



October 29, 2018  
RC-18-0128

Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-001

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1  
DOCKET NO. 50-395  
OPERATING LICENSE NO. NPF-12  
NEI 12-06, APPENDIX H, REVISION 4, H.4.5 PATH 5: GMRS > 2 X SSE,  
MITIGATING STRATEGIES ASSESSMENT (MSA) REPORT FOR THE NEW  
SEISMIC HAZARD INFORMATION

- References:
1. NEI 12-06, Revision 4, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, December 2016 [ML16354B421]
  2. JLD-ISG-2012-01, Revision 2, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events*, February 2017 [ML17005A188]
  3. South Carolina Electric & Gas Company, RC-14-0048, *Virgil C. Summer Nuclear Station (VCSNS) Unit 1, Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 26, 2014 [ML14092A250]
  4. South Carolina Electric & Gas Company, RC-14-0182, *Virgil C. Summer Nuclear Station (VCSNS) Unit 1, SCE&G Response to NRC Request for Additional Information Associated with Near-Term Task Force Recommendation 2.1, Seismic Re-evaluations*, dated November 12, 2014 [ML14318A314]
  5. South Carolina Electric & Gas Company, RC-15-0071, *Virgil C. Summer Nuclear Station (VCSNS) Unit 1, Response to NRC Request for Additional Information Regarding Seismic Evaluations Related to Southeastern Catalog Changes*, dated April 28, 2015 [ML15124A596]
  6. South Carolina Electric & Gas Company, RC-18-0117, *Virgil C. Summer Nuclear Station (VCSNS) Unit 1, Probabilistic Risk Assessment in Response to 50.54(f) Letter with Regard to NTTF 2.1 Seismic*, dated September 28, 2018 [ML18271A109]

7. EPRI, *Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic*, Report Number 1025287, Palo Alto, CA, November 2012
8. South Carolina Electric & Gas Company, RC-16-0143, *Virgil C. Summer Nuclear Station (VCSNS) Unit 1, Report of Full Compliance Letter and Final Integrated Plan in Response to the March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, dated October 31, 2016 [ML16307A390]
9. South Carolina Electric & Gas Company, RC-17-0032, *Virgil C. Summer Nuclear Station (VCSNS) Unit 1, Spent Fuel Pool Evaluation Supplemental Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 30, 2017 [ML17089A578]
10. NRC Letter, *Virgil C. Summer Nuclear Station, Unit 1, Safety Evaluation Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051*, dated August 1, 2017 [ML17089A617]
11. NRC Letter, *Virgil C. Summer Nuclear Station, Unit 1, Staff Assessment of Information Provided Pursuant to Title 10 of The Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations Relating to Recommendation 2.1 of The Near-Term Task Force Review of Insights from The Fukushima Dai-Ichi Accident*, dated July 20, 2015 [ML15194A055]

The purpose of this letter is to provide the results of the assessment for VCSNS Unit 1 to demonstrate that Seismic Probabilistic Risk Assessment (SPRA) based alternate mitigating strategy (AMS) can be implemented considering the impacts of the reevaluated seismic hazard. The assessment was performed in accordance with the guidance provided in Appendix H Section H.4.5.3 of NEI 12-06 Revision 4 (Reference 1) which was endorsed by Revision 2 of JLD-ISG-2012-01 (Reference 2).

The Mitigating Strategies Seismic Hazard Information (MSSHI) is the licensee's reevaluated seismic hazard information at VCSNS Unit 1 that was developed using Probabilistic Seismic Hazard Analysis. In response to the NRC's Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 12, 2012, VCSNS Unit 1 submitted the reevaluated seismic hazard information including the UHRS, GMRS and the hazard curves to the NRC on March 26, 2014 (Reference 3), and supplemented with additional information in responses on November 12, 2014 (Reference 4) and April 28, 2015 (Reference 5). The NRC staff concluded that the MSSHI that was submitted adequately characterizes the reevaluated seismic hazard for the site as detailed in Reference 6. Further, VCSNS Unit 1 submitted the SPRA to the NRC on September 28, 2018 (Reference 6).

Based upon the mitigating strategies assessment in the Enclosure, the mitigating strategies for VCSNS Unit 1, considering the impacts of the reevaluated seismic hazard, can be implemented as designed.

This letter contains no new regulatory commitments.

Should you have any questions regarding this submittal, please contact Michael S. Moore at (803) 345-4752.

I certify under penalty of perjury that the foregoing is true and correct.

10/29/18

Executed on



George A. Lippard

TS/GAL/wm

Enclosure: Mitigating Strategies Assessment for Virgil C. Summer Nuclear Station, Unit 1

cc: Without Attachment (or Enclosure) unless noted

J. E. Addison

W. K. Kissam

J. B. Archie

J. H. Hamilton

G. J. Lindamood

W. M. Cherry

C. Haney

S. A. Williams (with Enclosure)

M. O. Valentin (with Enclosure)

NRC Resident Inspector

K. M. Sutton

NSRC

RTS (CR-18-04521)

File (815.07)

PRSF (RC-18-0128) (with Enclosure)

Document Control Desk  
Enclosure  
CR-18-04521  
RC-18-0128  
Page 1 of 3

---

---

**VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1**

**ENCLOSURE**

**MITIGATING STRATEGIES ASSESSMENT FOR VIRGIL C. SUMMER NUCLEAR STATION,  
UNIT 1**

---

---

### Mitigating Strategies Assessment

The purpose of this Mitigating Strategies Assessment is to evaluate and demonstrate that VCSNS Unit 1 can mitigate the effects of the reevaluated seismic hazard information developed pursuant to the NRC's 10 CFR 50.54(f) letter dated March 12, 2012. The assessment was performed in accordance with the guidance provided in Reference 1. Reference 1 discusses a method to develop an alternate mitigating strategy (AMS) to address the mitigating strategies seismic hazard information (MSSHI). Reference 2 provides an NRC staff position that the method described in Section H.4.5 of Reference 1 for an AMS is acceptable for mitigating a beyond-design-basis external event.

The risk-informed assessment described in H.4.5.3 of Reference 1 uses the SPRA to address the impacts of the MSSHI on the plant. Consistent with Section H.4.5.3 of Reference 1, the VCSNS Unit 1 base SPRA (Reference 6) was submitted to the NRC for review and has been peer reviewed in accordance with the expectations set forth in Reference 7.

The results of the SPRA for VCSNS Unit 1 are:  $4.00 \times 10^{-5}$ /year seismic core damage frequency (SCDF) and  $3.65 \times 10^{-6}$ /year seismic large early release frequency (SLERF). These results are less than  $5.00 \times 10^{-5}$ /year SCDF and  $5.00 \times 10^{-6}$ /year SLERF, therefore in accordance with H.4.5.3, the base SPRA results demonstrate that mitigating strategies are reasonably protected for the MSSHI and an evaluation under H.4.5.2, H.4.5.4, or H.4.5.5 is not required.

### Spent Fuel Pool Cooling Evaluation

The evaluation of spent fuel pool (SFP) cooling for VCSNS Unit 1 was performed based on the initial conditions established in NEI 12-06 (Reference 1) for SFP cooling coping in the event of an Extended Loss of A/C Power (ELAP)/Loss of normal access to the Ultimate Heat Sink. The evaluation also used the results of pool heat up analyses from the ELAP evaluation as input.

The FLEX strategy for SFP cooling utilizes SFP level monitoring and make-up capability as described in Virgil C. Summer Nuclear Station Unit 1 Final Integrated Plan (FIP) (Reference 8) and summarized in the following paragraphs.

For Phase 1 SFP Cooling, VCSNS monitors the SFP level using instrumentation installed to meet the requirements of NRC Order EA-12-051. If no operator action is taken following a loss of SFP cooling at the maximum design heat load, analyses conclude the SFP will reach 212°F in approximately 21 hours and boil off to a level 10 foot above the top of fuel in approximately 87 hours from initiation of the loss of cooling.

For Phase 2 SFP Cooling, VCSNS initiates SFP makeup using one of the redundant FX UHS pumps systems taking suction from either the Service Water Pond or the Monticello Reservoir. Flexible and portable hoses connect the discharge of the FLEX pumps to the permanent FLEX connection on the Safety Related Spent Fuel Cooling System. The FLEX connection is located within the Safety Related Auxiliary Building. Alternate methods of providing SFP

cooling/makeup involve routing flexible hose from a fire pumper truck to the SFP deck where it can be pumped or sprayed into the SFP. Additional Defense-in-Depth strategies have been developed to makeup to the SFP using a FLEX SG Feed Pump taking suction from the Condensate Storage Tank. Lastly, if one of the Combustion Turbine Generators is in service, one of the seismically qualified, Class 1E, Reactor Makeup Pump can be energized which can restore the plant's normal spent fuel pool makeup source from the seismically qualified Reactor Makeup Water Storage Tank.

The permanently installed plant equipment relied on for the implementation of the SFP Cooling FLEX strategy has been designed and installed, or evaluated to remain functional, in accordance with the plant design basis to the SSE loading conditions. The spent fuel pool integrity evaluations demonstrated inherent margins of the spent fuel pool structure and interfacing plant equipment above the SSE to the GMRS level (Reference 9).

The NRC has issued their Safety Evaluation (Reference 10) of the VCSNS Unit 1 FIP and concluded that VCSNS Unit 1 has developed guidance that if implemented appropriately should maintain or restore SFP cooling following an ELAP consistent with NEI 12-06 (Reference 1) guidance as endorsed by JLD-ISG-2012-01 (Reference 2) and should adequately address the requirements of the order.

### Conclusion

The mitigating strategies for VCSNS Unit 1, considering the impacts of the reevaluated seismic hazard, can be implemented as designed without modification.