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

December 7, 2011

The Honorable Gregory B. Jaczko
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: REPORT ON THE SAFETY ASPECTS OF THE PROGRESS ENERGY FLORIDA, INC. COMBINED LICENSE APPLICATION FOR LEVY NUCLEAR PLANT, UNITS 1 AND 2

Dear Chairman Jaczko:

During the 589th meeting of the Advisory Committee on Reactor Safeguards (ACRS), December 1-3, 2011, we reviewed the NRC staff's Advanced Safety Evaluation (ASE) for the pending Progress Energy Florida, Inc. (PEF) Combined License Application (COLA) for the Levy Nuclear Plant (LNP), Units 1 and 2. This application incorporates the Westinghouse Electric Company (WEC) AP1000 certified design, and it conforms to the design-centered review approach (DCRA).[1] The DCRA is Commission policy which allows the staff to perform one technical review and reach a decision for each COLA standard issue outside the scope of the design certification and to use this review and decision to support decisions on multiple COLAs.

The first COLA that receives a complete NRC staff review is designated as the reference COLA (RCOLA). Any subsequent application referencing the same design is designated as a subsequent COLA (SCOLA). We reviewed Southern Nuclear Operating Company's Vogtle Electric Generating Plant (VEGP), Units 3 and 4, RCOLA and issued a letter report on January 24, 2011. We reviewed South Carolina Electric and Gas Company's V.C. Summer Nuclear Station, Units 2 and 3, SCOLA and issued a letter report on February 17, 2011.

The LNP COLA is the second AP1000 SCOLA. Our AP1000 Subcommittee held a meeting on October 18-19, 2011, to review the SCOLA and the staff's ASE. During the meeting, we met with representatives of the NRC staff, PEF and its vendors, and with 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.

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1 The DCRA is described in Regulatory Issue Summary (RIS) 2006-06, "New Reactor Standardization Needed to Support the Design-Centered Licensing Review Approach," as endorsed by the Commission's Staff Requirements Memorandum in response to SECY-06-0187, "Semiannual Update of the Status of New Reactor Licensing Activities and Future Planning for New Reactors," dated November 16, 2006.

CONCLUSION AND RECOMMENDATIONS

1. There is reasonable assurance that LNP, Units 1 and 2, can be built and operated without undue risk to the public, subject to the recommendations below. The PEF COLA for LNP should be approved following implementation of these recommendations.

2. A license condition should be established to require inclusion of a probabilistic evaluation of the tsunami hazard in the site specific, full scope PRA required before fuel load.

3. Prior to approval of the COLA, the staff should verify that inclusion of the adjacent shipping canal and watercourse would not significantly affect the conclusions of its deterministic tsunami hazard evaluation described in the ASE.

BACKGROUND

By letter dated July 28, 2008, and several supplemental letters, PEF submitted a combined license application to the NRC for LNP in accordance with the requirements of 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." In the application, PEF stated that LNP would consist of two Westinghouse AP1000 pressurized water reactor units and would be located at Levy County, Florida. The application incorporates Revision 19 to the Design Control Document (DCD).

As an AP1000 SCOLA, PEF has organized and annotated its application to identify: a) sections that incorporate by reference the AP1000 DCD; b) sections that are standard for COL applicants in the AP1000 RCOLA; and c) sections that are site-specific and thus only apply to LNP.

DISCUSSION

The LNP SCOLA incorporates the standard information found in the VEGP, Units 3 and 4, RCOLA, with no deviations. The recommendations described in our January 24, 2011, letter concerning the RCOLA in the following areas are also applicable to LNP: containment interior debris limitation, in-service inspection/in-service testing program requirements for squib valves, and power uncertainty measurement. Likewise, the discussion of site-specific probabilistic risk assessment in our January 24, 2011, letter is applicable.

The Levy Nuclear Plant Site

The LNP site is located in Levy County, Florida. It is a large, primarily rural "greenfield site" located southwest of Gainesville and west of Ocala and approximately 9 miles northeast of the Crystal River Energy Complex, an energy facility also owned by PEF. The nearest towns from the site are Inglis and Yankeetown, which are located 4 miles and 8 miles southwest from the site, respectively.

Seismic Source Model

PEF identified the Charleston, S.C. seismic source zone as the closest principal source of seismic activity to the LNP site. This source zone is the site of large magnitude earthquakes, including the 1886 earthquake which is the largest historical earthquake in the Southeastern U.S. with an estimated magnitude ranging from 6.7 to 7.5. Evaluation of the Electric Power Research Institute (EPRI) Seismicity Owner's Group (SOG) studies indicates that this zone is a significant contributor to the seismic hazard at the LNP site. The 2002 USGS National Seismic Hazard model of the zone, and related information from site specific studies conducted since the EPRI SOG program, provided an updated Charleston seismic source (UCSS) model which was used in the evaluation of the seismic hazard at the LNP site.

In the USGS National Seismic Hazard model of 2008, the Charleston seismic source was modified to include a larger zone than in the UCSS model. This modified USGS model includes the Helena Banks faults mapped by seismic reflection studies offshore from Charleston, SC. In response to our request, PEF provided an evaluation of the implications of the larger zone in the USGS model of 2008 for the LNP site. This evaluation demonstrated that the UCSS model used in the evaluation of the seismic hazard at the LNP site is conservative, relative to the modified USGS model.

Bedrock Topography

In response to our request, PEF provided a topographic map, based on site boring data, of the bedrock surface profile at the LNP site in order to determine if there were identifiable paleochannels which could be indicative of zones of dissolution in the carbonate bedrock and perhaps faulting in the bedrock. Review of the topographic map indicated no evidence of bedrock faulting at the site.

Nuclear Island Roller Compacted Concrete Bridging Mat

The lowest level of the nuclear island excavation will be filled to a depth of about 35 ft. by a roller compacted concrete (RCC) bridging mat, which is the only safety-related structure outside of the DCD scope; the nuclear plant application is unique to LNP. The bridging mat rests on a 75 ft. thick grouted zone of the underlying formation of limestone and dolomite. It is a seismic class 1 structure that is designed to bridge a possible collapse of solution cavities up to 10 feet in diameter, which is a conservative estimate of the maximum size anticipated at the LNP site. A waterproof membrane is placed on top of the RCC bridging mat and beneath the basemat installed in compliance with the AP1000 DCD.

Finite element modeling has been used to confirm that seismic capacities of the bridging mat will be adequate. It will be built according to U.S. Army Corps of Engineers guidance, and a prototype pad will be constructed and tested at the LNP site prior to construction of the nuclear island mat. A bonding agent will be used between concrete lifts, and its effectiveness will be evaluated by testing. An ITAAC[2] and a license condition have been established for the bridging mat and its prototype.

Dissolution Rate of the Carbonate Bedrock

The carbonate bedrock of the LNP site, consisting of both limestone and dolomite (dolostone) is subject to dissolution from carbonic acid charged ground waters moving through the rock's fractures and pores. This dissolution might lead to underground openings over time. In response to our request to evaluate the uncertainty in dissolution rate and its implications for the design assumptions, including those for the bridging mat described above, PEF provided a review of dissolution information from multiple sources. This review, and the results of our own review, indicates that the potential effect of dissolution over the plant life is well within the DCD design assumptions.

Emergency Planning

As noted, the LNP site is within the 10-mile emergency planning zone (EPZ) for the Crystal River nuclear plant. Although it is not included in our review of the LNP SCOLA, we note for information that construction of LNP will result in a substantial and sustained increase in the transient population within the Crystal River EPZ that will need to be considered.

Tsunami Evaluation

The LNP site is located approximately 8 miles from the coastline, separated by relatively flat terrain. In addition, a shipping canal and watercourse extend inland from the coast, passing within approximately 3.2 miles from the LNP site. The probable maximum tsunami (PMT) source is evaluated deterministically by both PEF and the staff to be caused by a sea slide. The staff analysis demonstrates that the resulting hazard to the LNP site is a strong function of the friction assumed in modeling the passage of the wave over land.

Although the staff concludes that the LNP site elevation at 51 ft. above sea level is adequately protected against the PMT runup, based on use of what is deemed to be a realistic friction factor and source characteristics, given the uncertainties in the parameters used in the analysis, a probabilistic approach would provide additional confidence that the risk of wave runup exceeding the site elevation is acceptably low. This probabilistic analysis of the tsunami hazard should be included in the full scope PRA that is required prior to fuel load. This should be done regardless of whether a consensus standard is available.

2 Inspections, Tests, Analyses, and Acceptance Criteria.

We note that there is no discussion in the application or in the ASE of the effect of the shipping canal and watercourse on the runup at the site. Prior to approval of the COLA, the staff should verify that their inclusion would not significantly affect the conclusions of its deterministic tsunami hazard evaluation.

In summary, we agree with the staff's conclusions as documented in the staff's ASE regarding the safety issues associated with the PEF COLA for LNP. We conclude that there is reasonable assurance that LNP can be built and operated without undue risk to the health and safety of the public. The PEF COLA for LNP should be approved following implementation of the recommendations in this letter.

Sincerely,

/RA/

Said Abdel-Khalik
Chairman

REFERENCES

1. Advanced Safety Evaluation Report for "Combined License Application for Levy Nuclear Plant Units 1 and 2"
2.

Chapter	Chapter Title	ASER ML#
1	Introduction and Interfaces	ML112210054
2	Sites Characteristics	ML112430010
2.4	Hydrologic Engineering	ML112550268
3	Design of Structures, Components, Equipment, and Systems	ML110350029
4	Reactor	ML100621198
5	Reactor Coolant System and Connected Systems	ML100670476
6	Engineered Safety Features	ML110250040
7	Instrumentation and Controls	ML101370732
8	Electric Power	ML11165A212
9	Auxiliary Systems	ML110450401
10	Steam and Power Conversion Systems	ML101100014
11	Radioactive Waste Management	ML101050411
12	Radiation Protection	ML101170825
13	Conduct of Operations	ML110320002
14	Initial Test Programs	ML110270027
15	Accident Analysis	ML110280070
16	Technical Specifications	ML102600161
17	Quality Assurance	ML110180232
18	Human Factors Engineering	ML101250013
19	Probabilistic Risk Assessment	ML110290004

3. Letter to U.S. Nuclear Regulatory Commission, "Combined License Application for Levy Nuclear Plant Units 1 and 2," July 28, 2008 (ML082260277)

4. Letter to U.S. Nuclear Regulatory Commission Chairman, "Report on the Final Safety Evaluation Report Associated with the Amendment to the AP1000 Design Control Document," December 13, 2010 (ML103410351)

5. Letter to U.S. Nuclear Regulatory Commission Chairman, "Long-Term Core Cooling for the Westinghouse AP1000 Pressurized Water Reactor," December 20, 2010 (ML103410348)

6. Letter to U.S. Nuclear Regulatory Commission Chairman, "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 (ML110170006)

7. Letter to U.S. Nuclear Regulatory Commission Chairman, “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)

8. Letter to U.S. Nuclear Regulatory Commission Chairman, “Revision 19 to the AP1000 Design Control Document and the AP1000 Final Safety Evaluation Report” September 19, 2011 (ML11256A180)

7. Letter to U.S. Nuclear Regulatory Commission Chairman, “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)

8. Letter to U.S. Nuclear Regulatory Commission Chairman, “Revision 19 to the AP1000 Design Control Document and the AP1000 Final Safety Evaluation Report” September 19, 2011 (ML11256A180)

Accession No: **ML11339A126** **Publicly Available** **Y** **Sensitive** **N**
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Letter to the Honorable Gregory B. Jaczko, NRC Chairman, from Said Abdel-Khalik, ACRS Chairman dated December6, 2011

SUBJECT: REPORT ON THE SAFETY ASPECTS OF THE PROGRESS ENERGY FLORIDA, INC. COMBINED LICENSE APPLICATION FOR LEVY NUCLEAR PLANT, UNITS 1 AND 2

ML# 11339A126

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