Progress Energy

Serial: NPD-NRC-2011-080
November 17, 2011

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
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 106 RELATED TO PROBABILISTIC RISK ASSESSMENT AND SEVERE ACCIDENT EVALUATION

Reference: Letter from Denise McGovern (NRC) to John Elnitsky (PEF), dated October 28, 2011, "Request for Additional Information Letter No. 106 Related to the SRP Section 19.59 for the Levy County Nuclear Plant, Units 1 and 2 Combined License Application"

Ladies and Gentlemen:

Progress Energy Florida, Inc. (PEF) hereby submits our response to the Nuclear Regulatory Commission's (NRC) request for additional information provided in the referenced letter.

A response to the NRC request is addressed in the enclosure. The enclosure also identifies changes that will be made in a future revision of the Levy Nuclear Plant Units 1 and 2 application.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or me at (727) 820-4481.

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

Executed on November 17, 2011.

Sincerely,

John Elnitsky
Vice President
New Generation Programs & Projects

Enclosure/Attachment

cc : U.S. NRC Region II, Regional Administrator
Mr. Brian C. Anderson, U.S. NRC Project Manager

Progress Energy Florida, Inc.
P.O. Box 14042
St. Petersburg, FL 33733

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NRO

Levy Nuclear Plant Units 1 and 2
Response to NRC Request for Additional Information Letter No. 106 Related to SRP Section 19.59 for the Combined License Application, dated October 28, 2011

NRC RAI #	Progress Energy RAI #	Progress Energy Response
19-75	L-0992	Response enclosed – see following pages

NRC Letter No.: LNP-RAI-LTR-106

NRC Letter Date: October 28, 2011

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 19-75

Text of NRC RAI:

10 CFR 52.79(a)(46) requires that a combined license application include "a description of the plant-specific probabilistic risk assessment (PRA) and its results," while 52.79(d)(1) states that "the plant-specific PRA information must use the PRA information for the design certification and must be updated to account for site-specific design information and any design changes or departures." The safety-related, roller-compacted concrete bridging mat is a site-specific design feature of LNP Units 1 and 2.

Discuss the risk significance of the bridging mat and identify any related insights. Also, report the seismic capacity (HCLPF value) for the bridging mat and the basis for concluding that it is adequate. Submit appropriate plant-specific supplemental information for the FSAR, including but not limited to Sections 17.4, 19.55, and 19.59; if no supplements are proposed for one or more of these specific sections, explain why the section is not affected by the addition of the bridging mat.

PGN RAI ID #: L-0992

PGN Response to NRC RAI:

Seismic HCLPF Capacity for Levy Nuclear Plant (LNP)

The LNP roller compacted concrete (RCC) bridging mat is designed to span the postulated (conservative) design basis karst void of 10 ft. The failure of the RCC bridging mat can result in displacement of the AP1000 nuclear island foundation in excess of the maximum 6 in. displacements specified in DCD Tier 1 Table 5.0-1. The high confidence low probability of failure (HCLPF) capacity of the RCC mat was calculated as 0.12g using the conservative deterministic failure margin (CDFM) methodology of Reference 19.55.7-201. In the AP1000 PRA-based Seismic Margin Assessment, the RCC bridging mat failure is conservatively assumed to fall within the gross structural collapse event modeled in the hierarchical event tree discussed in DCD Section 19.55. As gross structural collapse is assumed to directly lead to core damage, failure of the RCC bridging mat has the potential to drive the plant level HCLPF value. The 0.12g HCLPF capacity of the RCC bridging mat is 1.76 times the LNP site-specific GMRS peak ground acceleration; this exceeds the overall plant HCLPF minimum acceptance criteria of 1.67*GMRS specified in DC/COL-ISG-020.

Table 19.55-201 summarizes the HCLPF capacities of the LNP site-specific design features (e.g., RCC bridging mat, potential against soil liquefaction, and Seismic Category II/I interaction between the nuclear island and the adjacent buildings) based on the CDFM methodology.

FSAR Section 19.55 will be revised to document the HCLPF capacity of the RCC bridging mat and to add the new Table 19.55-201 summarizing the HCLPF capacities of the LNP site-specific design features (e.g., RCC bridging mat, potential against soil liquefaction, and Seismic Category II/I interaction between the nuclear island and the adjacent buildings).

Risk Significance and Insight

In the AP1000 PRA-based Seismic Margin Assessment (SMA), the RCC bridging mat failure is conservatively assumed to fall within the gross structural collapse event modeled in the hierarchical event tree discussed in DCD Section 19.55. As gross structural collapse is assumed to directly lead to core damage, failure of the RCC bridging mat has the potential to drive the plant level HCLPF value.

The assessment of risk significance of the LNP RCC bridging mat is based on the assumption that events which result in demand beyond the CDFM HCLPF capacity of the RCC bridging mat will lead to gross structural collapse. A more realistic assessment is that an event beyond the CDFM HCLPF capacity for the RCC bridging mat may result in some cracking within the RCC bridging mat which in turn may result in limited damage to the NI structures. Thus, exceeding the CDFM HCLPF capacity would only have a limited effect on the NI structure performance.

The CDFM HCLPF capacity for soil liquefaction potential is based on no liquefaction potential for the LNP 10^{-5} UHRS. A seismic event larger than the 10^{-5} UHRS is required for soil liquefaction. For the larger event, liquefaction will be confined to isolated areas under the adjacent Turbine and Annex buildings and may result in damage to these buildings which in turn may result in limited damage to the NI structures. For Seismic Category II/I interaction between the nuclear island and the adjacent buildings the CDFM HCLPF capacity is based on calculated relative displacements between the NI and the adjacent buildings for the LNP 10^{-5} UHRS of less than one (1) in. A two (2) in. gap is provided between the NI and adjacent building foundations. A seismic event larger than the 10^{-5} UHRS is required for the relative displacement between the NI and the adjacent structures to exceed the 2 in. gap provided. For the larger event, impact between the NI and the adjacent Turbine and Annex buildings would occur and may result in some local damage to the NI structure.

The seismic interaction between the Turbine Building and the NI was evaluated as discussed in DCD Subsection 19.55.2.2.6 and it was determined that the results of the seismic margin assessment, the plant HCLPF value, and the insights derived from the seismic margin assessment are not affected. For SMA, the Annex Building and the Radwaste Building are assumed to have failed as described in DCD Subsection 19.55.3.3. Thus, exceeding the reported CDFM HCLPF capacity for soil liquefaction or for Seismic Category II/I interaction between the nuclear island and the adjacent buildings will not affect the plant level HCLPF value.

FSAR Section 19.59 will be revised to document the above risk assessment and the related insights for soil liquefaction, Seismic Category II/I interaction between the nuclear island and the adjacent buildings, and RCC bridging mat discussed above. A new Table 19.59-201 will be added for PRA-based insight for the RCC bridging mat (site-specific design feature).

Site-Specific D-RAP

The RCC bridging mat will be added to the Design Reliability Assurance Program (D-RAP) as a site-specific SSC. A new Subsection 17.4.7.1.6 "Site-Specific SSCs to be Included in D-RAP" will be added to the FSAR. A new Table 17.4-201 will be added listing the "Rationale" and the "Insights and Assumptions".

References

19.55.7-201: EPRI Report No. NP-6041-SL, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin", Revision 1, August 1991.

Associated LNP COL Application Revisions:

The following changes will be made to the LNP FSAR in a future revision:

1) *Revise last sentence of the 3rd paragraph of Subsection 19.55.6.3 Site-Specific Seismic Margin Analysis from:*

   "Thus, liquefaction potential of soil beyond the nuclear island perimeter which will be left in place will not lower the HCLPF values calculated for the certified design."

   To read:

   "Thus, liquefaction potential of soil beyond the nuclear island perimeter which will be left in place has the potential to drive the plant level HCLPF; however the soil liquefaction HCLPF exceeds the 1.67*GMRS goal for the plant level HCLPF."

2) *Revise last sentence of the 4th paragraph of Subsection 19.55.6.3 Site-Specific Seismic Margin Analysis from:*

   "Thus, there is no adverse Seismic Category II/I interaction between the NI and the adjacent buildings that would lower the HCLPF values calculated for the certified design."

   To read:

   "Thus, Seismic Category II/I interaction between the NI and the adjacent buildings has the potential to drive the plant level HCLPF; however the HCLPF for Seismic Category II/I interaction between the NI and the adjacent buildings exceeds the 1.67*GMRS goal for the plant level HCLPF."

3) *Add the following paragraph after the 4th paragraph of Subsection 19.55.6.3 Site-Specific Seismic Margin Analysis:*

   "The LNP RCC bridging mat is designed to span the postulated (conservative) design basis karst void of 10 ft. The failure of the RCC bridging mat can result in displacement of the AP1000 nuclear island foundation in excess of the maximum 6 in. displacements specified in DCD Tier 1 Table 5.0-1. In the AP1000 PRA-based Seismic Margin Assessment, the RCC bridging mat failure is conservatively assumed to fall within the gross structural collapse event modeled in the hierarchical event tree discussed in DCD Section 19.55. As gross structural collapse is assumed to directly lead to core damage, failure of the RCC bridging mat has the potential to drive the plant level high confidence low probability of failure (HCLPF) value. The HCLPF capacity of the RCC mat was calculated as 0.12g using the conservative deterministic failure margin (CDFM) methodology of Reference 19.55.7-201. The 0.12g HCLPF capacity of the RCC bridging mat is 1.76 times the LNP site-specific GMRS peak ground acceleration; this exceeds the overall plant HCLPF acceptance criteria of 1.67*GMRS.

   Table 19.55-201 summarizes the HCLPF capacities of the LNP site-specific design features (e.g., RCC bridging mat, potential against soil liquefaction, and Seismic Category II/I interaction between the nuclear island and the adjacent buildings)."

4) *Revise 5th paragraph of Subsection 19.55.6.3 Site-Specific Seismic Margin Analysis from:*

"Thus, it can be concluded that the Seismic Margin Assessment analysis documented in Section 19.55 is applicable to the LNP site."

To read:

"Thus, it can be concluded that the Seismic Margin Assessment analysis documented in Section 19.55 is applicable to the LNP site. Exceeding the HCLPF capacities for soil liquefaction and Seismic Category II/I interaction effects of buildings adjacent to the nuclear island will not affect the plant level HCLPF capacity. The RCC bridging mat HCLPF capacity, while potentially driving the plant-level HCLPF, exceeds the plant level HCLPF goal of 1.67*GMRS."

5) *Add new Subsection 19.55.7 as follows:*

"19.55.7 REFERENCES

Add the following information at the end of DCD Subsection 19.55.7:

201. EPRI Report No. NP-6041-SL, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin", Revision 1, August 1991."

6) *Add new Table 19.55-201 as shown in Attachment 19.75.*

7) *Add the following paragraphs to the end of Subsection 19.59.10.5:*

"In the AP1000 PRA-based Seismic Margin Assessment (SMA), the RCC bridging mat failure is conservatively assumed to fall within the gross structural collapse event modeled in the hierarchical event tree discussed in DCD Section 19.55. As gross structural collapse is assumed to directly lead to core damage, failure of the RCC bridging mat has the potential to drive the plant level high confidence low probability of failure (HCLPF) capacity.

The assessment of risk significance of the LNP RCC bridging mat is based on the assumption that events which result in demand beyond the CDFM HCLPF capacity of the RCC bridging mat will lead to gross structural collapse. A more realistic assessment is that an event beyond the conservative deterministic failure mode (CDFM) HCLPF capacity for the RCC bridging mat may result in some cracking within the RCC bridging mat which in turn may result in limited damage to the NI structures. Thus, exceeding the CDFM HCLPF capacity would only have a limited effect on the NI structure performance.

The CDFM HCLPF capacity for soil liquefaction potential is based on no liquefaction potential for the LNP 10^{-5} UHRS. A seismic event larger than the 10^{-5} UHRS is required for soil liquefaction. For the larger event, liquefaction will be confined to isolated areas under the adjacent Turbine and Annex buildings and may result in damage to these buildings which in turn may result in limited damage to the NI structures. For Seismic Category II/I interaction between the nuclear island and the adjacent buildings the CDFM HCLPF capacity is based on calculated relative displacements between the NI and the adjacent buildings for the LNP 10^{-5} UHRS of less than one (1) in. A two (2) in. gap is provided between the NI and adjacent building foundations. A seismic event larger than the 10^{-5} UHRS is required for the relative displacement between the NI and the adjacent structures to exceed the 2 in. gap provided. For the larger event, impact between the NI and the adjacent Turbine and Annex buildings would occur and may result in some local damage to the NI structure.

The seismic interaction between the Turbine Building and the NI was evaluated as discussed in DCD Subsection 19.55.2.2.6 and it was determined that the results of the seismic margin assessment, the plant HCLPF capacity, and the insights derived from the seismic margin assessment are not affected. For SMA, the Annex Building and the Radwaste Building are assumed to have failed as described in DCD Subsection 19.55.3.3. Thus, exceeding the CDFM HCLPF capacity for soil liquefaction or for Seismic Category II/I interaction between the nuclear island and the adjacent buildings will not affect the plant level HCLPF capacity.

Table 19.59-201 summarizes the PRA-based insight for the RCC bridging mat (site-specific design feature). "

8) *Add new Table 19.59-201 as shown in Attachment 19.75.*

9) *Add new Subsection 17.4.7.1.6 as follows:*

LNP SUP 17.4-1 "17.4.7.1.6 Site-Specific SSCs to be Included in D-RAP

Table 17.4-201 lists the site-specific SSC (RCC bridging mat) included in the D-RAP. The rationale for inclusion of the SSC and the risk insights and assumptions are also described in the table."

10) *Add new Table 17.4-201 as shown in Attachment 19.75.*

Attachments/Enclosures:

Attachment 19.75: New tables 19.55-201, 19.59-201, and 17.4-201

Attachment 19.75

New tables 19.55-201, 19.59-201, and 17.4-201

Table 19.55-201

LNP COL 19.59.10-6

HCLPF Capacities for LNP Site Specific Design Features

Description	HCLPF Capacity[(a)]	HCLPF/GMRS[(b)]	Basis
Soil Liquefaction Potential under Adjacent Buildings	> 0.12g	> 1.67 GMRS	(c)
Seismic II/I Interaction Potential	> 0.12g	> 1.67 GMRS	(d)
RCC bridging mat	0.12g	1.76 GMRS	(e)

Notes:

(a) LNP site-specific Ground Motion Response Spectra (GMRS) peak ground acceleration (PGA) is 0.0691g.

(b) HCLPF Capacity as a fraction of LNP site-specific GMRS PGA.

(c) Liquefaction potential of soils under the adjacent buildings was evaluated for the LNP site-specific 10^{-5} annual exceedance probability Uniform Hazard Response Spectra (10^{-5} UHRS). The LNP 10^{-5} UHRS is greater than 1.67*GMRS.

(d) Relative displacement between the NI and adjacent buildings for the LNP site-specific 10^{-5} UHRS is less than the gap provided. The LNP 10^{-5} UHRS is greater than 1.67*GMRS.

(e) HCLPF capacity calculated using conservative deterministic failure margin method of Reference 19.55.7-201.

Table 19.59-201

LNP COL 19.59.10-6

PRA-Based Insights for Site-Specific SSCs

Insight	Disposition
RCC Bridging Mat In the Seismic Margin Assessment, the RCC bridging mat failure is conservatively assumed to fall within the gross structural collapse event. As gross structural collapse is assumed to directly lead to core damage, failure of the RCC bridging mat has the potential to drive the plant level HCLPF value. The RCC bridging mat serves two purposes: 1) replace the weakly cemented, undifferentiated Tertiary sediments that are present above elevation -7.3 m (-24 ft.) NAVD88, thereby, creating a uniform subsurface with increased bearing capacity; and 2) bridge conservatively postulated karst features. The RCC bridging mat has been designed to bridge a 3 m (10 ft.) air-filled cavity located immediately beneath the RCC (elevation -7.3 m [-24 ft.] NAVD88) at any plan location.	2.5.4.5.4
Roller Compacted Concrete Strength and Constructability Verification Program includes use of test results from large scale commercial projects, pre-COL RCC testing, post-COL RCC testing, and RCC testing during production construction. The RCC bridging mat will be constructed using construction specifications, non destructive testing and quality controls during construction, construction implementing procedures, and construction equipment that are comparable to those used on past successful RCC projects.	3.8.5.11

Table 17.4-201

LNP SUP 17.4-1

Risk-Significant Site Specific SSC within the Scope of D-RAP

System, Structure, or Component (SSC)	Rationale	Insights and Assumptions
RCC Bridging Mat	SMA	The RCC bridging mat supports the AP1000 Nuclear Island (NI) Structures. The RCC bridging mat has the least calculated CDFM HCLPF for all risk significant SSCs including the Fuel Assembly. In the AP1000 PRA-based Seismic Margin Assessment, the RCC bridging mat failure is conservatively assumed to fall within the gross structural collapse event. As gross structural collapse is assumed to directly lead to core damage, failure of the RCC bridging mat has the potential to drive the plant level HCLPF value.