



**UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001**

December 14, 2015

The Honorable Stephen G. Burns
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: REPORT ON THE SAFETY ASPECTS OF THE DUKE ENERGY CAROLINAS, LLC, COMBINED LICENSE APPLICATION FOR WILLIAM STATES LEE III NUCLEAR STATION, UNITS 1 AND 2

Dear Chairman Burns,

During the 630th meeting of the Advisory Committee on Reactor Safeguards (ACRS), December 3-4, 2015, we reviewed the Duke Energy Carolinas, LLC (Duke Energy or applicant) Combined License Application (COLA) for the William States Lee III Nuclear Station (Lee), Units 1 and 2 and the NRC staff's Advanced Final Safety Evaluation Report (AFSER). The COLA incorporates the Westinghouse Electric Company AP1000 certified design, the standard content material from the AP1000 Reference COLA, and the Lee plant-specific information. Our AP1000 Subcommittee held a two-day meeting on October 21-22, 2015, to review the plant-specific information in the COLA and the staff's AFSER.

During the meeting, we had the benefit of discussions with representatives of the staff, Duke Energy and its vendors, and we had input from members of the public. We also had the benefit of the documents referenced. This report fulfills the requirement of 10 CFR 52.87 that the ACRS report on those portions of the application which concern safety.

CONCLUSION AND RECOMMENDATIONS

1. There is reasonable assurance that Lee, Units 1 and 2, can be built and operated without undue risk to the health and safety of the public.
2. Site seismic inputs requiring a departure from the AP1000 certified design have been adequately addressed by the applicant and the staff, and this departure should be approved.
3. The departure providing for a consolidated Technical Support Center for the two units should be approved.
4. The location exception for a consolidated Emergency Operations Facility should be approved.

5. The Duke Energy COLA for Lee should be approved following approval of generic changes which are pending submittal and which affect standard content material for the AP1000.

BACKGROUND

In accordance with 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Duke Energy provided to the NRC, by letter dated December 12, 2007, the initial application for Lee Units 1 and 2. In the application, Duke Energy stated that Lee will consist of two Westinghouse AP1000 certified design pressurized water reactor units, each with a core thermal power rating of 3,400 megawatts. The units are to be located in Cherokee County, South Carolina.

The application conforms to the design-centered review approach (DCRA), which is a Commission policy that allows the staff to perform one review and reach a decision for all plants which reference a certified design. The first COLA that receives a complete staff review for a certified design is designated as the Reference COLA (RCOLA). Any subsequent application referencing the same design is designated as a Subsequent COLA (SCOLA). We reviewed the COLA for Southern Nuclear Operating Company's Vogtle Electric Generating Plant, Units 3 and 4, and issued a letter report on January 24, 2011. This plant became the AP1000 RCOLA. We also reviewed COLAs for South Carolina Electric and Gas Company's V.C. Summer Nuclear Station, Units 2 and 3, and Progress Energy Florida's Levy Nuclear Plant, Units 1 and 2, and issued letter reports on February 17 and December 7, 2011, respectively. These latter plants are AP1000 SCOLAs.

DISCUSSION

Our review of the Lee SCOLA and AFSER was limited to plant-specific information, consistent with the reference to the current AP1000 certified design and RCOLA. Duke Energy identified five generic changes to standard content material:

- Condensate return and passive residual heat removal cooling
- Main Control Room operator dose
- Main Control Room heat load
- Hydrogen vent in containment
- Plant monitoring system flux doubling to comply with IEEE 603

These will be resolved as a part of the DCRA process and are applicable to Lee. They should be submitted and approved prior to approval of the Lee application. The results of our review of Lee plant-specific information are described below.

The Lee units will be located on the partially developed site of the Cherokee Nuclear Station for which the NRC issued a Construction Permit in the late 1970's. The site is adjacent to the Broad River in north-central South Carolina. Each Lee unit will be served by forced draft cooling towers. Makeup to the cooling towers is from the river or from onsite holding ponds during periods of low river flow. Processed discharges are to the nearby Ninety-Nine Islands Reservoir.

The site seismic input conforms to the Central and Eastern United States Seismic Source Characterization (NUREG-2115). The units are located on a uniform, hard-rock site which is consistent with that described in the AP1000 Design Certification Document (DCD). In order to accommodate differing site seismic conditions, the certified design includes two seismic spectra: the Certified Seismic Design Response Spectra and the Hard Rock High Frequency Response Spectra. However, the Lee site Ground Motion Response Spectrum exceeds both of these at higher frequencies. The exceedances require a DCD departure.

Accordingly, in compliance with requirements included in the AP1000 DCD, the applicant and Westinghouse performed evaluations for Seismic Category I structures, systems and components (SSCs) to demonstrate that the high frequency exceedances of the DCD spectra are non-damaging. At six specific locations which have been identified in the DCD for this purpose, in-structure spectra from these evaluations were compared to in-structure spectra from the DCD. Where the Lee spectra exceeded the DCD spectra, more detailed analysis was performed to demonstrate that the exceedances will not result in damage to the SSCs. Information from additional analyses was used to identify equipment for which high frequency amplification is important. In those cases, completed equipment qualification test response spectra were reviewed and found to envelope the Lee plant-specific response spectra. The applicant stated they will ensure that all future test response spectra for installed equipment are also higher than the plant-specific response spectra.

The staff conducted a review of these evaluations and concluded that the certified AP1000 design of Seismic Category I SSCs is acceptable at the Lee hard rock site. We agree with this conclusion.

For some Seismic Category II structures, the site foundation response spectra exceed the DCD spectra at higher frequencies. The applicant committed to design the Seismic Category II structures to the higher of the DCD or the Lee plant-specific spectra.

The applicant evaluated the potential for site water holding ponds to be the cause of reservoir-induced seismicity. The staff agreed that these ponds, including Pond C, pose negligible induced seismic risk to the Lee site.

The foundation for Lee Unit 1 will include a layer of concrete which was placed originally for the Cherokee Nuclear Station before its construction was terminated. The foundation for Lee Unit 2 will be on the natural hard rock of the site. Any resulting differences in the nuclear island foundation input response spectra have been addressed by the applicant and found acceptable by the staff.

Thorough mapping of the underlying rock formation was conducted prior to placement of concrete for the planned Cherokee Nuclear Station and similar work will be completed in accordance with a license condition to include the entire site. These explorations, which will be examined independently by the staff, and the associated laboratory testing comply with applicable regulatory guidance and satisfy the requirements of 10 CFR 100.23(c).

The waste water and liquid radioactive waste systems will discharge through a diffuser into the Ninety-Nine Islands Reservoir in accordance with a National Pollutant Discharge Elimination System operating permit. The discharge uses a stainless steel pipe located inside a guard pipe in order to ensure against leakage into the groundwater. Any leakage into the guard pipe is monitored as part of the Radiation Protection Program.

An emergency response facilities departure from the AP1000 DCD provides for a common Technical Support Center (TSC) for the two units. This is estimated to increase the travel time between the TSC and the Control Room from two minutes for the single-unit TSC location to about five minutes for the common location. This increase is considered acceptable, based on the communication and data links which are provided, and based on the fact that it allows each unit's Operational Support Center to be located adjacent to the Control Room where the TSC would have been located.

The applicant is also seeking a location exception for the Emergency Operations Facility (EOF). It would be located in Charlotte, North Carolina, approximately 40 miles from the site, in an existing EOF facility which is currently supporting the Catawba, McGuire, and Oconee Nuclear Stations. Lee would be the fourth site supported from this facility. The staff has proposed a license condition requiring that the ability of the facility to simultaneously support an emergency condition at Lee and one of the other three sites be demonstrated prior to fuel loading. The distance from the Lee site to the common EOF is not excessive, and Duke Energy will provide a closer offsite assembly area in a facility approximately 15 miles from the Lee site. We recommend approval of this location exception based on the advantages provided by use of a common EOF facility with the resources necessary to support more than a single site.

The applicant's analysis shows that conservatively determined water elevations due to local intense precipitation and the probable maximum flooding levels do not exceed the elevation of safety-related SSCs. The staff performed an independent analysis of flooding due to potential dam failures, including failure of a proposed dam not addressed in the application. This analysis showed that a conservatively estimated flood elevation due to dam failure would remain 7.5 feet below the site grade.

Other site-specific considerations, including meteorology and industrial hazards, have been addressed by the applicant, evaluated by the staff and determined to be bounded by the AP1000 DCD and RCOLA design requirements. The consequences of accidental releases of radioactive liquid effluents are within regulatory requirements, and there are no nearby intakes for potable water supplies.

SUMMARY

The applicant and the staff have addressed the plant-specific requirements necessary for approval of the SCOLA. This includes DCD departures concerning the site-specific seismic input to the plant and the location of the TSC. Subject to our recommendation that the generic issues identified by the applicant should first be approved in accordance with the DCRA, the SCOLA for Lee Units 1 and 2, including the departures and the EOF location exception, should be approved.

Sincerely,

/RA/

John W. Stetkar
Chairman

REFERENCES

1. Duke Energy, "Application for Combined License for William States Lee III Nuclear Station Units 1 and 2," December 12, 2007 (ML073510494).
2. U.S. Nuclear Regulatory Commission, "William States Lee III Nuclear Station, Units 1 and 2 Combined License Application – Advanced Safety Evaluation without Open Items for Chapter 1 through 20," October 7, 2015 (ML15272A470).
3. Advisory Committee on Reactor Safeguards, "Report on the Safety Aspects of the Southern Nuclear Operating Company Combined License Application for Vogtle Electric Generating Plant, Units 3 and 4," January 24, 2011 (ML110170008).
4. Advisory Committee on Reactor Safeguards, "Report on the Safety Aspects of the South Carolina Electric and Gas Company Combined License Application for V.C. Summer Nuclear Station, Units 2 and 3," February 17, 2011 (ML110450490).
5. Advisory Committee on Reactor Safeguards, "Report on the Safety Aspects of the Progress Energy Florida, Inc. Combined License Application for Levy Nuclear Plant, Units 1 and 2," December 7, 2011 (ML11339A126).
6. U.S. Nuclear Regulatory Commission, NUREG-2115, "Central and Eastern United States Seismic Source Characterization for Nuclear Facilities," January 2012 (ML12048A776).
7. Duke Energy Carolinas, LLC, "Information to Address ACRS Subcommittee Follow-up Items," November 3, 2015 (ML15308A586).
8. IEEE, IEEE 603-1991, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," June 17, 1991.

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