FPL

L-2015-047
10 CFR 52.3

February 19, 2015

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

Re: Florida Power & Light Company
Proposed Turkey Point Units 6 and 7
Docket Nos. 52-040 and 52-041
FSAR Subsection 2.5.4 Grout Test Program Description

References:

1. FPL Letter L-2014-316 to NRC dated October 29, 2014, Combined License Application Submittal 13 Submittal of the Annual Update of the COL Application - Revision 6 and the Semi-Annual Update of the Departures Report
2. FPL Letter L-2015-008 to NRC dated January 15, 2015, Revised Schedule for Chapter 3 RAI Updated Responses

In Reference 1, FPL provided the annual COL Application (COLA) update which included the revisions to FSAR Section 2.5 as a result of revised requests for additional information (RAI) responses. As a result of subsequent discussions with the NRC staff, FPL committed to provide additional details on the grouting program and the grout test program in Reference 2. The attachment provides the additional details on the grouting program and the grout test program along with the associated COLA revisions. These activities will be implemented under the proposed PTN 6 & 7 Quality Assurance Program.

If you have any questions, or need additional information, please contact me at 561-691-7490.

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

Executed on February 19, 2015.

Sincerely,

William Maher
Senior Licensing Director – New Nuclear Projects

WDM/RFB

D097
NRO

Attachment: FSAR Subsection 2.5.4 Grout Test Program Description

cc:
PTN 6 & 7 Project Manager, AP1000 Projects Branch 1, USNRC DNRL/NRO
Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant 3 & 4

BACKGROUND:

FPL submitted to the NRC FPL letter L-2014-316, "Combined License Application Submittal 13 Submittal of the Annual Update of the COL Application - Revision 6 and the Semi-Annual Update of the Departures Report," dated October 29, 2014. In clarification calls, the NRC Staff requested further information be provided in FSAR Subsection 2.5.4.6.2 regarding the grout plug testing that FPL intended to perform. The information provided below provides additional detail on the grouting and the grout test program that FPL will perform to assure that the grout plug would perform as expected and not impact any geotechnical properties.

DISCUSSION:

Non-safety related grouting will be performed at the site for construction-related groundwater control. A grout plug is proposed between the bottom of the excavation for the Nuclear Island (approximately elevation [El.] -35 feet North American Vertical Datum of 1988 [NAVD 88]) and the bottom of the diaphragm wall (approximately El. -60 feet NAVD 88). The purpose of the proposed grout plug is to provide a zone of low residual (post-grouting) hydraulic conductivity at the base of the excavation. The grouted zone will serve to limit inflows into the excavation and significantly reduce the level of effort required to dewater the excavation during construction. Due to the high groundwater table and the high hydraulic conductivity of the Key Largo Limestone and Fort Thompson formations at the Turkey Point Units 6 & 7 Site, very high seepage infiltration rates are expected through the rock mass, if grouting is not performed.

As discussed in FSAR Subsection 2.5.4.6.2, grouting will be performed within the excavation area for the Nuclear Island. The anticipated grouting layout is shown in FSAR Figure 2CC-239. In general, grouting will be performed in a series of split spaced borings starting with primary order holes, and continuing through secondary order holes at a minimum. In the primary holes, individual grout stages will be grouted to a closure criteria determined from the results of water pressure tests, evaluation of available boring data, and the target residual permeability of the grouted zone. Upon completion of the grout stages in the primary borings, secondary borings will be drilled and grouted to the same closure criteria. Tertiary and quaternary grout holes will be drilled as indicated by the results of the grouting of lower order borings. For example, if the grout take in an area decreased significantly from the primary to secondary order holes, tertiary borings may not be necessary. However, if grout takes in stages in secondary holes are significant, tertiary borings will be assigned to further treat the area. In general, higher order borings will be assigned until the grout takes in the highest order borings drilled and grouted are acceptably low. When the grout takes have been reduced, the residual hydraulic conductivity of the grout mass will be determined via water pressure tests performed in cored holes in the area. An area of the grouted zone will be accepted as complete when the results of verification borings indicate that the residual hydraulic conductivity of the rock

mass is equal to or below the target residual hydraulic conductivity. Permeation Grouting is a ground improvement technique that has also been proposed to reduce the level of effort for dewatering at the Levy Nuclear Plant in Levy County, Florida. The rock formation in the target grout zone for the Levy site is the Avon Park Limestone Formation (El. -24 to -99 feet NAVD 88). A question raised for both sites is whether grouting has an impact on the engineering properties of rock, especially on shear wave velocity, which is input to seismic analyses. The grouting zones at each site are limestone formations, with similar intact rock properties. However, the formations have differing rock mass characteristics, particularly voids and fracture patterns. A grout test program was performed at Levy Nuclear Plant that provided valuable dewatering recommendations as well as demonstrating that grout injection into the native rock mass did not result in changes to the overall shear wave velocity of the mass. A grout test program will be performed at the Turkey Point Units 6 & 7 site similar to the grout test program that was performed for Levy Nuclear Plant.

Grouting will be performed to facilitate construction in the dry and is not classified as safety-related. Mix design, material control, laboratory testing, grout placement, and field testing will be performed under a quality program.

The purpose of the grout test program will be to validate the grout design and grouting techniques, and to determine the approximate grout takes for the Key Largo Limestone and Fort Thompson formations. In addition, the impact of grout on the stiffness of the subsurface will be evaluated by comparing the shear wave velocity obtained in a verification boring both before and after grouting.

The location of the grout test program will not be within the footprint of a safety related structure. Although the location is not finalized yet, it is anticipated that the grout test program will be performed in a limited area within the footprint of the Turbine building, outside the First Bay area. The grout test program will be performed prior to the Nuclear Island excavation.

The layout for the grout test program will be selected to resemble the planned construction grouting configuration. Hole spacing will be set with regard to the spacing of the dominant geologic features and the construction grouting configuration. Boring orientations and inclinations will be selected to promote intersections with the dominant fractures and bedding features in the area of the work. Since the fractures in the Key Largo Limestone and Fort Thompson formations range from vertical and subvertical to around 40 degree dip, it is anticipated that the inclination of the grout borings will be adjusted to best intercept the dominant features in the treatment area. It is anticipated that on the order of 10 primary holes will be drilled for the grout test program, with a spacing of approximately 20 feet. Verification borings will be drilled at various locations within the grouted area to measure residual hydraulic conductivity of the rock mass and to physically and visually assess the suitability of grouting parameters. Additionally, one verification boring in the center of the grouted area will be used for P-S suspension logging before and after grouting.

The grout test program will be used to optimize and finalize the grouting and dewatering specifications, including:

- Spacing for primary and secondary grout holes
- Layout of grout holes
- Suitability of the formation for grouting via downstages, upstages, a combination of up- and downstages, or other means such as Tube A Manchettes (TAMs)
- Inclination of grout holes (vertical or inclined)
- Effective grout mixes using locally available materials and water sources
- Drilling and flushing of grout holes

In order to meet these objectives, a field study will be performed with the following attributes:

- Drilling of primary and secondary grout holes, collecting rock mass data using a drilling parameter recorder
- Grout injection using computer controlled real time monitoring of grout injected volumes, injection pressures, injection flow rates, Apparent Lugeon values, grout mix changes and automatic recording of data
- Testing of different grout mixes and assessing their mobility, stability and durability
- Testing of different staging methods (uphole, downhole) to determine the suitability of each method
- Drilling and coring of verification borings for the performance of water pressure tests to measure the residual hydraulic conductivity of the rock mass and to physically and visually assess the suitability of grout hole spacing and inclination.

As mentioned above, the grout test program will also assess whether grouting has a significant impact on the subsurface shear wave velocity profile. As was performed for the Levy Nuclear Plant, the shear wave velocity profile in the center of the grout test area, both before and after the grout test program, will be obtained by P-S Suspension logging in a verification boring. The resultant shear wave velocity profile will be compared to the randomized profiles described in FSAR Subsection 2.5.2.5.2 to determine if additional analyses are required.

References:

FPL Letter L-2014-316 to NRC dated October 29, 2014, Combined License Application Submittal 13 Submittal of the Annual Update of the COL Application - Revision 6 and the Semi-Annual Update of the Departures Report

ASSOCIATED COLA REVISIONS:

The third paragraph of FSAR Subsection 2.5.4.6.2 will be revised in a future COLA revision as follows:

2.5.4.6.2 Construction Dewatering

~~An option for~~ **For** construction-related groundwater control, ~~is to form~~ a grout**ed zone or "**plug**" will be constructed via grout injections into the rock mass** between the bottom of the excavation at approximately El. -35 feet and the bottom of the diaphragm wall at approximately El. -60 feet. **In general, grouting will be performed in a series of split spaced borings starting with primary order holes, and continuing through secondary order holes at a minimum. In the primary holes, individual grout stages will be grouted to a closure criteria determined from the results of water pressure tests, evaluation of available boring data, and the target residual permeability of the grouted zone. Upon completion of the grout stages in the primary borings, secondary borings will be drilled and grouted to the same closure criteria. Tertiary and quaternary grout holes will be drilled as indicated by the results of the grouting of lower order borings.** ~~Grout is injected in a series of primary grout holes until minimal grout take is achieved. Secondary grout holes are then drilled between the primary grout holes and grout is injected until minimal grout take again occurs.~~ Tertiary grout holes are ~~probably~~ **likely to be required in some areas**~~required~~. Quarternary grout holes may be needed at some locations ~~but probably only where excessive seepage is observed as the excavation progresses.~~**where excessive grout take occurs in higher order borings but are anticipated to be minimal**. **Grouting parameters will be measured in real-time including injection pressures, rate of injection, apparent Lugeon value (hydraulic conductivity), and total volume of grout.** The groundwater model simulation (Appendix 2CC) assumes hydraulic conductivity of the grout plug is 1.0E-04 cm/sec. The corresponding predicted groundwater extraction rate is 96 gpm per unit. In addition to using this value of hydraulic conductivity, a series of sensitivity analyses using a range of hydraulic conductivities (1.0E-03, 1.0E-05 and 1.0E-06 cm/sec) is conducted to determine the feasible range of dewatering discharge rates, which range from approximately 1000 to 1 gpm per unit. These values demonstrate that grouting can significantly reduce the quantity of discharge water generated during excavation dewatering activities.

FSAR Subsection 2.5.4.6.2.1 will be added in a future COLA revision as follows:

2.5.4.6.2.1 Grout Test Program

A grout test program will be performed to validate the grout design and grouting techniques, and to determine the approximate grout takes for the Key Largo Limestone and Fort Thompson formations.

Grouting will be performed to facilitate construction in the dry and is not classified as safety-related. Mix design, material control, laboratory testing, grout placement, and field testing will be performed under a quality program.

The purpose of the grout test program will be to validate the grout design and grouting techniques, and to determine the approximate grout takes for the Key Largo Limestone and Fort Thompson formations. In addition, the impact of grout on the stiffness of the subsurface will be evaluated by comparing the shear wave velocity obtained in a verification boring both before and after grouting. The grout test program will be used to optimize and finalize the grouting and dewatering specifications, including:

- **Spacing for primary and secondary grout holes**
- **Layout of grout holes**
- **Suitability of the formation for grouting via downstages, upstages, a combination of up- and downstages, or other means such as Tube A Manchettes (TAMs)**
- **Inclination of grout holes (vertical or inclined)**
- **Effective grout mixes**
- **Drilling and flushing of grout holes**

In order to meet these objectives, a field study will be performed with the following attributes:

- **Drilling of primary and secondary grout holes, collecting rock mass data using a drilling parameter recorder;**
- **Grout injection using computer controlled real time monitoring of grout injected volumes, injection pressures, injection flow rates, Apparent Lugeon values, grout mix changes and automatic recording of data;**
- **Testing of different grout mixes and assessing their mobility, stability and durability;**
- **Testing of different staging methods (uphole, downhole) to determine the suitability of each method; and**
- **Drilling and coring of verification borings for the performance of water pressure tests to measure the residual permeability of the rock mass and to physically and visually assess the suitability of grout hole spacing and inclination.**

As mentioned above, the grout test program will also assess whether grouting has a significant impact on the subsurface shear wave velocity profile. The shear wave velocity profile in the center of the grout test area, both before and after the grout test program, will be obtained by P-S Suspension logging. The resultant shear wave velocity profile will be compared to the randomized profiles described in Subsection 2.5.2.5.2 to determine if additional analyses are required.

ASSOCIATED ENCLOSURES:

None