

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of

DUKE ENERGY FLORIDA, LLC

(Levy Nuclear Plant, Units 1 and 2)

Docket No. 52-029-COL

Docket No. 52-030-COL

ORDER

(Transmitting Pre-Hearing Questions)

On June 17, 2016, the Commission issued a notice that it would convene an evidentiary hearing at its Rockville, Maryland headquarters on July 28, 2016, pursuant to section 189a. of the Atomic Energy Act of 1954, as amended, to receive testimony and exhibits in the uncontested portion of the captioned proceeding.¹ In connection with that hearing, pursuant to my authority under 10 C.F.R. § 2.346(a) and (j), Duke Energy Florida, LLC and the NRC Staff should file written responses to the questions provided in the table below. Responses should be filed by **July 7, 2016**.

¹ See Duke Energy Florida, LLC, Levy Nuclear Plant, Units 1 and 2, Combined License Application; Notice of Hearing 81 Fed. Reg. 39, 720 (June 17, 2016).

No.	Category	Subject	Directed to	Question
1	Safety	SER § 2.4.6.4.3	Staff, Applicant	<p>In its analysis of Seismic Seiches, the Safety Evaluation Report (SER) at 2-165 states: “Parameters for the maximum submarine landslide were determined for each of the provinces, except for the Campeche Escarpments where we are awaiting additional data.”</p> <p>New escarpment studies have recently been released (e.g., Monterey Bay Aquarium Research Institute, 2013) that map the escarpment in considerably more detail than studies that are reflected in SER Section 2.4. Did the Staff consider the more recent studies and their possible effect on the conclusions in the SER? If so what were the results?</p> <p>December 2013, American Geophysical Union Fall Meeting Presentation, Poster P41F-1985. December 12, 2013. Multibeam mapping of the Cretaceous-Paleogene meteorite impact deposits on the Campeche Escarpment, Yucatán, Mexico. Roberto Gwiazda (presenter); Charles K. Paull; David W. Caress; Mario Rebolledo-Vieyra; Jaime U. Fucugauchi; Iza Canales; Esther J. Sumner; Xavier Tubau Carbonell; Eve M. Lundsten; Krystle Anderson. Online: http://www.mbari.org/mapping-the-demise-of-the-dinosaurs-2/</p>
2	Safety	SER § 2.5.3.4.8	Staff	<p>In SER § 2.5.3.4.8, the Staff states that it “finds that the applicant provided a thorough and accurate description of the potential for tectonic and non-tectonic surface deformation at the site in support of the LNP COL application.” This conclusion is based on the review of LNP FSAR Section 2.5.3.8 and other FSAR sections, “which document the lack of evidence for surface tectonic faulting and the possibility of non-tectonic surface deformation related to karst development at the site, as well as the examination by staff during the April and September 2009 site visits of core samples from the LNP site and examination of core logs, photographs, and descriptions in February 2010.” However, the Staff is requiring the applicant to perform a final check for</p>

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				<p>potentially detrimental tectonic and nontectonic geologic features in safety-related excavations at the LNP site through a geologic mapping license condition. Explain the need for this license condition and what would be the implications if potentially detrimental geologic features were found in the safety-related excavations.</p>
3	Safety	SER §§ 2.5.4.4.3.7; 3.8	Staff, Applicant	<p>Subsection 2.5.4.4.3.7, “Grouting of Karst Features,” of the SER articulates that the purpose of the grouting program is to create a semi-impermeable barrier to reduce ground water inflow into the excavation, thereby reducing dewatering requirements during construction. The program will grout the eroded vertical joint sets and bedding planes through primary, secondary and if necessary through tertiary grouting to achieve the desired seepage cutoff. As noted in the subsection, the Staff has accepted that that the foundation system is designed to accommodate isolated voids up to 10 ft. in size, which is at least double the conservatively estimated lateral dimension of any actual void intercepted. Finally, the Staff acknowledges that the grout program is not intended to strengthen the foundation, but only reduce inflow into the excavation during construction. Filling of all the voids is therefore not required for stability. However, the Staff concludes, the proposed grouting in combination with the diaphragm wall, and the 35-foot Roller Compacted Concrete (RCC) bridging mat will improve the nuclear island basemat/foundation conditions.</p> <p>What inspections, tests, and acceptance criteria will the applicant use to demonstrate that:</p> <ol style="list-style-type: none"> 1. the grouted rock will perform its intended function over the life of the plant; and

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				<p>2. potential sinkholes in the rock will be filled with grout to minimize the inflow of water over the life of the plant?</p> <p>If none, why are they not necessary?</p>
4	Safety	FSAR § 16.3	Staff, Applicant	<p>The uniqueness of the RCC bridging mat and grouted subgrade below the nuclear island has prompted the applicant (as presented in a slide to the Advisory Committee on Reactor Safeguards Subcommittee meeting of October 18, 2011) to consider a long-term monitoring program of the foundation system. Given the importance of the RCC bridging mat, as a Category I Structure, should the plant technical specifications include a condition/performance monitoring program with applicable surveillance and limiting condition for operation requirements?</p>
5	Safety	FSAR ch. 17	Applicant	<p>Alkali-carbonate reaction is observed in certain Dolomitic rocks. Dolomitic limestone may include up to 50% dolomite. As noted during the supplemental borings, the collected specimens indicated that the noted voids were filled with fragmented rock. Since grouting is expected to reduce the porosity and voids of the underlying rock, it is possible that during the process, the Calcium Hydroxide (Ca(OH)₂) or Portlandite of the grout cement may react with the fragmented Dolomite (CaMg(CO₃)₂). The reaction (dedolomitization) and subsequent potential recrystallization to Brucite (Mg(OH)₂) may cause considerable expansion.</p> <p>Has the applicant looked at the potential for alkali-carbonate reaction? If so, has the applicant performed any petrographic examination of the recovered</p>

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				<p>subsurface rock (especially those containing dolomite) to examine whether the findings would be a cause for concern during the grouting process?</p>
6	Safety	FSAR § 2.5-17; SER § 3.8.5.4	Staff, Applicant	<p>The applicant plans to use a sheet-type waterproofing system for the below grade exterior walls exposed to flood and groundwater under seismic Category I structures. Section 3.4.1.1.1 of the AP1000 design control document (DCD) states:</p> <p style="padding-left: 40px;">The COL applicant will use a waterproofing system for foundation mat (mudmat) and the below grade exterior walls exposed to flood and groundwater that will demonstrate a friction coefficient ≥ 0.55 with all horizontal concrete surfaces. This friction coefficient is maintained for the life expectancy of the plant and will not introduce a horizontal slip plane increasing the potential for movement during an earthquake. . . . The waterproof function of the membrane is not safety-related; however, the membrane between the mudmats must provide adequate shear strength to transfer horizontal shear forces due to seismic (SSE) loading. This function is seismic Category I.</p> <p>Section 3.8.5.4, "Technical Evaluation," of the SER states:</p> <p style="padding-left: 40px;">In a letter dated September 23, 2010, the LNP applicant proposed identifying, as LNP COL 2.5-17, the information in Section 3.8.5.1 addressing the type of waterproofing</p>

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				<p>system to be used for the below grade exterior walls exposed to flood, and groundwater under seismic Category I structures. The applicant provided a waterproofing material to be used for the below grade, exterior walls exposed to flood and groundwater under seismic Category I structures. The applicant stated that a sheet type waterproofing membrane will be used for both the horizontal and vertical surfaces under Seismic Category I structures. The performance requirements to be met by the COL applicant for the waterproofing material are described in Section 3.4.1.1.1.1 of the AP1000 DCD. Thus, the NRC Staff considers LNP COL 2.5-17 to be resolved.</p> <p>The applicant has selected a waterproofing membrane to support the functions of the nuclear island during the life of the plant. The applicant defined the waterproof function of the membrane to be nonsafety related. Its sliding, however, was defined as safety related. Its failure to function as a watertight barrier could impact the performance of the nuclear island basemat.</p> <ol style="list-style-type: none"> 1. For the applicant: Explain how the consequences of potential damage, anticipated aging, and creep were factored in when selecting and qualifying the membrane as a watertight barrier. For the Staff: how were these effects evaluated in the Staff's review? 2. Is Table 3.8-3, "Waterproof Membrane, ITAAC," sufficient to demonstrate that its safety and non-

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				<p>safety functions will be maintained for the life of the plant? Is a license condition appropriate to ensure these functions?</p>
7	Safety	SER § 3.2	Staff, Applicant	<p>Given that the grouting program will diminish but not eliminate ground water infiltration, proper compaction of the Roller Compacted Concrete (RCC) bridging mat layers during construction is of utmost importance.</p> <p>The LNP will use unreinforced RCC placed in layers as a bridging mat over karst. Karst geological features include limestone and dolomite rocks that would still be exposed to the existing ground water. Additional rainwater seeping into nearby surface joints and could adversely affect unmitigated underlying carbonate rocks. This could lead over the life of the plant to additional geologic discontinuities (e.g., caverns, sinkholes) and less than desirable future substrate environments that could affect the performance of RCC bridging mat. The importance of proper and adequate compaction is captured in American Concrete Institute standard ACI 309.5R-00, which states:</p> <p style="padding-left: 40px;">As the water content increases from the optimum level, the workability increases until the mixture will no longer support the mass of a vibrating roller. As the water content decreases from the optimum level, sufficient paste is no longer available to fill voids and lubricate the particles, and compacted density is reduced.</p> <p>How will the applicant control the consistency of the <i>in situ</i> compaction of individual lifts of the RCC bridging</p>

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				mat to be optimal, so that potential seepage paths and poorly bonded lifts are eliminated?
8	Safety	FSAR § 3.7.1.4	Staff, Applicant	<p>The applicant states that lateral stiffness of the drilled shaft is governed by the soil properties in the top 10 to 16 feet. However, Figure 3.7-226 of the FSAR shows that some of the drilled shafts are located almost adjacent to the nuclear island diaphragm wall (minimum distance of 1 foot).</p> <p>Both the applicant and the Staff considered the implications of lateral movements and interactions between the nuclear island structures, the adjacent structures, and their foundations, concluding that the provided seismic gap is adequate to minimize any potential interactions between buildings. In addition, the applicant states in the FSAR that the top of the diaphragm wall and the controlled low strength material fill between the diaphragm wall and the NI wall are below the individual building mat foundations and therefore there are no concerns of damage or interaction. There is no discussion, however, as to the effects of lateral movement of the annex, turbine, and radwaste building mats or drilled shafts on the engineered fill. Proper compactness of the engineered fill at all times ensures its design strength, compressibility, and permeability will be maintained ensuring compliance for its intended function.</p> <p>1. Were the effects of lateral loads from drilled shafts on the engineered fill, if any, considered in the applicant's evaluation or the Staff's review?</p>

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				2. Following a seismic event, what measures, if any, will be taken or required to ensure continued compliance of engineered fill to specifications?
9	Safety	SER § 3.8; FSAR § 2.5.4.10.3.5	Applicant	<p>LNP COL 2.5-13 states:</p> <p>Settlement bench marks will be installed within the subgrade mudmat . . . and monitored before and periodically during construction of the nuclear island basemat and sidewalls prior to placement of backfill materials. Additional bench marks will be installed approximately 1 m (3 ft.) above site grade . . . and connected to the sidewalls of the nuclear island, directly above the deeper benchmark locations described previously. These bench marks will be monitored during backfilling operations and, periodically, during and after construction of the nuclear island structures.</p> <p>Since the RCC is classified as a seismic Category I, safety-related structure, how would the applicant monitor RCC bridging mat deformations beyond those induced from settlements (e.g., material reactivity based, DEF, etc.)?</p>
10	Safety	SER Table 3.8-2; FSAR § 3.8.5.9.	Staff, Applicant	A proposed ITAAC in Table 3.8-2 states that, “during construction, inspection of the physical properties of the rock socket for each drilled shaft will be performed in accordance with LNP Inspection of the as-built drilled shaft foundation physical arrangement will also be performed.” The acceptance criterion for the ITAAC is that a “report exists that reconciles the during

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				<p>construction physical properties of the rock socket for each drilled shaft and the as-built physical arrangement of the Turbine, Radwaste, and Annex Buildings' drilled shaft foundations with design specifications and drawings. The report concludes that the as-built drilled shaft foundation conforms to the design commitment." It is not clear how the applicant will confirm load carrying capacity of the drilled shafts. The karst rock may have voids below the rock socket for drilled shafts.</p> <p>The applicant provides explanation in the FSAR on how the design and installation of the drilled shafts would be implemented. The SER does not appear to address LNP SUP 3.8-2.</p> <ol style="list-style-type: none"> 1. Please further explain why the proposed construction methodology in LNP FSAR 3.8.5.9, "Drilled Shaft Foundations Design and Installation" is acceptable. 2. How would the performance of the shafts be verified?
11	Safety	SER § 3.9.2	Staff, Applicant	<p>Recent modifications to the reactor pressure vessel internals indicate the addition of a flow skirt to the vessel bottom head. In addition, neutron panels have also been added. Additions and vessel modifications invariably also involve added bolted or welded connections. A perennial problem in vessel internals has been irradiation-enhanced stress relaxation, creep, and swelling which could result in dimensional instabilities, loss of preload (i.e., loosening of bolts), fasteners, keyed and/or pinned connections resulting</p>

No.	Category	Subject	Directed to	Question
				<p>possibly in increased vibrations and further deterioration of the connections.</p> <p>How has the applicant demonstrated that the fasteners of the added flow skirt and neutron panels can be maintained through the expected life of the facility?</p>
12	Safety	SER § 8.2.4	Staff, Applicant	<p>As stated on page 8-19 of the SER, the Staff relied on the request for additional information (RAI) responses in letter dated March 21, 2014 (ADAMS accession No. ML14010A421) (Response to RAI 114), to conclude that the supplemental information provided by the applicant to address the open phase condition of the offsite electric power system, as described in Bulletin 2012-01, "Design Vulnerability in Electric Power System" (ML12074A115), is acceptable. The Staff stated that the Final Safety Analysis Report (FSAR) and the ITAAC supplemental texts included in the SER are those provided in the RAI responses. However, the ITAAC texts in the SER (page 8-24) differ from the ITAAC texts in the RAI responses (Response to RAI 114, at 16).</p> <p>Explain how the ITAAC texts changed from the version contained in the RAI responses to the version in the SER.</p>
13	Safety	SER § 8.2.4; FSAR § 8.2.1.2.2, LNP SUP 8.2-5	Staff, Applicant	<p>Page 8-19 of the SER sets forth the Staff's position for an acceptable approach for passive designs to address the open phase condition, which includes four elements. The first element is a dedicated <u>automatic detection</u> of one and two open phase conditions of the offsite power system with and without a high impedance ground fault condition on the high voltage (HV) side of the main</p>

No.	Category	Subject	Directed to	Question
				<p>power transformer under all loading and operating configurations.</p> <p>The supplemental text to the FSAR states: “The system <u>detects</u> an open phase condition (with or without a concurrent high impedance ground on the HV side of the transformer) on one or more phases under all transformer loading conditions.” The supplemental text for the ITAAC in the SER states: “The credited GDC [General Design Criterion] 17 offsite power source is monitored by an open phase condition monitoring system that <u>can detect</u> the following at the HV terminals of the transformer connecting to the offsite source, over the full range of transformer loading from no load to full load: (1) loss of one of the three phases of the offsite power source (with or without a high impedance ground fault condition), or (2) loss of two of the three phases of the offsite power source (with or without a high impedance ground fault condition).”</p> <p>Confirm that the open phase monitoring system will <u>automatically detect</u> one or two open phase conditions (with or without a high impedance ground fault condition) at the HV side of the main power transformer under all electrical system configurations and loading conditions.</p>
14	Safety	SER § 8.2.4; FSAR § 8.2.1.2.2, LNP SUP 8.2-5	Staff, Applicant	<p>The second element of the Staff’s position is an alarm in the control room, which activates upon detection of an open-phase condition, <u>for operators to take manual actions if the standby diesel generators are not automatically connected to the auxiliary alternating current buses</u> (ES-1 and ES-2).</p>

No.	Category	Subject	Directed to	Question
				<p>The supplemental text to the FSAR states: “The open phase condition monitoring system provides an alarm to the operators in the control room should an open phase condition occur on <u>the high voltage source to the main step-up transformers</u>. [...] Operator actions and maintenance and testing activities are addressed in procedures [...] Plant operating procedures, including off-normal operating procedures associated with the monitoring system will be developed prior to fuel load.”</p> <ol style="list-style-type: none"> 1. Confirm that the plant procedures will specify operator actions for connecting the standby diesel generators to the ES-1 and ES-2 buses if they are not automatically connected. 2. Explain why the applicant was not required to include in the FSAR that operators will take manual actions if the standby diesel generators are not automatically connected to the ES-1 and ES-2 buses. <p>Clarify what the “high voltage source to the main step up transformers” is.</p>
15	Safety	SER § 13.3B.4; COLA Emergency Plan	Staff, Applicant	<p>10 C.F.R. Part 50, Appendix E, § I.3, footnote 1 requires a plume exposure pathway emergency planning zone (EPZ) that consists of an area about 10 miles in radius. The regulation also provides that the actual size and shape of the EPZ will vary depending on demography, topography, land characteristics, access routes, and jurisdictional boundaries. Figure Intro-3 of the emergency plan shows the Levy Nuclear Plant (LNP) EPZ to be consistent with these requirements, with the apparent exception of an area on the southeast side of the EPZ within Citrus Springs. The defined EPZ boundary has about a 1.5- to 2-mile reduction in the EPZ periphery in this area. A review using a satellite</p>

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				<p>view in Google Maps and StreetView shows that this excluded area contains residences.</p> <ol style="list-style-type: none"> 1. How many people reside in this excluded area? 2. Why was the current boundary selected, given the existence of roads not far outside of the 10-mile radius that could have been used as a boundary for this area? <p>Additional reference: 44 Fed. Reg. 61,123 (Oct. 23, 1979).</p>
16	Safety	SER § 13.4; FSAR Table 13.4-201; Tech Spec 16.1	Staff, Applicant	<p>LNP Technical Specification 16.1 for the Containment Leakage Rate Testing Program states:</p> <p>A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, <i>as modified by approved exemptions</i>. This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program, dated September 1995," <i>as modified by approved exceptions</i>.</p> <p>Does the applicant intend to exempt certain containment pressure boundary components from leak rate testing? If so, which components?</p>
17	Safety	COLA Emergency Plan § B.5.1 (SER § 13.3C.2.5)	Staff, Applicant	<p>Section B.5.1 of the LNP emergency plan states that there is a technical support center (TSC) and operational support center (OSC) for each unit. It also specifies that in the event of a site-wide emergency (e.g., security event or natural phenomenon) Unit 1 will take the lead and that only the TSC and OSC of the lead unit will be activated.</p>

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				<ol style="list-style-type: none"> 1. Would the lead stay with Unit 1 if the event resulted in a substantial challenge to the fission product barriers at Unit 2? 2. Would the onsite response continue to be implemented from one of the TSCs/OSCs or would both TSCs and OSCs be staffed and activated to respond to the event in the respective units?
18	Safety	SER § 13.3C.7.5 SER § 13.3C.8.22 SER § 13.3C.8.26	Staff, Applicant	<p>In its discussion of the emergency news center (ENC), in SER § 13.3C.7.5 and the emergency operations facility (EOF) in SER § 13.3C.8.22 and SER § 13.3C.8.26, the Staff determined that the Crystal River-3 (Crystal River) ENC and EOF for LNP were acceptable because:</p> <ul style="list-style-type: none"> • The NRC performs oversight of emergency preparedness, including the ENC and EOF, by monitoring performance indicators; • The ENC and EOF are inspected periodically during routine inspections, drills, and exercises; and • Any changes to the ENC and EOF are reviewed in accordance with the established inspection program and requirements for operating reactors. <p>Given recent activities, including the Commission’s issuance of exemptions that, in addition to other relaxations, remove the requirement for the identification of a physical location for dissemination of information from the Crystal River licensing bases, the facts underlying the Staff’s assessment may have changed. In addition, Crystal River has submitted a certification of permanent cessation of operations. Because of that certification, Crystal River was removed from the reactor oversight process, eliminating</p>

No.	Category	Subject	Directed to	Question
				<p>monitoring of performance indicators and shifting from IMC 2515, "Light-Water Reactor Inspection Program-Operations Phase," to IMC 2561, "Decommissioning Power Reactor Inspection Program." Emergency preparedness is not a core inspection module under IMC 2561. There will be no further inspections on the Crystal River ENC and EOF. Changes to the Crystal River ENC and EOF would no longer trigger the 10 C.F.R. § 50.54(q) change process.</p> <p>How, if at all, do these changes at CR-3 affect the Staff's acceptance of the Crystal River ENC and EOF for LNP as described in the SER?</p>
19	Safety	SER § 13.3C.8.4, § 13.3C.8.28, COLA Emergency Plan	Staff, Applicant	<p>Emergency Plan § H.4 (SER §§ 13.3C.8.4 (TSC), 13.3C.8.28 (EOF)) discusses activation and staffing of the emergency response facilities. This discussion establishes a "goal" of 60 minutes for the emergency response organizations (EROs) to achieve minimum staffing of the emergency operations facility (EOF) following the notification of an Alert (Site Area Emergency or general emergency). The discussion further states that applicable emergency response facilities will be operational within 15 minutes of achieving minimum staffing. The SER discussion states that the LNP plan is acceptable because it conforms to the guidance in NUREG-0654 and Supplement 1 to NUREG-0737.</p> <p>While compliance with the regulatory guidance is not required, please further explain the regulatory basis of the proposed alternatives for the following deviations from the following guidance:</p>

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				<ul style="list-style-type: none"> • NUREG-0737, Supplement 1, § 8.2.1.j states that the TSC will be “staffed by sufficient technical, engineering, and senior designated licensee officials to provide needed support and be <i>fully operational within approximately 1 hour.</i>” Specifically, how will the Staff enforce this criterion when it appears to be treated as a goal, rather than an explicit licensee commitment? • NUREG-0654 evaluation criterion B.5 states that “the licensee must be able to augment on-shift capabilities within a short period <i>after declaration</i> of an emergency.” Specifically, the applicant states that the clock start time is the notification of the ERO. • NUREG-0696 § 4.3 states, with regard to the EOF, “designated personnel shall report directly to the EOF <i>to achieve full functional operation within 1 hour.</i>” Specifically, the applicant states that the facility will be operational within 15 minutes of achieving minimum staffing.
20	Safety	COLA Emergency Plan § J.12	Applicant	<p>Emergency Plan § J.12 “Registering and Monitoring Evacuees,” states that LNP has the means for registering and monitoring all evacuees at relocation centers and that personnel and monitoring equipment will be made available to monitor all residents and transients. (This is not a responsibility assigned to the licensee; hence, it is not addressed in the SER.)</p> <ol style="list-style-type: none"> 1. This section appears to establish that the applicant has taken the responsibility for registering and monitoring evacuees. Is this correct?

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				<p>2. Neither these personnel nor the equipment to be used have been previously identified in the emergency plan. Where are these resources being obtained from? In what time frame would they become available?</p> <p>3. Has the Federal Emergency Management Agency reviewed these arrangements? If so, what was the result of its review?</p>
21	Safety	SER § 14.3 FSAR §§ 14.3-3; 2.5-17 SER/FSAR ch. 17	Staff, Applicant	<p>Section 3.8.5.4 of the SER outlines how the RCC lifts are to be bonded and the bonding to be verified through testing. The ITAAC, however, in “Design Commitment,” “Inspection, Test, and Analysis,” and Acceptance Criteria” as described in Table 3.8-1, “Roller Compacted Concrete ITAAC,” does not stipulate that the RCC Bridging Mat should be designed and perform for life as a monolithic section to avoid relative movements and sliding of individual lifts.</p> <p>How will cohesion between lifts be assured, so that there is reasonable assurance that the RCC will behave as a monolithic structure following a safe-shutdown earthquake? Has this been inadvertently omitted from Table 3.8-1 “Roller Compacted Concrete ITAAC”?</p>
22	Safety	SER § 21.0	Staff	<p>The introduction to SER Chapter 21 discusses the Staff’s evaluation of the applicant’s requested departures from the AP1000 certified design. The Staff states:</p> <p>The staff evaluated each of the departures for impact on the LNP plant-specific probabilistic risk assessment (PRA). None of them have any impact on the quantification of core damage frequency or large release frequency. Only one (the departure relating to the passive</p>

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				<p>core cooling system containment condensate return) resulted in a revision to any PRA-based insight.</p> <p>Please describe this revision to the PRA insight.</p>
23	Safety	SER § 21.0	Staff, Applicant	<p>Chapter 21.0 concludes with the statement, “The staff finds that the cumulative risk impact of these design changes and departures is acceptable.”</p> <p>For the Staff: Please describe further how the Staff assessed the cumulative risk impact of these design changes and departures from AP1000 Design Control Document Rev. 19?</p> <p>For the applicant: Has the applicant assessed the cumulative risk impact of the five design changes and departures listed in Chapter 21 of the SER as compared to AP1000 Design Control Document Rev. 19? If so, what were the results?</p>
24	Safety	SER § 21.1.3	Staff, Applicant	<p>The Staff states the guidance in Regulatory Guide (RG) 1.82, Rev. 3, dated November 2003 and NEI-04-07, Rev. 0 were used in conducting the review of STD-COL 6.3-1. Regulatory Guide 1.82, Rev. 4, dated March 2012 was issued prior to the 2014 applicant-proposed changes in DEP 6.3-1 and specifically incorporated developments and lessons learned in the implementation of NEI-04-07, Rev. 0.</p> <p>Please explain the rationale for using RG 1.82, Rev. 3 instead of Rev. 4 for this departure and exemption request. Did the applicant’s submission and Staff’s</p>

No.	Category	Subject	Directed to	Question
				review incorporate lessons learned from implementation of NEI-04-07?
25	Safety	SER § 21.1.4 FSAR § 6.3.2.2.7.2 [Please provide a publicly available response. If necessary to use proprietary information in the response, please provide an additional OOU response]	Staff, Applicant	As a part of LNP DEP 3.2-1 and LNP DEP 6.3-1, the applicant describes the addition of protective screens to the downspouts to protect the passive residual heat removal heat exchanger (PRHR HX) from debris. Has the applicant or the Staff investigated whether the screens could be subject to clogging phenomena similar to what is considered by Generic Safety Issue 191 (GSI-191)? Has the applicant performed any analysis to determine how long the PRHR HX can remain functional with degraded return flow to the in-containment refueling water storage tank (IRWST)?
26	Safety	SER § 21.1.4 [Please provide a publicly available response. If necessary to use proprietary information in the response, please provide an additional OOU response]	Staff, Applicant	<p>In RAI 7439, the Staff inquired about the applicant's use of extrapolated predictions of condensate return losses. SER § 21.1.4 states that "the NRC staff remains unconvinced as to the validity of the applicant's temperature scaling argument, especially given the relative variance in the test results," although the Staff went on to find that the treatment of condensate losses over the attachments to the containment shell was acceptable due to conservatism in the extrapolation.</p> <ol style="list-style-type: none"> 1. For the applicant, please discuss further the justification for using extrapolated predictions. 2. For the Staff, please explain the Staff's justification for the finding that "the treatment of film losses over attachments to the containment shell" is acceptable.
27	Safety	SER § 21.1.4.B.1; FSAR § 6.3	Staff, Applicant	As part of the exemption for DEP 3.2-1 related to the passive core cooling system (PXS) containment condensate return, Technical Specification (TS)

No.	Category	Subject	Directed to	Question
		FSAR Figure 6.3-201 (sheet 3 of 3)		<p>Surveillance Requirement 3.5.4.7 was added to require a visual inspection of the IRWST gutter and downspout screens to verify that the return flow to the IRWST will not be restricted by debris.</p> <p>The Staff's technical evaluation of the exemption request and departure states, "Condensate return is one of the primary factors influencing the performance of the PRHR HX." The Staff further explains that the PXS downspout piping network was added at the polar crane girder and stiffener with four specific collection points located on both the upper portion and the lower flange of the polar crane girder. While in use during refueling or forced outages the polar crane can be positioned at any point on the girder.</p> <p>Does the final polar crane bridge position on the girder (relative to the 8 downspout screens on the polar crane girder and internal stiffener) affect the rate of return of condensate from the polar crane bridge via the gutter system or is the rate of condensate return unaffected by polar crane bridge position?</p> <p>If the final polar crane bridge position on the girder affects the rate of return of condensate to the IRWST, please explain why a TS Surveillance Requirement for polar crane position is unnecessary to ensure that the quality of systems and components is maintained and the limiting conditions for operation will be met for the PXS.</p> <p>If the final polar crane bridge position on the girder affects the rate of return of condensate to the IRWST,</p>

No.	Category	Subject	Directed to	Question
				are restrictions on polar crane position relative to TS operational MODES required?
28	Safety	SER § 21.1.4.B.1.2.1 FSAR § 6.3 FSAR Figure 6.3-201 (sheet 3 of 3)	Staff, Applicant	<p>The Staff discusses the tube plugging assumption used for DBA analyses along with the analysis of the Loss of AC Power to Plant Auxiliaries (LOAC). The Staff notes that the analyses of the LOAC event demonstrate that the top horizontal portion of the PRHR heat exchanger becomes uncovered.</p> <p>Did the tube plugging assumptions conservatively assume that the plugged tubes were not within the top horizontal portion of the PRHR heat exchanger that becomes uncovered? If not, please explain why this additional conservatism was unnecessary.</p>
29	Safety	SER § 21.1.4.B.1.2.5 SER § 21.1.4.B.1.3 FSAR § 6.3.1.2	Staff, Applicant	<p>The design requirement of establishing an initial long term safe shutdown condition within 36 hours (i.e., reaching an average reactor coolant system (RCS) temperature less than 420°F in 36 hours) following an event with a safety grade decay heat removal system is established in the EPRI utility requirements document (URD) and SRM-SECY-94-084. SECY-94-084 states that after the passive residual heat removal system affects the initial shutdown condition, a non-safety-grade reactor shutdown cooling system will be available to bring the plant to cold shutdown conditions for inspection and repair.</p> <p>In SER § 21.1.4.B.1.2.5, "Safe Shutdown," the Staff discusses the safe shutdown criteria for reaching an average RCS temperature of less than 420°F in 36 hours. In SER § 21.1.4.B.1.3, "Non-Safety Design Basis," the Staff states that the PRHR heat exchanger</p>

No.	Category	Subject	Directed to	Question
				<p>long-term shutdown condition for 14 days in a closed loop mode of operation are non-safety related operational requirements.</p> <p>In FSAR § 6.3.1.2.1, “Nonsafety Design Basis-Post Accident Core Decay Heat Removal,” the applicant describes both establishment of the reactor coolant temperature of 420°F in 36 hours and a long-term shutdown condition of 14 days at 420°F as non-safety related. In an April 5, 2016, presentation (slide 15) to the Advisory Committee on Reactor Safeguards on the PXS condensate return, the applicant again stated that the PRHR establishment of the reactor coolant temperature of 420°F in 36 hours and a long-term shutdown condition of 14 days at 420°F are “nonsafety” design basis licensee performance goals.</p> <p>While not a Chapter 15 design basis accident safety requirement, the establishment of the reactor coolant temperature of 420°F in 36 hours appears to be a safe shutdown safety-related requirement from SER § 21.1.4.B.1.2.5, with criteria as discussed in SECY-94-084. Please explain the discrepancy between the Staff’s SER and applicant’s FSAR regarding whether the performance criteria for the initial establishment of the reactor coolant temperature of 420°F in 36 hours is a safe shutdown safety-related equipment performance requirement or a non-safety design basis requirement. Were the calculations and analyses performed by the applicant/vendor completed as part of a 10 C.F.R. Part 50, Appendix B program?</p>
30	Safety	SER § 21.2.4.B.1 (page 21-39)	Staff, Applicant	The main control room (MCR) radiation monitors are de-energized on either a High-2 radiation signal (MCR

No.	Category	Subject	Directed to	Question
				<p>emergency habitability system (VES) actuation) or a low battery charger input voltage for greater than 10 minutes. Therefore, following an actuation of the High-2 radiation signal, the MCR radiation monitors no longer function to provide operators in the control room with real-time radiation readings.</p> <p>Continuous MCR radiation measurements with automatic alarm setpoints available to operators during an accident ensure the control room provides a safe environment for operators under accident conditions and that operators know the MCR emergency habitability system (VES) filtration system is properly functioning following a valid actuation.</p> <p>Additionally, Emergency Action Level "AA3" for an ALERT due to abnormal radiation levels in the NRC endorsed NEI 07-01, Rev. 0, describes an example emergency action level threshold dose rate of greater than 15 mRem/hour in the AP1000 MCR. The emergency action level basis description states the value of 15 mRem/hour is derived from the General Design Criteria 19 value of 5 Rem in 30 days.</p> <p>Are continuous MCR radiation monitors needed to determine whether an Emergency Action Level is met in the AP1000 MCR under all conditions?</p> <p>Please explain why de-energization of the MCR radiation monitors following a High-2 radiation signal or a low battery charger input voltage for greater than 10 minutes is acceptable.</p>

No.	Category	Subject	Directed to	Question
31	Safety	SER § 21.3.4.B.4	Staff, Applicant	<p>Stage 1 load shed de-energizes large screen displays used for weather and the non-safety-related MCR area radiation monitor. The applicant and the Staff conclude that the stage 1 load shed does not affect operational decision making or plant control.</p> <p>Please explain further the effect, if any, that the stage 1 load shed has on operational decision making in the context of emergency plan implementation by operators with the loss of large screen displays for weather and the non-safety-related MCR area monitor.</p>
32	Safety	SER § 21.3.4.B.4	Staff, Applicant	<p>The Staff concludes that “there is reasonable assurance that Scenarios 4, 5, and 9 will not occur because of the low probability of concurrent independent failures,” recognizing many of the scenarios may be considered beyond design basis.</p> <p>Please provide additional information on the expected probability of occurrence of the scenarios presented in Table 21.3-1 and a further explanation of why there is reasonable assurance Scenarios 4, 5, and 9 will not occur.</p>
33	Environmental	General	Staff	<p>Discuss any issues of special interest that arose from the Staff’s review of LNP as a “greenfield” site.</p>
34	Environmental	General	Staff, Applicant	<p>For the Staff: How is the NRC Staff keeping track of and considering changes that have occurred since publication of the final environmental impact statement (FEIS) (April 2012) to determine whether to supplement the FEIS?</p> <ul style="list-style-type: none"> • Describe the process the Staff is using to monitor and evaluate changes that may occur during the time period between publication of the

No.	Category	Subject	Directed to	Question
				<p>FEIS and the Commission licensing decision, which has spanned several years.</p> <ul style="list-style-type: none"> Do any events—such as the Duke Energy-Progress merger, the overall delay in LNP's construction and commercial date of operation schedule, or the closure of Crystal River—present a seriously different picture of the environmental impact of the issuance of the COLs from what was previously envisioned? <p>For the applicant: How has the applicant kept track of changes that have occurred since publication of the FEIS and kept the Staff apprised of these changes?</p>
35	Environmental	General	Staff	<p>Did the Staff consider whether any new information would warrant supplementation under the discretionary standard set forth in 10 C.F.R. § 51.92(c)?</p>
36	Environmental	General	Staff	<p>One of the new pieces of information that the Staff considered in its Consideration of New Information Regarding the Crystal River Alternative Site (“New and Significant Review”) (ML16060A186) is that a new combined-cycle plant named Citrus County Combined-Cycle Project (CCCP) has been proposed and would be located adjacent to the Crystal River Energy Complex. The Staff states on page 3 of the New and Significant Review that the CCCP footprint appears to overlap with the footprint for the nuclear plant at the Crystal River alternative site. The Staff concludes, however, that “there appears to be ample land available to the applicant to adjust the placement of the nuclear units if the Crystal River alternative site were to be used.” Did the Staff consider what specific site reconfigurations would be necessary to accommodate both facilities?</p>

No.	Category	Subject	Directed to	Question
				Explain how the Staff evaluated whether such reconfigurations would alter or intensify impacts to cultural resources, sensitive habitats (such as wetlands), or other environmental resources.
37	Environmental	General	Staff	Duke Energy issued a revised wetland mitigation plan dated September 2015 (ML15294A201). In its consideration of new information regarding the revised wetland mitigation plan (ML15327A349), did the Staff coordinate with the U.S. Army Corps of Engineers (USACE) regarding whether information in the revised wetland mitigation plan would require supplementation of the FEIS? If not, why not? And if so, what were the results of that consultation?
38	Environmental	General	Staff	The revised wetland mitigation plan includes the clearing and excavation of 91 acres of upland habitat for the purposes of wetland creation. Because wetland creation was not an element of the original plan, explain how the Staff evaluated the potential impacts of this upland habitat loss on ecological resources and specifically on the Florida scrub-jay, an endangered species for which the U.S. Fish and Wildlife Service (FWS) issued a Biological Opinion (ML113530504) in December 2011.
39	Environmental	General	Staff	Considering that USACE is a cooperating agency on the environmental review, and that the Least Environmentally Damaging Practicable Alternative (LEDPA) review was ongoing at the time the Staff issued the FEIS, how was the NRC able to finalize the FEIS well before the outcome of the LEDPA determination?

No.	Category	Subject	Directed to	Question
				<ul style="list-style-type: none"> • Has the USACE completed its LEDPA? • If the LEDPA has been completed, did the NRC Staff evaluate the LEDPA to determine if it contained new and significant information that would require the Staff to supplement the FEIS? If the LEDPA review has been completed, did it result in any significant changes to the plant design?
40	Environmental	FEIS Ch. 1	Staff	What are “Conditions of Certification” and did the NRC consider them in its environmental review?
41	Environmental	FEIS Ch. 1	Staff	In Chapter 1, the FEIS states that the NRC contacted Tribal organizations. Explain how the NRC Staff engaged Tribal organizations.
42	Environmental	FEIS § 2.4.2.3	Staff	The FEIS at page 2-116 references NMFS’s current Biological Opinion for the Crystal River Energy Complex. However, the reference “NMFS 2002” is for an NRC letter forwarding the Biological Opinion and does not contain the Biological Opinion, itself. Please provide the appropriate citation to the opinion. How did the NRC Staff use this Biological Opinion during its assessment of impacts to federally listed species?
43	Environmental	FEIS § 2.4.2.3	Staff	The descriptions of the sea turtles at pages 2-117 and 2-118 include incidental take information for each species. Though the NRC receives real-time information and licensee event reports on each incidental take, the data cited is from NMFS technical memoranda that date back to 2005. Additionally, the numbers of incidental takes cited for loggerheads and Kemp’s ridley turtles appear to be incorrect. In addition,

No.	Category	Subject	Directed to	Question
				<p>the text says that the hawksbill turtle has never been reported at Crystal River; however, there was a hawksbill incidental take on 11/28/00 (see ML030070080, p. 4).</p> <p>Please reconcile the information in the FEIS with the NMFS technical memoranda and the Environmental Plan Protection Report referenced above. Please discuss whether the Staff has reviewed any updated information regarding incidental takes of sea turtles at Crystal River and whether that information would require updating the FEIS.</p>
44	Environmental	FEIS § 2.6	Staff	At the top of page 2-159, please describe the information that is captured in Tables B02001, B03003, and C17002.
45	Environmental	FEIS § 2.6.1	Staff	The FEIS states that, in determining whether each minority or low-income population should be considered a population of interest, the Environmental Justice analysis considers whether either 1) the demographic group exceeds 50 percent of the total population for the census block group, or 2) the demographic group is 20 percentage points (or more) greater than the same population's percentage in the census block group's state. Why is 20 percent (above the state average) the threshold criterion? Is this a widely used and accepted threshold criterion?
46	Environmental	FEIS § 4.3.2.3	Staff	Given that the Office of Nuclear Reactor Regulation (NRR) oversees the compliance and enforcement of NMFS's current Biological Opinion for Crystal River for sea turtles, explain any efforts that the Office of New Reactors (NRO) Staff took to coordinate with NRR Staff

No.	Category	Subject	Directed to	Question
				concerning up-to-date information on sea turtles and the assessment of potential impacts on sea turtles.
47	Environmental	FEIS § 4.3.2.3	Staff	In Section 4.4.3.3, Taxes, it is not clear why the impacts to Levy County are “MODERATE (beneficial).” It seems that the primary driver of the “moderate” impact determination could be the property taxes at the site; however, even after the agricultural tax exemptions expire upon the start of construction, those tax revenues remain a fraction (from \$11,000 before construction to \$77,000 during) of the County’s overall property tax income (\$18 million). The FEIS states that once the plant is reassessed after construction is complete, property taxes will increase a significant amount. It appears, however, that this tax income is considered in Chapter 5, Impacts of Operation. Why are taxes considered MODERATE (beneficial) as opposed to SMALL (beneficial) for the construction/pre-construction phase?
48	Environmental	FEIS § 4.4.4.3	Staff	In Section 4.4.4.3 (and also in Chapter 5) of the FEIS, there is a discussion about housing values in the vicinity of the LNP. The FEIS cites two studies: Bezdek and Wendling (2006) and Clark et al. (1997). Have there been more recent studies of housing values near nuclear power plants that are applicable to this review? If so, were these studies evaluated in the Staff’s consideration of new and significant information?
49	Environmental	FEIS §§ 5.3.1.4, 5.3.1.5	Staff	FEIS Sections 5.3.1.4, Terrestrial Monitoring, and 5.3.1.5, Potential Mitigation Measures for Terrestrial Impacts, do not discuss the Reasonable and Prudent Measures or Terms and Conditions contained in the FWS Biological Opinion for Florida scrub-jays. Describe

No.	Category	Subject	Directed to	Question
				the monitoring and mitigation required by NRC and USACE as a result of the Biological Opinion.
50	Environmental	FEIS § 5.3.1.6	Staff	Section 5.3.1.6 indicates that the FWS's Biological Opinion requires updated surveys for federally listed species prior to ground disturbances. Will the Staff ensure that these surveys are completed? If so, how will the Staff ensure that these surveys are completed?
51	Environmental	FEIS Ch. 7	Staff	In the FEIS, the Staff relied heavily on the U.S. Global Change Research Program's 2009 "Global Climate Change Impacts in the United States" to evaluate impacts of the proposed action on climate change. Did the Staff consider whether updated information in the 2014 "Global Climate Change Impacts on the United States" would change the evaluation or conclusions of the Staff's climate change analysis? If so, please discuss the Staff's considerations. If not, why not?
52	Environmental	FEIS Ch. 7	Staff	Table 7-1 of the FEIS lists the past, present, and reasonably foreseeable future projects and other actions considered in the LNP cumulative impacts analysis. In its review of new and potentially significant information, did the Staff consider changes to the projects described in this table and whether those changes would require supplementation of the FEIS? (For instance, a number of the projects are listed as "proposed" but may not have been undertaken or may have been altered before being implemented, given the amount of time that has passed since completion of the FEIS.) If not, why not?

No.	Category	Subject	Directed to	Question
53	Environmental	FEIS Ch. 9	Staff	Discuss how the Staff in the LNP environmental review tailored its discussion of “other alternatives” based on the location of the proposed plant.
54	Environmental	FEIS Ch. 9	Staff	In considering whether new information would require supplementing the FEIS, did the Staff consider changes in State regulations, energy conservation objectives, and greenhouse gas emission reduction goals, etc.? Why or why not?
55	Environmental	FEIS App. A	Staff	Please summarize the key U.S. Environmental Protection Agency’s comments on the draft EIS and how the Staff addressed those in the FEIS.
56	Environmental	FEIS App. F (Biological Assessment)	Staff	The NMFS separated the listing of the loggerhead sea turtle into distinct population segments in September 2011 (nearly 8 months before NRC published the FEIS) (76 Fed. Reg. 58,868), but the biological assessment does not address the species by distinct population segments (see page F-87). This could affect the NRC’s conclusions because the FEIS’s analysis of effects to the species is considered in light of the size of the global population of loggerheads instead of in light of the size of the distinct population segment that would occur near LNP. Did the NRC Staff consider whether this listing would constitute new and significant information? If so, what were the results? If not, why not?
57	Environmental	FEIS App. F (Biological Assessment)	Staff	The correspondence between the NRC Staff, the USACE, and NMFS in Appendix F seems to indicate that the essential fish habitat (EFH) consultation under the Magnuson-Stevens Act (MSA) was not completed at the time the Staff issued the FEIS. Has this

No.	Category	Subject	Directed to	Question
				consultation been concluded following the publication of the FEIS? If not, when will it be concluded and how will it be documented? If so, what were the results of the consultation?
58	Environmental	FEIS App. H (Authorizations, Permits, and Certifications)	Staff	Has the Staff kept track of updates to Appendix H Authorizations, Permits, and Certifications since the 2012 publication of the FEIS?
59	Environmental	Non-concurrence	Staff	Please explain (without using deliberative or privileged information) the nature of the two non-concurrences and how they were resolved. Include in this discussion any previous generic analysis of ISFSI impacts that may apply to the LNP environmental review, and opportunities for public involvement involved in those analyses.
60	Environmental	Non-concurrence	Staff	Explain whether the Staff's environmental review takes into account all impacts of an ISFSI on the site (including, for example, land use impacts associated with use of the site after plant shutdown).
61	Environmental	FEIS Chapter 6	Staff	If the Staff had directly considered the environmental impacts of spent fuel storage, as described in the Continued Storage GEIS, NUREG-2157, what effect, if any, would that consideration have had on the benefit-cost balance described in Chapter 10 and the evaluation of alternatives in Chapter 9?
62	Environmental	FEIS Page 9-5	Staff, Applicant	Please provide additional summary information on the costs of refurbishment and environmental impacts of operating refurbished coal-fired units.
63	Environmental	FEIS Page 9-28	Staff	Does comparing the cumulative impacts of the proposed action with the non-cumulative impacts of the

No.	Category	Subject	Directed to	Question
				generation alternatives in Table 9-4 yield a more conservative analysis than comparing the non-cumulative impacts of the proposed action with the non-cumulative impacts of the generation alternatives?
64	Environmental	FEIS Page 9-110	Staff	Why are the cumulative impacts on surface water MODERATE for the Dixie site alternative when the FEIS concludes that other projects listed in Table 9-13 have little or no impact on surface water and building and operating a plant at the Dixie site would not be a significant contributor to those impacts?
65	Environmental	FEIS Pages 9-151, 161, 196, 206	Staff, Applicant	Clarify whether the Highlands site requires 6,725 (9-151) or 2,000 acres (9-161) for the transmission line corridor and whether the Putnam site requires 6,212 (9-196) or 2,150 acres (9-206) for the transmission line corridor.
66	Environmental	FEIS Page 9-156	Staff, Applicant	What additional actions would the applicant need to take to acquire water rights to the Kissimmee River for the Highlands site alternative since “no additional surface water will be allocated from [South Florida Water Management District]-controlled surface-water bodies over and above existing allocations?”
67	Environmental	FEIS Page 9-227	Staff	Please explain the justification for assuming subsistence fishing for the Putnam site but not the Crystal River or Dixie sites.
68	Environmental	FEIS Page 9-238	Staff, Applicant	The FEIS estimates that the Dixie site would disturb approximately 5,468 acres of land (9-103), the Highlands site would disturb about 4,068 acres of land (9-151), and the Putnam site would disturb around 4,218 acres of land but that the Levy site would only

No.	Category	Subject	Directed to	Question
				<p>disturb roughly 2,525 acres of land (4-17). Nonetheless, Table 9-31 lists the cumulative impacts for land use at all of these sites as MODERATE. Does the significant difference in disturbed land between the LNP site and these alternative sites provide further support for the Staff's conclusion that none of the alternative sites are environmentally preferable to the proposed LNP site? (9-243)</p>
69	Environmental	FEIS Ch. 9	Staff, Applicant	<p>Have there been significant energy or environmental regulatory or policy changes at the state or federal level that alter the viability of the various alternatives evaluated in the FEIS?</p>
70	Environmental	FEIS § 9.3.1.6; FEIS § 9.3.2.3	Applicant	<p>One of the reasons that the applicant provided for selecting the Levy 2 area as its proposed site instead of the Crystal River site was that adding new nuclear generating capacity at Crystal River would result in a significant concentration of the applicant's generating assets in one location. According to the applicant, this would make its system overly vulnerable to a major hurricane or other natural or man-made disaster. Further, in its Section 404(b)(1) Alternatives Analysis the applicant concluded that the Crystal River site would not meet the purpose and need of the project. Has the decision not to restart Crystal River Unit 3 changed this analysis? Has this decision affected the USACE's determination of the LEDPA?</p>

IT IS SO ORDERED.

For the Commission

NRC SEAL

 /RA/
Rochelle C. Baval
Acting Secretary of the Commission

Dated at Rockville, Maryland
this 24th day of June, 2016.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)
)
PROGRESS ENERGY FLORIDA, INC.) Docket Nos. 52-029-COL
) and 52-030-COL
)
(Levy County Nuclear Power Plant)
Units 1 and 2))
Mandatory Hearing)

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **Order (Transmitting Pre-Hearing Questions)** have been served upon the following persons by Electronic Information Exchange and e-mail.

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[Original signed by Brian Newell]
Office of the Secretary of the Commission

Dated at Rockville, Maryland
this 24th day of June, 2016