PMLevyCOLPEm Resource

From: Chandu Patel
Sent: Wednesday, May 27, 2009 4:39 PM
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Cc: Brian Anderson
Subject: RAI 2775 for Section 3.3.1 and RAI 2925 for Section 3.8.5
Attachments: RAI 2775 Draft.doc; RAI 2925 Draft.doc

Please see attached RAIs and let me know if you like to have a call. Otherwise we will issue after a reasonable time.

Thanks,

Chandu Patel

Hearing Identifier: Levy_County_COL_Public
Email Number: 162

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RAI 2775 Draft.doc	28154	
RAI 2925 Draft.doc	41978	

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Request for Additional Information No. 2775 Revision 0

Levy County, Units 1 and 2
Progress Energy Florida, Inc.
Docket No. 52-029 and 52-030
SRP Section: 03.03.01 - Wind Loading
Application Section: FSAR 3.3.1

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

03.03.01-***

GDC 2 requires the applicant to consider the effects of the most severe of the natural phenomena historically reported. RAI 2.3.1-8 requested that the applicant explain why the basic wind speed did not consider the most severe hurricanes historically reported. In its response, the applicant stated that the 3-second gust wind speed will be changed from 139 mph to 185 mph. The 185 mph wind speed exceeds the AP1000 design value of 145 mph. Present the technical basis for compliance with AP1000 DCD and GDC 2.

Request for Additional Information No. 2925 Revision 0

Levy County, Units 1 and 2
Progress Energy Florida, Inc.
Docket No. 52-029 and 52-030
SRP Section: 03.08.05 - Foundations
Application Section: 3.8.5

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

03.08.05-***

Levy FSAR Section 3.8.5.1 “Description of the Foundations” refers to Section 2.5.4 for information about overburden and depth of embedment. Section 2.5.4.5.4 identifies a roller compacted concrete (RCC) bridging mat. The RCC mat is expected to be about 35 feet thick and serves to create “a uniform subsurface with increased bearing capacity” and to “ bridge conservatively over postulated features”.

Additional information on the RCC mat has been supplied by the applicant with a September 12, 2008 submittal: “Levy Nuclear Plants Units 1 and 2 (LNP) NRC Project Number 756 LNP COLA Supplemental Information” (Serial NPD-NRC-2008-031) and a November 20, 2008 submittal: “Levy Nuclear Plants Units 1 and 2 NRC Docket Numbers 52-029 and 52-030 LNP COLA Request for Additional Information” (Serial NPD-NRC-2008-064).

The planned RCC mat falls within the design and construction techniques addressed by ACI 207.5R-99, “Roller Compacted Mass Concrete”. ACI 207.5R-99 summarizes the state of the art for design and construction of RCC in mass applications.

More information is needed about the design assumptions for RCC strength at lift boundaries and the testing to verify the assumptions. Per ACI-207.5R Section 3.2, practice has shown that the RCC tensile and shear strengths at lift joints are sensitive to mix, construction method and quality control.

Page 9 of the September 12 submittal states that the nominal concrete tension capacity is 230 psi using the ACI-318-05 equation for plain structural concrete. That equation applies to conventionally constructed concrete and may not be appropriate at RCC lift joints. The slab nominal shear capacity is not identified. Additional information is requested:

1. Please describe the type of joint to be formed at lift boundaries (e.g., bonded, cold joint, bedded joint).

2. Please identify methods to be used to determine tensile and shear strengths and stifnesses at lift joints, together with their variability, number and types of tests to be used to verify properties.

3. Page 9 of the September 12 submittal states that tensile capacity will be verified with the Test Pad. Please identify the methods and standards that will be used to verify tensile strength and how the test will address strength at lift boundaries.

4. Please identify the required shear strength at lift joints, the assumed shear strength at lift joints and the technical basis for the assumed strength. Address the assumptions regarding cohesion between lifts, the effective coefficient of friction, the effective bonded area (as a percent of nominal area), and the required stresses for seismic conditions.

5. Page 10 of the September 12 submittal states that a Test Pad will be constructed and various tests will be conducted. Testing of the as-built strength of the RCC mat (e.g., from core samples) is not discussed. Clearly, because of sensitivities to construction, strength of the as-built RCC mat may differ from the Test Pad. If no as-built shear and tensile strength testing is to be conducted, please demonstrate that design assumptions are sufficiently conservative to account for uncertainty in the as-built mat strength.

Page 8 of the September 12 submittal describes a finite element analysis of the combined RCC mat and underlying rock. The description provided of the finite element analysis of the coupled RCC bridging mat and rock/void materials does not provide information on sensitivity of the computed responses (stresses developed in and around the rock mass as well as stresses induced in the RCC bridging mat) to uncertainties and variability in material properties. Additional information is requested:

6. Please provide information on the assumed planned location of cavities and specifically whether the analysis considers conditions wherein a cavity is located (a) under an edge of the NI basement and, (b) under a corner of the NI basement. If the cases have not been considered then please justify that the calculated stresses sufficiently bound these cases for normal and seismic conditions.

03.08.05-***

Levy FSAR Section 2.5.4.8.5 states that liquefaction analysis has identified random zones of soil with an inadequate FS against liquefaction. These zones occur beneath buildings that are adjacent to the NI. The adjacent buildings are to be supported on piles that bear on rock.

The section further states that liquefaction will not affect the NI and that the piles will be designed in a manner that precludes soil liquefaction effects from having an impact on the surrounding structures such that they might unfavorably interact with the NI. Increasing pile shaft lateral stiffness, grouting, excavation and soil remediation are cited as possible remedies.

An updated seismic interaction review is to be conducted as described in FSAR Section 3.7.5.3. The review will consider as-built information. This review is listed as a COL Holder action Item in Table 1.8-202.

AP1000 DCD Section 3.7.2.8 discusses seismic interaction between the NI and adjacent buildings. Five soil profiles have been addressed. Liquefaction has not been considered in any of the seismic interaction analyses.

Zones of liquefied soil may reduce effective foundation stiffness for earthquake conditions even if they are isolated. This softening effect would depend in part on the extent and distribution of liquefiable soil. A concern is that the softening may produce horizontal seismic displacements that exceed the gaps between buildings, either above ground (4 inch minimum gap) or at the foundation level (2 inch minimum gap).

Please provide more detail on how liquefaction potential has been addressed in the existing seismic interaction calculations:

1. Levy FSAR Section 3.7.2.8.1 states that analyses have shown that seismic displacements at the foundation level are less than 1 inch. Please provide the calculations for peak foundation displacements discussed in Section 3.7.2.8 for the Annex, Radwaste and Turbine Buildings.

2. Please describe how foundation stiffness has been addressed in the seismic interaction calculations in light of the liquefiable soil; please include the values used for soil shear moduli and the assumed extent (volume and distribution) of liquefiable soil. If soil liquefaction is not considered then please address why this is justified.

3. Please explain how the AP1000 DCD seismic interaction analysis for the Annex Building bounds the Levy site given that liquefaction was not considered in the DCD analysis.

4. With regard to liquefaction, what soil data will be recorded during pile test boring and how will this data be used to verify the seismic interaction analyses?

FSAR Section 2.5.4.8.5 indicates that, based on test borings at pile locations and design studies, measures to control seismic displacements will be developed. Piles are identified as a design measure to control seismic displacement but no description is provided about methods for seismic design of piles. Typically, for a long pile, the lateral stiffness provided by the pile originates mainly from lateral bearing on the upper layers of soil (pile embedment). Lateral stiffness can also be provided by the use of battered piles. Moment frame action (moment fixity at pile ends) is often a small contributor to stiffness when the piles are long. Please provide more information on the planned method for seismic design of piles:

5. Please identify if pile seismic design will rely on lateral bearing on soil and how potential zones of liquefaction will affect the pile stiffness. Also, does the 7 foot depth of engineered fill (FSAR Section 2.5.4.8.1) account for required pile stiffness?

6. If pile seismic design will not rely on the upper soil layers as a load path, please demonstrate that a practical stiffening design can be achieved by moment fame action given the length of the piles.

7. Will the use of battered piles be considered as a design method?