

United States Nuclear Regulatory Commission Official Hearing Exhibit	
In the Matter of:	(Levy County Nuclear Power Plant, Units 1 and 2)
Progress Energy Florida, Inc.	
ASLBP #: 09-879-04-COL-BD01	Identified: 10/31/2012
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Rejected:	
Other:	
	

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Alternatively, parts of the Silver Bluff terrace may have been reoccupied during a subsequent sea-level highstand during MIS 5a (approximately 80 ka), when sea level may have been close to present levels. Uranium series ages of approximately 80,000 years for corals from the tectonically stable Atlantic Coastal Plain suggest that sea level at that time was near present, whereas the oxygen isotope record suggests that sea level was then well below present ([Reference 2.5.1-237](#)). The elevation of the MIS 5a shoreline in Florida is not well constrained at this time.

The Levy County map shows the LNP site to be located at the inner edge of the Pamlico terrace below the Penholoway terrace ([Figure 2.5.1-235](#)); however, the general elevation of the LNP site (12 to 13.4 m [40 to 44 ft.] NAVD88) suggests that the site is located on the outer edge of the Penholoway terrace or possibly on an unmapped remnant of the Talbot terrace. The elevation of the unconformity between the thin mantle of Quaternary sediments and Eocene limestone at the site (approximately 11 ± 1 m [36 ± 3 ft.]) indicates that the site is well above the expected elevation of the Pamlico wave cut terrace platform (approximately 6 m [20 ft.] amsl), and therefore is on a terrace surface older than MIS 5e (approximately 120 - 125 ka). As noted previously, dating of marine terraces in southern Florida indicates that the MIS 7 (220 - 230 ka) and MIS 9 (300 - 340 ka) shorelines may have been close to present ([Reference 2.5.1-237](#)) indicating that it is not likely the terrace surface at the site was formed during either of those sea level highstands.

The marine terrace that underlies the LNP site may correlate to MIS 11 (approximately 400-440 ka), which is recognized as one of the longer and warmer interglacials of the past 1 Ma ([Reference 2.5.1-357](#)). Recent and ongoing research regarding MIS 11 suggests that the paleosea level during this highstand may have been higher than during the MIS 5e (approximately 120-125 ka) highstand. Data that constrain the paleosea level during MIS 11 are available from studies in Bermuda and South Africa, both stable intraplate like Florida where marine terrace shorelines are expected to reflect glacio-eustatic sea levels ([Reference 2.5.1-357](#), [Reference 2.5.1-358](#)). These studies suggest that sea level during MIS 11 was approximately +20 m (66 ft.) and +15 m (49 ft.), respectively, as recorded in Bermuda and South Africa. The marine terrace platform at the LNP site lies at a similar or slightly lower elevation. A correlation to the MIS 11 highstand cannot be precluded at this time, but additional work is needed to confirm the preliminary age estimates and paleosea level elevation of this highstand in South Africa and in other regions.

Based on these observations, the marine terrace underlying the LNP site is estimated to be Middle Pleistocene (approximately 400-440 ka) or older (early Pleistocene to possibly late Pliocene) in age.

2.5.1.2.1.3 Karst Terrain

Karst terrain refers to a topographic configuration of subsidence features and drainage arising mainly from dissolution of limestone and other soluble rocks.

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(Reference 2.5.1-315) The Florida karst displays a gently rolling topography with shallow, broad depressions. (Reference 2.5.1-316)

The LNP site, located within the Gulf Coastal Lowlands geomorphic province, is characterized by both depositional and erosional features. Broad plains underlain by a series of late Tertiary and Quaternary surfaces and shorelines are pitted with karstic depressions within the limestone and dolostone at or near the present land surface in the site area. The Gulf Coastal Lowlands represent a typical mature karst terrain overlain by a thin mantle of permeable terrace deposits (i.e., a mantled epikarstic subsurface as described below in FSAR Subsection 2.5.1.2.1.3.1). (Reference 2.5.1-316) It is important to note that dolomite/dolostone is less soluble than calcite/limestone. The LNP site is underlain by dolomitized limestones and dolostones. See the discussion of site geology (FSAR Subsection 2.5.1.2.3).

Karst topography created by dissolution processes influences local coastal morphology, sedimentation, and resulting stratigraphy. Two basic karst processes operating in the Big Bend coastal area that have produced three easily recognizable horizontal scales of surficial topography are: (1) surface dissolution due to downwelling of acid pore waters from overlying marsh sediments; and (2) regional dissolution, primarily subterranean dissolution, and subsequent collapse due to mixing-zone undersaturation. The smallest scale (centimeters to a few meters) is less important than the medium (tens to hundreds of meters) and large-scale (kilometers) karst-induced coastal features. Medium-scale features are rectilinear tidal creeks occupying enlarged joint patterns as well as rock-cored hammocks forming marsh islands. Large-scale features are broad shallow depressions in the bedrock forming shelf embayments, elevated rocky areas between embayments forming marsh-island archipelagoes, and linear channel structures etched in the bedrock by laterally moving spring-discharge events (Figure 2.5.1-236). (Reference 2.5.1-213) The morphology of the modern coastline is a likely analog for the types of features that would have been present along the older, higher paleoshorelines in the LNP site area.

Based on a regional classification of karst potential throughout the State of Florida, Sinclair and Stewart (Reference 2.5.1-317) show the LNP site to be located in a region where the limestone is bare or thinly covered and sinkholes are few, generally shallow and broad and developed gradually (Figure 2.5.1-237). Site characterization activities were conducted to evaluate the development of karst at the site (see FSAR Subsection 2.5.1.2.5.3) and potential for surface deformation related to karst (see FSAR Subsection 2.5.3.8). The following sections provide an overview of karst evolution and description of karst features that are observed in the site region.

2.5.1.2.1.3.1 Conceptual Model of Karst and Epikarst Evolution

Schematic cross sections showing development of karst features beneath a marshy coastline like that in the site area are shown on Figure 2.5.1-238. In a marsh archipelago, numerous marsh islands form on a flooded, elevated,