time frame for the Part 70 operations proposed.

4.4 EVALUATION FINDINGS

The staff finds that SCE&G will establish and maintain an acceptable RP program for VCSNS Units 2 and 3 that addresses operations under 10 CFR Part 70, which includes:

1. an effective documented program to ensure that occupational radiological exposures are ALARA;
2. an organization with adequate qualification requirements for RP personnel;
3. approved, written RP procedures and RWPs for RP activities;
4. RP training for all personnel who have access to restricted areas;
5. a radiation survey and monitoring program that includes requirements for controlling radiological contamination within the facility and monitoring of external and internal radiation exposures;
6. effective controls to manage radiological risk in the event of accidents; and
7. other programs to maintain records and generate reports in accordance with 10 CFR Parts 20 and 70, and correct for upsets at the facility.

The staff concludes that the applicant's RP program for VCSNS Units 2 and 3, with respect to the initial fresh fuel elements for the first reactor core as described in its License Application, complies with regulatory requirements in 10 CFR Parts 20 and 70; adequately addresses the applicable acceptance criteria in Section 4.4 of NUREG-1520, Rev. 1 (NRC, 2010); and is, therefore, acceptable to the staff.

4.5 REFERENCES

(NEI, 2009a) Nuclear Energy Institute, NEI 07-03A, "Generic FSAR Template Guidance for Radiation Protection Program Description, Revision 0," (Agencywide Documents Access and Management System [ADAMS]) Accession No. ML091490684, 2009.

(NEI, 2009b) Nuclear Energy Institute, NEI 07-08A, "Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures are as Low as is Reasonably Achievable (ALARA), Revision 0," ADAMS Accession No. ML093220178, 2009.

(NRC, 1987) U.S. Nuclear Regulatory Commission, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," June 1987.

(NRC, 2007) U.S. Nuclear Regulatory Commission, Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants," June 2007.

(NRC, 2009a) U.S. Nuclear Regulatory Commission, "Safety Evaluation Regarding the Nuclear Energy Institute Technical Report 07-03, Revision 7, Generic FSAR Template Guidance for Radiation Protection Program Description," ADAMS Accession No. ML090510379, March 2009.

(NRC, 2009b) U.S. Nuclear Regulatory Commission, "Final Safety Evaluation for Nuclear Energy Institute Technical Report 07-08, "Generic Final Safety Analysis Report Template

Guidance for Ensuring that Occupational Radiation Exposures are As Low As Reasonably Achievable, Rev. 3," ADAMS Accession No. ML091130034, October 2009.

(NRC, 2010) U.S. Nuclear Regulatory Commission, NUREG-1520, Revision 1, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," May 2010.

(SCE&G, 2011a) South Carolina Electric and Gas, "V.C. Summer Nuclear Station Units 2 and 3 COLA (Final Safety Analysis Report)," Revision 5, ADAMS Accession No. ML11187A074, 2011.

(SCE&G, 2011b) South Carolina Electric and Gas, "V.C. Summer Nuclear Station Units 2 and 3 COLA (Emergency Plan)," Revision 4, ADAMS Accession No. ML110410276, 2011.

(Westinghouse, 2011) Westinghouse Electric Company AP1000 Design Control Document, Rev. 19, ADAMS Accession No. ML11171A500, Date Released: June 21, 2011.