

September 6, 2012

MEMORANDUM FOR: Mark Tonacci, Chief
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

FROM: Donald Habib, Project Manager */RA/*
Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: U. S. NUCLEAR REGULATORY COMMISSION AUDIT REPORT
FOR THE LEVY NUCLEAR PLANT COMBINED LICENSE
APPLICATION REVIEW RELATED TO NEAR TERM
TASK FORCE RECOMMENDATION 2.1, SEISMIC
RE-EVALUATION

On June 18–20, 2012, U.S. Nuclear Regulatory Commission (NRC) staff performed an audit of seismic calculations as part of the review of the Levy Nuclear Plant (LNP) combined license (COL) application. The audit was held at Progress Energy Florida Inc.'s (PEF) offices in Raleigh, North Carolina. A summary of the audit discussion and findings are described below.

Background

In a letter dated July 28, 2008, as supplemented by several letters, PEF submitted a combined COL application for two Westinghouse AP1000 advanced passive pressurized water reactors pursuant to the requirements of Sections 103 and 185(b) of the Atomic Energy Act, and 10 CFR Part 52, "Licenses, Certifications and Approvals for Nuclear Power Plants." The LNP site where Units 1 and 2 are proposed to be located is in Levy County, Florida. The LNP Final Safety Analysis Report (FSAR), Revision 4, Chapter 2, Site Characteristics, Section 2.5, Geology, Seismology, and Geotechnical Engineering, was submitted under a cover letter dated February 2, 2012.

On March 15, 2012, the NRC staff issued request for additional information (RAI) Letter No. 108 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML120550146) related to the NRC's Near-Term Task Force (NTTF) Tier 1 recommendations. A seismic re-evaluation is one of the four actions applicable to the LNP COL review in SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," dated February 17, 2012 (ADAMS Accession No. ML12039A103). NTTF Recommendation 2.1 actions specified in SECY-12-0025 include use of the Central and Eastern U.S. Seismic Source Characterization (CEUS-SSC) model, issued January 2012 (NUREG-2115), to determine the seismic hazard, as well as restrictions on the use of the cumulative absolute velocity filter (CAV) when conducting seismic evaluations.

At the time of the audit, PEF had completed its seismic re-evaluation calculations and developed an outline of its draft RAI response (ADAMS Accession No. ML12171A045). At the audit, the NRC staff reviewed PEF's draft RAI response outline and asked questions regarding PEF's CEUS-SSC source model evaluations. The NRC staff also reviewed PEF's supporting calculations, procedures, and other supporting documents to gain a better understanding of PEF's approach and to determine the adequacy of the PEF seismic re-evaluation information and analysis.

Regulatory Audit Bases

The basis for the audit is found in the following regulations and requirements:

- 10 CFR 100.23, "Geologic and seismic siting criteria"
- 10 CFR 52.79, "Contents of applications; technical information in final safety analysis report"
- SRM-12-0025, "Staff Requirements – SECY-12-0025 – Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami"

Audit Summary

The applicant presented a summary of the seismic analysis approach and results which included a discussion of assumptions PEF made for calculations. The staff asked questions and was presented with supporting information regarding PEF's quality assurance program and data validation processes as related to its seismic re-evaluation.

The staff reviewed the details of the implementation of the CEUS-SSC model for the Levy site. The technical review included clarification questions during PEF's slide presentation on June 18, 2012, review of PEF's calculation package 33884-CALC-FL-004 "LNP CEUS SSC Seismic Hazard Analysis," review of PEF's draft and outline RAI response (ADAMS Accession No. ML12171A045), and a CEUS-SSC software demonstration by Robert Youngs (AMEC).

The staff's technical review covered the topics of:

1. The input parameters and seismic source zones used by PEF in the Levy CEUS-SSC calculations.
2. PEF's CEUS-SSC model hazard comparison calculations for the seven test sites presented in NUREG-2115.
3. Comparisons of the CEUS-SSC calculations of 10^{-3} , 10^{-4} , 10^{-5} and 10^{-6} rock hazard curves with existing Levy FSAR calculations.
4. PEF's application of the new CAV filter settings for removing the effect of non-damaging earthquakes in ground motion response spectra (GMRS) calculations.

5. The final comparison of the CEUS-SSC GMRS, Foundation Input Response Spectra (FIRS), and Performance-Based Surface Response Spectra (PBSRS) calculation with that in the FSAR.
6. Quality assurance documents related to the seismic hazard calculation software.

The list of attendees, audit plan, references, and a list of documents and other information that was provided by PEF to support the audit are provided in the enclosures as stated below.

Conclusion

At the audit exit meeting, the staff discussed the following items with PEF:

1. The technical staff suggested to PEF that a thorough justification be included in their official response to RAI Letter No. 108 (ADAMS Accession No. ML120550146) regarding the following items:
 - a. PEF's comparison of CEUS-SSC non-scaled spectra (GMRS, FIRS, PBSRS) with the scaled spectra in the FSAR.
 - b. PEF's choice to not recalculate site amplification functions for the CEUS-SSC hazard calculations, but instead to use the existing site amplification function from the FSAR in their CEUS-SSC calculations of spectra (GMRS, FIRS, PBSRS).

The staff requested that PEF provide data values (i.e., in Excel files or tabular representations) for any data graph or plot that appears in PEF's official response to RAI Letter No. 108 (ADAMS Accession No. ML120550146). The staff remarked that this will enable the staff to most quickly review the data.

PEF indicated that it would address the issues described above in a future submittal.

The staff's review of the seismic hazard calculation software revealed no apparent discrepancies in the implementation of the seismic source model provided in NUREG-2115.

Docket Nos.: 052-029 and 052-030

Enclosures:

1. Attendees List
2. Audit Plan
3. Audit Plan References
4. Documents and Other Information Provided
by Progress Energy Florida to Support the Audit

cc w/encls: See next page

5. The final comparison of the CEUS-SSC GMRS, Foundation Input Response Spectra (FIRS), and Performance-Based Surface Response Spectra (PBSRS) calculation with that in the FSAR.
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cc w/encls: See next page

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ADAMS ACCESSION NO.: ML12235A301

NRO-002

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DATE	08/27/12	08/22/12	08/22/12	09/05/12

OFFICIAL RECORD COPY

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(Revised 08/09/2012)

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**LEVY NUCLEAR PLANT COMBINED LICENSE SEISMIC
AUDIT
JUNE 18-20, 2012**

LIST OF ATTENDEES

Name	Organization
Don Habib	NRO/DNRL/LB4
Amy Snyder	NRO/DNRL/LB4
Rebecca Karas*	NRO/DSEA/RGS1
Mohamed Shams*	NRO/DE/SEB1
Pravin Patel*	NRO/DE/SEB1
Stephanie Devlin	NRO/DSEA/RGS2
Vladimir Graizer	NRO/DSEA/RGS2
Dogan Seber	NRO/DSEA/RGS1
Zuhan Xi*	NRO/DSEA/RGS1
Robert Kitchen	Progress Energy Florida/Licensing
Tillie Wilkins	Progress Energy Florida/Licensing
Vann Stephenson	Progress Energy Florida/Licensing
David Waters	Progress Energy Florida/Licensing
Chris Keenan	Progress Energy Florida/Licensing
Robert Youngs	AMEC Environment & Infrastructure
A.K. Singh	Sargent & Lundy/Progress Energy
Jennifer Schaeffer	CH2M Hill

***--Via Phone**

Enclosure 1

Audit Plan for Review of Levy Calculations Associated with
Seismic Re-Evaluation in Response to Request for Additional Information
Associated with Near-Term Task Force
Tier 1 Recommendation 2.1 and SECY-12-0025

Audit Date: June 18-20, 2012

Background

Following the nuclear accident at the Fukushima Dai-ichi Nuclear Power Plant in Japan, the Nuclear Regulatory Commission (NRC) established a Near-Term Task Force (NTTF) to review NRC processes and regulations and make recommendations for policy direction. The NTTF issued a report in July 2011 recommending, among other things, that NRC order licensees to re-evaluate the seismic hazards at their sites against current NRC requirements and guidance and, if necessary, update the design basis and structures, systems, and components important to safety to protect against the updated hazards. Legislation imposing this requirement appears in Section 402 of the December 2011 Consolidated Appropriations Act, 2012 (PL 112-74).

In February and March 2012, the NRC issued SECY-12-0025 and SRM-12-0025, which included a 50.54(f) information request letter addressing the seismic re-evaluation requirement (ML12039A103 and ML120690347).

On March 15, 2012, NRC issued a request for additional information (RAI) to Progress Energy Florida requesting information on the seismic re-evaluation (ML120550146).

On April 12, 2012, PEF submitted a 30-day response letter indicating that its preliminary evaluation showed that the Levy site is bounded by the existing evaluation, and that the preliminary evaluation does not implement the new NRC requirement that the cumulative absolute velocity (CAV) filter should be limited to M_w less than or equal to 5.5. PEF also stated that a more rigorous reevaluation would be submitted by August 2012.

On April 27, 2012, NRC held a public meeting to discuss PEF's planned approach to address NTTF Recommendation 2.1 (ML12123A186)

The NRC staff will audit PEF's seismic reevaluation calculations and documentation related to the RAI on the NTTF Recommendation 2.1 at the PEF office in Raleigh, NC. PEF informed the staff that this information is technically complete, but not yet through its internal review progress. The purpose of this planned audit is to examine and evaluate primarily non-docketed information including the newly calculated seismic hazard curves obtained using NUREG2115, "Central and Eastern United States Seismic Source Characterization for Nuclear Facilities" seismic source model and the software used in these calculations. This is in order to gain understanding of PEF's seismic reevaluation, to verify applicable information and, as appropriate, to identify information that will require docketing to support the basis of a licensing or regulatory decision. Performing this audit should help the staff to conduct its review more efficiently.

Enclosure 2

Regulatory Audit Basis

The basis for the audit is found in the following regulations:

- 10 CFR 100.23, "Geologic and seismic siting criteria"
- 10 CFR 52.79, "Contents of applications; technical information in final safety analysis report"

Regulatory Audit Scope or Methodology

1. Review details of the implementation of the new Central and Eastern United States (CEUS) seismic hazard model for Levy site.
2. Review input parameters and seismic source zones used by the applicant in Levy seismic hazard calculations.
3. Review new model computer code implementation by comparing applicant's hazard calculations for the seven test sites presented in NUREG-2115 released in February 2012. This report describes a new seismic source characterization (SSC) model for the Central and Eastern United States (CEUS). It is replacing the *Seismic Hazard Methodology for the Central and Eastern United States*, EPRI Report NP-4726 (July 1986) and the *Seismic Hazard Characterization of 69 Nuclear Power Plants east of the Rocky Mountains*.
4. Review comparisons of the newly performed calculations of 10⁻⁴ and 10⁻⁵ rock hazard curves with existing Levy FSAR calculations.
5. Review applicant's application of the new cumulative absolute velocity (CAV) filter settings for removing effect of non-damaging earthquakes in ground motion response spectra (GMRS) calculations.
6. Review final comparisons of the new GMRS calculations with that of the FSAR.

Documents and other Information to be Provided by PEF to Support Audit

1. CEUS software QA validation
2. CEUS calculation (Includes 7 benchmark sites)
 - a. Approved by Joint Venture Team
 - b. Initial review in progress at Progress Energy
3. RAI response outline (including FSAR changes)
4. LNG-0000-X7C-030 Seismic Hazard Model for the LNP Site
5. LNG-0000-X7C-031 Computation of Rock PSHA
6. LNG-0000-X7C-032 Site Response and Development of Safe Shutdown Earthquake Spectra
7. LNG-0000-X7C-044 Development of Inputs for SSI Analysis

8. Private conference room with speakerphone
9. Internet Access for NRC audit team

Team Assignments

- Don Habib – Project Manager (Audit Leader)
- Amy Snyder – Project Manager
- Vladimir Graizer – Technical Reviewer
- Stephanie Devlin – Technical Reviewer
- Dogan Seber – Technical Reviewer

Schedule

- Monday, June 18
 - 1:00 – 2:30 Introductions & Overview
 - 2:30 – 5:00 Audit Reviews
- Tuesday, June 19
 - 8:00 – 11:30 Audit Reviews
 - 11:30 – 12:30 Lunch
 - 12:30 – 5:00 Audit Reviews
- Wednesday, June 20
 - 9:00 – 11:30 Exit/RAI Discussion (ML12158A510 Meeting Notice and Agenda)
 - 11:30 – 12:30 Lunch
 - 12:30 – 1:00 Follow-up (if required)

Available Applicant Personnel

- Bob Kitchen (PEF)
- Tillie Wilkins (PEF)
- Vann Stephenson (PEF)
- Chris Keenan (PEF)
- AK Singh (Sargent & Lundy)
- Bob Youngs (AMEC)

Audit Points of Contact, Location, and Directions

Progress Energy Contacts

- Dana Rose 919-546-2496
- Bob Kitchen 919-546-6992 or 919-219-6356 (Cell)

The audit will be conducted at:

Progress Energy Building – PEB CR1072
410 S. Wilmington Street
Raleigh, NC 27601

Directions

1. From RDU Airport take Aviation Parkway to I-40 East to Raleigh.
2. At approx. 12 miles take exit 298B (South Saunders Street/Downtown Raleigh Exit).
3. Going north, follow South Saunders Street, will run into McDowell Street, stay on McDowell Street (a very short distance) turn right onto South Street.
4. At the 2nd stop light go left onto Wilmington Street.
5. The Progress Energy Building (PEB) is at the corner of S Wilmington and E. Davie St. (entrance from either S. Wilmington St or Fayetteville St). Look for a parking deck on the right.

Deliverables

The NRC staff will issue a regulatory audit summary. The goal is to issue this summary within 30 days of the audit and place the summary on the docket and in ADAM S within 90 days of the completion of the audit. The audit summary may be publically available, as appropriate.

AUDIT PLAN REFERENCES

1. NRO-REG-108, "Regulatory Audits," April 2, 2009
2. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants."
3. AP1000 DCD, Revision 19
4. "AP1000 Standard Combined License Technical Report Effect of High Frequency Seismic Content on SSCs" (TR-115), Revision 3, June 2010.
5. LNP FSAR, Revision 4, Sections 2.5.4, 3.7 and 3.8

**DOCUMENTS AND OTHER INFORMATION
PROVIDED BY PROGRESS ENERGY FLORIDA TO SUPPORT THE AUDIT**

1. CEUS software QA validation (detail for this is # 9-14 of this list)
2. CEUS calculation (Includes 7 benchmark sites)
3. RAI L-0998 Response Outline, June 15, 2012, (including FSAR changes)
4. LNG-0000-X7C-030 Seismic Hazard Model for the LNP Site, Rev.2, 8/15/11
5. LNG-0000-X7C-031 Computation of Rock PSHA, Rev.1, 8/15/11
6. LNG-0000-X7C-032 Site Response and Development of Safe Shutdown Earthquake Spectra, Rev.1, 6/26/09
7. LNG-0000-X7C-044 Development of Inputs for SSI Analysis, Rev.3,8/15/11
8. 33884-CALC-FL-004 LNP CEUS SSC Seismic Hazard Analysis, Rev. A, 6/17/12, by Robert Youngs AMEC, Checked by AMEC, Approved by Lorin Young, CH2M Hill.
9. Progress Energy, Nuclear Generation Group, Standard Procedure, Volume 99, Book/Part 99, EGR-NGGC-0003, Design Review Requirements, Revision 11 (undated)
10. Progress Energy, Nuclear Generation Group, Support Department Procedure, NGGS-NPD-0001, Process for Document Reviews and Affirmation, Revision 5 (undated)
11. CH2M Hill, Nuclear Business Group, NBG-QA-03-01, Design Control, Revision 7, approved 11/16/07, effective 11/20/12
12. CH2M Hill, Nuclear Business Group, NU-P04-QA-03-07-P, Pre-Existing Software Implementation and Management, Revision 5, approved 3/26/12, effective 3/29/12
13. CH2M Hill, Nuclear Business Group, NU-P04-QA-03-03-P, Software Development, Acquisition, Verification, and Validation, Revision 7, approved 3/26/12, effective 3/29/12
14. CH2M Hill, Software Documentation Review Package for CEUSIF (CEUSIF 1) Version 1, SVAL# 338884-SVAL-108, Revision 2, 6/16/12, including (1) Software Requirements Statement, NU-P04-SW001-F, (2) Software Validation (Acceptance Test) Record, NU-P04-SW007-F, (3) Software Installation Record, NU-P04-SW008-F, (4) Software Users Manual, NU-P04-SW010-F, and (5) Software Screening & Quality Classification Checklist, NU-P04-SW011-F [Note: This document is an artifact produced by CH2 according to the above procedures (especially for Pre-existing software procedure). For each of the 5 forms prepared by CH2, there is an attachment from AMEC that fulfills the requirement.
15. PEF slide presentation, June 18, 2012