



Serial: NPD-NRC-2012-036
October 31, 2012

10CFR52.79

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

**LEVY NUCLEAR PLANT, UNITS 1 AND 2
DOCKET NOS. 52-029 AND 52-030
REVISED SUPPLEMENT 4 TO RESPONSE TO NRC RAI LETTER 108 – IMPLEMENTATION
OF FUKUSHIMA NEAR-TERM TASK FORCE RECOMMENDATIONS**

- References:
1. Letter from Mark Tonacci (NRC) to John Elnitsky (PEF), dated March 15, 2012, "Request for Additional Information Letter No. 108 Concerning Implementation of Fukushima Near-Term Task Force Recommendations."
 2. Letter from John Elnitsky (PEF) to Nuclear Regulatory Commission (NRC), dated April 12, 2012, "30-Day Response to NRC RAI Letter 108 – Implementation of Fukushima Near-Term Task Force Recommendations," Serial: NPD-NRC-2012-012.
 3. Letter from John Elnitsky (PEF) to Nuclear Regulatory Commission (NRC), dated April 25, 2012, "Response to NRC RAI Letter 108 – Implementation of Fukushima Near-Term Task Force Recommendations," Serial: NPD-NRC-2012-014.
 4. Letter from John Elnitsky (PEF) to Nuclear Regulatory Commission (NRC), dated June 19, 2012, "Supplement 1 to Response to NRC RAI Letter 108 – Implementation of Fukushima Near-Term Task Force Recommendations," Serial: NPD-NRC-2012-019.
 5. Letter from Christopher Fallon (PEF) to Nuclear Regulatory Commission (NRC), dated August 1, 2012, "Supplement 2 to Response to NRC RAI Letter 108 – Implementation of Fukushima Near-Term Task Force Recommendations," Serial: NPD-NRC-2012-029.
 6. Letter from Christopher Fallon (PEF) to Nuclear Regulatory Commission (NRC), dated September 27, 2012, "Supplement 3 to Response to NRC RAI Letter 108 – Implementation of Fukushima Near-Term Task Force Recommendations," Serial: NPD-NRC-2012-033.
 7. Letter from Christopher Fallon (PEF) to Nuclear Regulatory Commission (NRC), dated October 15, 2012, "Supplement 4 to Response to NRC RAI Letter 108 – Implementation of Fukushima Near-Term Task Force Recommendations," Serial: NPD-NRC-2012-035.

Progress Energy Florida, Inc.
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Ladies and Gentlemen:

Progress Energy Florida, Inc. (PEF) hereby submits a revised supplemental response to the Nuclear Regulatory Commission's (NRC) request for additional information (RAI) provided in Reference 1.

A supplemental response addressing one of the four NRC actions identified in the RAI is contained in the enclosure. The supplemental response addresses questions 1, 2, 3, and 4 which were identified by the NRC staff in a public meeting call held on August 30, 2012.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or me at (704) 382-9248.

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

Executed on October 31, 2012.

Sincerely,



Christopher M. Fallon
Vice President
Nuclear Development

Enclosure

cc : U.S. NRC Region II, Regional Administrator
Mr. Donald Habib, U.S. NRC Project Manager
Mr. Ngola Otto, U.S. NRC Project Manager

**Levy Nuclear Plant Units 1 and 2 (LNP)
Supplement 4 to Response to NRC Request for Additional Information Letter No. 108
Related to Implementation of Fukushima Near Term Task Force Recommendations,
Dated 3/15/2012**

<u>NRC RAI #</u>	<u>Progress Energy RAI #</u>	<u>Progress Energy Response</u>
01.05-1	L-0998 & L-1016	August 1, 2012; NPD-NRC-2012-029 and revised supplemental response enclosed – see following pages
01.05-1	L-0999 & L-1013	April 25, 2012; NPD-NRC-2012-0014 and September 27, 2012; NPD-NRC-2012-033
01.05-1	L-1000 & L-1014	April 25, 2012; NPD-NRC-2012-0014 and September 27, 2012; NPD-NRC-2012-033
01.05-1	L-1002	June 19, 2012; NPD-NRC-2012-019

NRC Letter No.: LNP-RAI-LTR-108

NRC Letter Date: March 15, 2012

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 01.05-1

Text of NRC RAI:

Subject: Request for Additional Information Letter No. 108 Concerning Implementation of Fukushima Near-term Task Force (NTTF) Recommendations

Bullet 1

Evaluate the seismic hazards at your site 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 (seismic portion only - of detailed Recommendation 2.1 - Enclosure 7 of SECY-12-0025).

PGN RAI ID #: L-1016

PGN Response to NRC RAI:

On August 28, 2012 Progress Energy Florida (PEF) received an email from Mr. Ngola Otto of the US Nuclear Regulatory Commission (NRC) staff that posed four questions concerning the analysis to implement the Central and Eastern United States Seismic Source Characterization (CEUS-SSC) model presented in NUREG-2115 (EPRI/USDOE/USNRC, 2012). Based on a review of the draft responses provided to the NRC in advance of the formal submittal, the NRC staff informed PEF in a public telecom on October 11, 2012, that the information proposed to be provided in response to questions 2, 3, and 4 was acceptable, but the response to question 1 should be expanded to include sensitivity results for a range of structural frequencies and not limited to just one (1) Hz. The responses to questions 2, 3, and 4 were documented in NPD-NRC-2012-035, dated October 15, 2012, at the request of NRC. This letter provides the responses to all four NRC questions, with the response to question 1 based on sensitivity calculations performed for the seven structural frequencies defined in the EPRI (2004) ground motion models. The responses to questions 2 and 3 include the results of sensitivity calculations performed for spectral acceleration at a structural frequency of 1 Hz. One (1) Hz spectral acceleration was chosen because, for the LNP site, the hazard at this structural frequency is dominated by the contributions from the Charleston RLME source.

1. *There is a discrepancy between NUREG-2115 Appendix H Equation H-1 and the original equation by Wells and Coppersmith (1994). The staff would like to discuss the applicant's implementation of NUREG-2115 Appendix H Equation H-1 for the Levy application.*

Response

Equation H-1 reported in Appendix H of NUREG-2115 is based on the relationship presented in Table 4 of Somerville et al. (2001) as noted in Section 5.4.5 of NUREG-2115, not Wells and Coppersmith (1994). The coefficients of the equation were derived from the relationship presented in Somerville et al. (2001) using the moment magnitude relationship developed by Hanks and Kanamori (1979). Repeating the process suggests that there should be a small change in the equation. The relationship should be $\log_{10}(\text{RA in km}^2) = \mathbf{M} - 4.35$ instead of

$\log_{10}(\text{RA in km}^2) = \mathbf{M} - 4.366$. This change produces an approximately 4 percent increase in the rupture area for a given magnitude. Sensitivity calculations performed using the revised equation show that the 10^{-4} and 10^{-5} spectral accelerations differ from those presented on FSAR (Rev 5) Figure 2.5.2-340 by about 0.1 to 0.2 percent, depending on structural frequency. Table 1 lists the results of the sensitivity tests for the seven structural frequencies defined in the EPRI (2004) ground motion models: 100 Hz (PGA), 25 Hz, 10 Hz, 5 Hz, 2.5 Hz, 1 Hz, and 0.5 Hz.

Table 1: Percent Change in Ground Motion Obtained Using Corrected Equation H-1 of NUREG-2115

Exceedance Frequency	Percent Change in Spectral Acceleration for Spectral Frequency of:						
	100 Hz	25 Hz	10 Hz	5 Hz	2.5 Hz	1 Hz	0.5 Hz
10^{-4}	0.17%	0.16%	0.17%	0.16%	0.15%	0.12%	0.10%
10^{-5}	0.09%	0.09%	0.09%	0.11%	0.12%	0.11%	0.09%

Note that the difference between Equation H-1 and its corrected version does not affect the hazard from the distributed seismicity sources as these were developed using the epicentral distance adjustments given in EPRI (2004) which represent the effect of earthquake rupture size as a function of magnitude on ground motion prediction for a given epicentral distance. As described in EPRI (2004), these epicentral distance adjustments were based on the magnitude-rupture area relationships presented in Somerville et al. (2001). Therefore, they accomplish the same objective as would be obtained by explicitly modeling earthquake rupture areas in hazard calculations using Equation H-1 of NUREG-2115.

- As described in FSAR Section 2.5.2.7.2.6 "Results for the Savannah Site", you modeled the Charleston regional and local sources using two different methods. First using "a series of closely spaced pseudo faults parallel to the northeast orientation of the zone and earthquake ruptures were modeled as occurring uniformly along these faults". Second, an alternative approach was used "in which the source zone was filled with a grid of uniformly spaced points. At each location, magnitude-dependent ruptures were placed with the specified northeast orientation with a random location on the grid point. The "strict" boundary condition for the Regional and Local geometries was then imposed by forcing the ruptures to remain within the source boundary." Please clarify which source model implementation was used for the modeling the effects of the Charleston regional and local sources at the Levy site.

Response

For the LNP site, the Charleston Repeated Large Magnitude Earthquake (RLME) source was modeled as a series of closely spaced pseudo faults with ruptures uniformly spaced along their length. This model was found to produce satisfactory results matched to the hazard results presented in NUREG-2115 at sites located at large distances from the Charleston RLME (e.g. Chattanooga). Sensitivity calculations performed using the alternative model of the Charleston RLME source (uniformly spaced epicenters) show that the 10^{-4} and 10^{-5} 1 Hz spectral accelerations are larger than those presented on FSAR (Rev 5) Figure 2.5.2-340 by 0.4 percent and 0.5 percent, respectively. These results confirm that the hazard at large distances from the Charleston RLME source is not sensitive to details of modeling the distribution of ruptures within the source.

- In NUREG-2115, the Charleston RLME regional source is described being modeled as having two alternative fault rupture orientations (1) is parallel to the long axis of the source (northeast) with 0.80 weight, and (2) is oriented parallel to the short axis of the source

(northwest) with 0.20 weight. Please verify that these are the orientations and weights used in your model computer files for the calculation of the Levy seismic hazard.

Response

The calculations for the LNP site presented in Subsection 2.5.2.7 of the LNP FSAR (Rev 5) were performed using only the northeast orientation for the Charleston RLME Regional Source zone with a weight of 1.0. This was based on the statement in NUREG-2115 that the hazard at the Savannah demonstration site showed only small sensitivity to the orientation of ruptures in the Regional source geometry and the use of only the northeast-southwest orientations produced higher hazard. Sensitivity calculations performed for the LNP site using a combined model with northeast ruptures weighted 0.8 and northwest ruptures weighted 0.2 for the Regional source geometry show that the 10^{-4} and 10^{-5} 1 Hz spectral accelerations are approximately 0.04 percent lower than those presented on FSAR (Rev 5) Figure 2.5.2-340.

4. *NUREG-2115 lists the following moment magnitudes (M) as maximum magnitudes and (weights) for implementing the Charleston RLME source – M6.7 (0.1), M6.9 (0.25), M7.1 (0.3), M7.3 (0.25), and M7.5 (0.1). Please verify that these are the input parameters you coded into your model computer files for the calculation of seismic hazard at the Levy site.*

Response

It is confirmed that the Charleston RLME source was modeled using the distribution for RLME magnitude listed in the question. Aleatory variability in earthquake magnitude for each case was modeled by a uniform distribution over the range ± 0.25 magnitude units about the RLME magnitude.

Associated LNP COL Application Revisions:

None

Attachments/Enclosures:

None