



Serial: NPD-NRC-2009-121
June 23, 2009

10 CFR 52.79

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

**LEVY COUNTY NUCLEAR POWER PLANT, UNITS 1 AND 2
DOCKET NOS. 52-029 AND 52-030
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 033 RELATED TO
STABILITY OF SUBSURFACE MATERIAL AND FOUNDATIONS**

Reference: Letter from Brian C. Anderson (NRC) to Garry Miller (PEF), dated May 8, 2009,
"Request for Additional Information Letter No. 033 Related to SRP Section 2.5.4 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.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or me at (919) 546-6107.

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

Executed on June 23, 2009.

Sincerely,

A handwritten signature in black ink that reads "Garry D. Miller".

Garry D. Miller
General Manager
Nuclear Plant Development

Enclosure

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

Levy Nuclear Power Plant Units 1 and 2
Response to NRC Request for Additional Information Letter No. 033 Related to
SRP Section 2.5.4 for the Combined License Application, dated May 8, 2009

<u>NRC RAI #</u>	<u>Progress Energy RAI #</u>	<u>Progress Energy Response</u>
02.05.04-23	L-0291	Response enclosed – see following pages

NRC Letter No.: LNP-RAI-LTR-033

NRC Letter Date: May 8, 2009

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.05.04-23

Text of NRC RAI:

FSAR Section 2.5.4.1.2.1.1 (pg 2.5-190) and supplemental materials (Supplement dated 12 September 2008, Attachment 2, pg 4, Karst Discussion) describe local fracture systems observed in outcrops of the Avon Park Formation along the Waccasassa River and in the Gulf Hammock Quarry, which apparently parallel the regional fracture trends defined by Vernon (1951). The Waccasassa River outcrop is located 25 km (15.7mi) north-west of the LNP site, and the Gulf Hammock Quarry outcrop occurs 19 km (11.8mi) north-northwest of the site, so both outcrops lie within the site vicinity (FSAR Section 2.5.4.1.2.1.1, pg 2.5-190).

As shown in FSAR Figure 2.5.4.1-202 in the supplemental materials dated 12 September 2008 (Attachment 2), fracture spacing of these local fractures in both outcrops is 5.8m (19 ft) for the primary fractures trending N39W and 7.7m (23.5ft) for orthogonal fractures striking N51E. FSAR Section 2.5.4.1.2.1.3 (pg 2.5-191), supplemental materials (12 September 2008 Supplement, Attachment 2, pg 18, Site Uniformity Discussion), and RAI Response 2.5.4-2 address the assumptions made regarding the occurrence of large voids at depth directly beneath the RCC bridging mat to enable the 3D FEM analysis. However, it is not clear whether these assumptions properly incorporate pertinent information on the observed local fracture systems into the 3D FEM analysis, including the potential for enhanced dissolution at intersections of fractures with bedding planes. In addition, it is not clear whether field observations at the two outcrops in the site vicinity may have revealed more closely-spaced fracture systems that should be included in the 3D model, and whether the fractures observed in the two outcrops are expected to be characteristic of the anticipated fracture sets at the site location so that the 3D model is appropriate for the site location.

In order for the staff to thoroughly assess the input data for and results of the 3D FEM analysis, please explain how information related to the observed local fracture systems was incorporated into this analysis for the Levy LNP1 and LNP2 sites, including possible interactions between fractures and intersecting bedding planes which may have a strong influence on development of dissolution voids at depth. To ensure that the 3D FEM model is appropriate for the site location, please clarify whether more closely-spaced fractures also occur in the two outcrops and whether the fractures observed in the two outcrops are thought to be characteristic of fracture sets at the site location. Please explain how the design analyses account for settlement due to movement permitted by joint sets and bedding planes.

PGN RAI ID #: L-0291

PGN Response to NRC RAI:

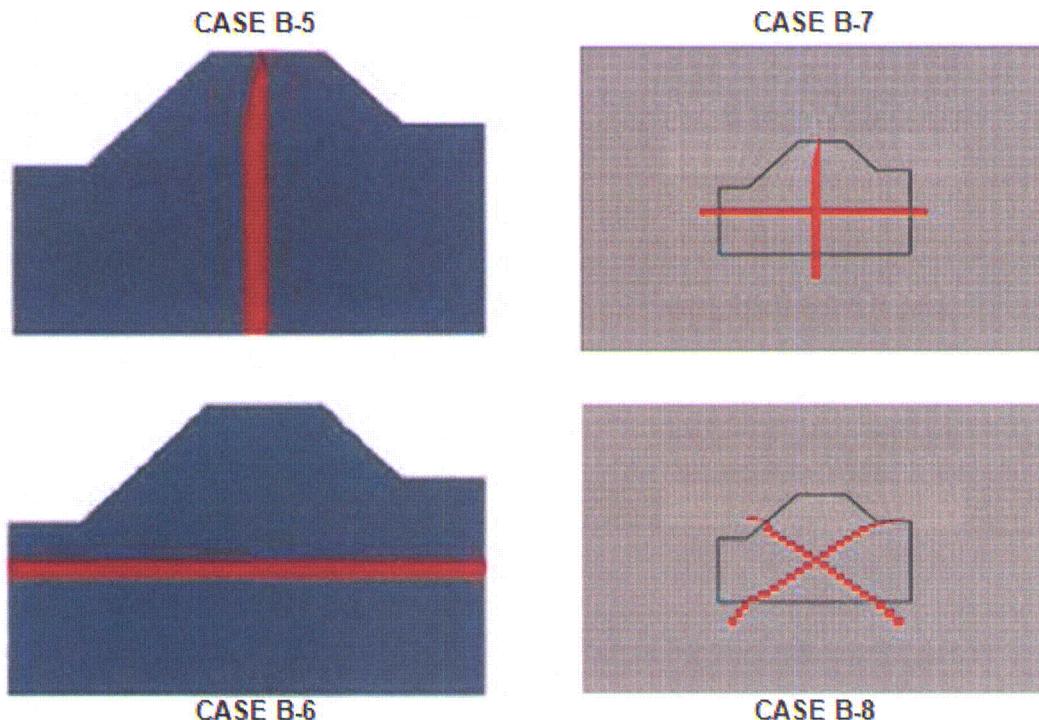
As described in the Supplement and in the response to RAI 02.05.01-2, local fractures were observed at Avon Park Formation outcrops at the Waccasassa River and Gulf Hammock Quarry. These fractures were interpreted from a foundation engineering perspective, and anecdotally considered during subsurface analysis. The primary fractures were observed to be trending approximately N39W with orthogonal fractures trending N51E. Fractures were observed in both locations at lesser spacing than the primary fractures, but without a discernable spacing. The intermittent subset of these primary fractures (which we term "secondary fractures") was observed to trend in approximately N-S and E-W directions. The response to RAI 02.05.01-5 discusses the potential for coalescing dissolution between fractures, and the impact of such on the determination of the design karst feature.

Preliminary data obtained from the Grout Test Program has indicated two findings: 1) the fracture orientation at the LNP site is consistent with the regional orientation identified by Vernon (1951) and described in the FSAR and subsequent RAI responses; and 2) observed fractures in the LNP subsurface are noted as being less than 0.1 feet in width.

The observed local fracture systems were analyzed in the finite element model through sensitivity analyses that considered the presence of these fractures. These fractures were modeled as 10-feet wide voids present beneath the entire nuclear island, as such:

- Case B-5 - 10-feet wide void at approximate trend of N39W
- Case B-6 - 10-feet wide void at approximate trend of N51E
- Case B-7 - 10-feet wide voids in both approximate trends of N39W and N51E
- Case B-8 - 10-feet wide voids in both approximate trends of N-S and E-W

These cases are illustrated below on Figure RAI 02.05.04-23-1:



**FIGURE RAI 02.05.04-23-1
LOCAL FRACTURE SYSTEMS MODELED IN FEM**

By modeling these fractures as 10 feet wide, the analyses account for fractures that are two orders of magnitude larger than those encountered during the Grout Test Program. These fractures were also conservatively modeled immediately beneath the RCC bridging mat. Also, by placing these fractures in the center of the nuclear island, larger stresses on the RCC bridging mat are induced. The combination of these assumptions represent that up to one hundred fractures of 0.1-foot width, in each direction, are modeled together in the center of the footprint, immediately beneath the RCC bridging mat.

The maximum tensile stresses induced in the four cases (B-5 through B-8) are 102 psi, 94 psi, 112 psi, and 126 psi, respectively. The maximum elastic settlement was determined to be 0.27 inches, with differential settlement of 0.17 inches. These results are considerably less than the ultimate tensile capacity of the RCC bridging mat, and considerably less than the allowable settlement identified in the AP1000 DCD Rev. 17.

Settlement due to bedding planes is discussed in the response to RAI 02.05.04-8 (laterally continuous soft zones) and RAI 02.05.04-11 (laterally discontinuous soft zones).

References:

Vernon, R.O., "Geology of Citrus and Levy Counties, Florida," Florida Geological Society Bulletin No. 33, 1951

Associated LNP COL Application Revisions:

No COLA revisions have been identified associated with this response.

Attachments/Enclosures:

None