UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

Stephen G. Burns, Chairman
Kristine L. Svinicki
Jeff Baran

In the Matter of DUKE ENERGY FLORIDA, LLC (Levy Nuclear Plant, Units 1 and 2)	Docket Nos. 52-029-COL 52-030-COL

CLI-16-16

MEMORANDUM AND ORDER

On July 28, 2016, we held a hearing on the combined license (COL) application of Duke Energy Florida, LLC to construct and operate two new nuclear reactors at the Levy Nuclear Plant site in Levy County, Florida. In this uncontested proceeding, we consider whether the review of the application by the NRC Staff has been adequate to support the findings set forth in 10 C.F.R. §§ 52.97(a) and 51.107(a). As discussed below, we conclude that the Staff's review was sufficient to support the regulatory findings and authorize issuance of the combined licenses.

I. BACKGROUND

A. Proposed Action

Duke seeks to build two Advanced Passive 1000 (AP1000) reactors on a new site in Levy County, Florida. Duke's predecessor, Progress Energy Florida, Inc. (Progress Energy), applied for the combined licenses in July 2008.[1] The Staff accepted the application for review shortly thereafter.[2] Duke took over as the applicant following a corporate merger between Progress Energy, Inc. and Duke Energy Corporation.[3]

Consistent with 10 C.F.R. Part 52, Appendix D, Duke's application references the AP1000 certified design, as amended in design control document (DCD) Revision 19.[4] Accordingly, issues resolved in the AP1000 design certification rulemaking are closed and will

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[1] Progress Energy Florida, Inc., Notice of Receipt and Availability of Application for a Combined License, 73 Fed. Reg. 60,726 (Oct. 14, 2008).

[2] Progress Energy Florida, Inc., Acceptance for Docketing of an Application for Combined License for Levy County Nuclear Power Plant Units 1 and 2, 73 Fed. Reg. 60,726 (Oct. 14, 2008).

[3] *See* Letter from Christopher M. Fallon, Progress Energy, to NRC Document Control Desk (Apr. 15, 2013) (ADAMS accession no. ML13109A046) (transmitting changes to combined license application for corporate name change from Progress Energy Florida, Inc., to Duke Energy Florida, Inc. following the merger between Duke Energy Corporation and Progress Energy, Inc.). Duke Energy Florida, Inc. subsequently changed its corporate name to Duke Energy Florida, LLC. *See* Ex. NRC-006A, Levy Nuclear Plant Units 1 and 2, COL Application, Part 1, General and Financial Information, rev. 8 (Apr. 2016), at 1-1 n.1 (ML16111A178). The combined license application was admitted into the record as exhibits NRC-006A through NRC-006L (excluding the letter "I" to avoid confusion with the number "1"). *See Revised NRC Staff Exhibit List*, attach. at 1-2 & n.2 (Sept. 7, 2016). Exhibits NRC-006H and NRC-006J contain sensitive information and are not publicly available. *Id*., attach. at 2 n.3.

[4] *See* Ex. NRC-006B, Levy Nuclear Plant Units 1 and 2, COL Application, Part 2, Final Safety Analysis Report, rev. 9 § 1.1 (Apr. 6, 2016) (ML16111A957 (package)) (FSAR); *see also* Westinghouse AP1000 Design Control Document, rev. 19 (June 13, 2011) (ML11171A287 (package)) (AP1000 DCD). The Revision 19 design was certified in 10 C.F.R. Part 52, Appendix D, "Design Certification Rule for the AP1000 Design."

not be revisited here, unless they are the subject of a departure or exemption. The Staff followed the design-centered review approach, under which the Staff performs one technical review for each standard issue outside the DCD. Under this approach, the first combined license application for a given design is designated the "reference COL" application (RCOLA) and later applications referencing the same design are designated "subsequent COL" applications (SCOLA). Where the Staff has already resolved an issue with respect to the RCOLA, its review of the same issue in an SCOLA consists of confirming that the information is identical in both applications. The application for Vogtle Electric Generating Plant, Units 3 and 4 was designated as the RCOLA for the AP1000 design; the Levy combined license application is therefore considered an SCOLA, with a correspondingly limited review.[5]

Over the past eight years, the Staff has spent approximately 83,000 hours on the safety and environmental reviews of the application.[6] During this time, the Staff conducted approximately 100 public meetings and teleconferences.[7] Over the course of the review, Duke responded to approximately 690 requests for additional information from the Staff.[8]

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[5] *See* Ex. NRC-001, "Staff Statement in Support of the Uncontested Hearing for Issuance of Combined Licenses for the Levy Nuclear Plant Units 1 and 2 (Docket Nos. 52-029 and 52-030)," Commission Paper SECY-16-0076 (June 10, 2016), at 3-4 (ML16214A173) (Staff Information Paper). *See generally* NRC Regulatory Issue Summary 2006-06, New Reactor Standardization Needed to Support the Design-Centered Licensing Review Approach (May 31, 2006) (ML053540251).

[6] Tr. at 51 (Dr. Uhle).

[7] Ex. NRC-001, Staff Information Paper, at 5; Tr. at 51 (Dr. Uhle).

[8] Tr. at 51 (Dr. Uhle).

The Office of New Reactors led the Staff's technical review, with support from across the agency.[9] Because building on the proposed site will require permits from the U.S. Army Corps of Engineers (Corps), the Corps participated in preparing the Final Environmental Impact Statement (Final EIS) as a cooperating agency.[10] In addition, the Staff consulted with federal, state, local, and tribal organizations and governments concerning a variety of issues, including those arising under the National Environmental Policy Act of 1969 (NEPA), the National Historic Preservation Act (NHPA), and the Endangered Species Act.[11] The Advisory Committee on Reactor Safeguards (ACRS), a committee of technical experts advising the Commission, provided an independent assessment of the safety aspects of Duke's application.[12]

Duke's application does not reference an early site permit. Therefore, all site characteristics, including site geology, hydrology, seismology, and man-made hazards, as well as the potential environmental impacts of the project, were considered during the review of the combined license application.

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[9] *Id.* at 51-52 (Dr. Uhle).

[10] *See* Exs. NRC-009A to NRC-009C, "Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2" (Final Report), NUREG-1941, vols. 1-3 (Apr. 2012) (ML16214A178, ML16214A179, ML16214A181) (Final EIS); *see* Tr. at 52 (Dr. Uhle). Other federal agencies, including the U.S. Department of Homeland Security, also contributed to the Staff's review. Ex. NRC-001, Staff Information Paper, at 6.

[11] Ex. NRC-001, Staff Information Paper, at 6.

[12] AEA § 182b., 42 U.S.C. § 2232(b); 10 C.F.R. §§ 1.13, 52.87; *see* Letter from Said Abdel-Khalik, Chairman, ACRS, to Gregory B. Jaczko, Chairman, NRC (Dec. 7, 2011) (ML11339A126) (2011 ACRS Letter) (generally recommending approval of the combined license application); Letter from J. Sam Armijo, Chairman, ACRS, to R.W. Borchardt, Executive Director for Operations, NRC (Apr. 25, 2012) (ML12108A270) (requesting additional information with regard to generic issues); Letter from Dennis Bley, Chairman, ACRS, to Stephen G. Burns, Chairman, NRC (Apr. 18, 2016) (ML16102A149) (2016 ACRS Letter) (regarding exemptions to the AP1000 certified design included in the Levy combined license application).

B. Review Standards

Section 189a. of the Atomic Energy Act of 1954, as amended (AEA), requires that we hold a hearing on each application to construct a nuclear power plant, regardless of whether an interested member of the public requests a hearing on the application.[13] With respect to safety matters, we must determine whether

(1) the applicable standards and requirements of the AEA and the Commission's regulations have been met;

(2) any required notifications to other agencies or bodies have been duly made;

(3) there is reasonable assurance that the facility will be constructed and will operate in conformity with the licenses, the provisions of the AEA, and the Commission's regulations;

(4) the applicant is technically and financially qualified to engage in the activities authorized by the licenses; and

(5) issuance of the licenses will not be inimical to the common defense and security or to the health and safety of the public.[14]

With respect to environmental matters, we must:

(1) determine whether the requirements of NEPA section 102(2)(A), (C), and (E), and the applicable regulations in 10 C.F.R. Part 51 (the NRC regulations implementing NEPA) have been met;

(2) independently consider the final balance among conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken;

(3) determine, after weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, whether the combined licenses should be issued, denied, or appropriately conditioned to protect environmental values; and

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[13] AEA § 189a., 42 U.S.C. § 2239(a).

[14] 10 C.F.R. § 52.97(a).

(4) determine whether the NEPA review conducted by the NRC Staff has been adequate.[15]

We do not review Duke's application *de novo*; rather, our inquiry is whether the Staff's review was sufficient to support the findings described above.[16]

C. Contested Proceeding

After the Staff accepted the application for review, the NRC provided an opportunity to challenge the application in an adjudicatory hearing.[17] Three joint petitioners were granted a hearing in the contested proceeding: Nuclear Information and Resource Service, Inc. (NIRS), the Green Party of Florida, and the Ecology Party of Florida (collectively, Joint Intervenors).[18] The Atomic Safety and Licensing Board admitted three contentions at the outset of the proceeding.[19] One of these, Contention 4 (later designated Contention 4A), concerned

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[15] *Id*. § 51.107(a).

[16] *See, e.g.*, *DTE Electric Co*. (Fermi Nuclear Power Plant, Unit 3), CLI-15-13, 81 NRC 555, 560-61 (2015).

[17] Progress Energy Florida, Inc.; Application for the Levy County Nuclear Power Plant Units 1 and 2; Notice of Order, Hearing, and Opportunity to Petition for Leave to Intervene, 73 Fed. Reg. 74,532 (Dec. 8, 2008).

[18] LBP-09-10, 70 NRC 51 (2009). The Green Party of Florida subsequently withdrew from the contested proceeding. *See Notice of Withdrawal* (May 17, 2012).

[19] *Id.* at 147.

hydroecology, particularly, salt drift[20] and dewatering activities during construction and operation of the proposed facility and was the subject of an evidentiary hearing.[21]

Following the hearing, the Board held that the Staff's Final EIS had satisfied NEPA in its discussion of issues relating to the contention.[22] The Board made detailed findings of fact regarding dewatering in several areas: site characterization, groundwater modeling and modeling assumptions, seasonal fluctuations and hydroperiods, passive dewatering impact analysis, climate change and saltwater intrusion, cumulative impacts analysis, reliance on conditions of certification and state regulatory processes, connection to the Floridan Aquifer System, impacts to outstanding Florida waters, nutrient concentration impacts, and destructive wildfires.[23] The Board also made detailed findings of fact regarding salt drift and salt deposition.[24]

As a matter of law, the Board concluded that (1) the Final EIS contained an "adequate and fair analysis" of the potential impacts of the proposed facility that satisfied the NEPA rule of reason, (2) the NRC exercised independent judgment in its identification and assessment of the potential environmental impacts, and (3) the Staff's reliance in the Final EIS on certain

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[20] The Levy site is located eight miles inland and includes freshwater wetlands. The applicant plans to use salt water as coolant, which will cause some salt drift and deposition from the cooling towers. The Final EIS discusses environmental impacts from salt drift and salt deposition. *See* Ex. NRC-009A, Final EIS § 5.3.1.1, at 5-19 to 5-26; *id.* § 5.7.2, at 5-85 to 5-86.

[21] Memorandum and Order (Admitting Contention 4A) (Feb. 2, 2011) (unpublished); *see* LBP-13-4, 77 NRC 107, 116 (2013).

[22] LBP-13-4, 77 NRC at 107.

[23] *See id.* at 143-50, 153-163, 165-67, 168-69, 170-71, 172-73, 178-97, 198-99, 200-02, 203-04, 205-06.

[24] *Id.* at 207-09.

monitoring and mitigation measures required by the Florida Department of Environmental Protection (included in conditions of certification for the project) was reasonable.[25] The Joint Intervenors did not seek review of the Board's decision.

In the two other admitted contentions the Joint Intervenors asserted that Progress Energy lacked a plan for disposal of low-level radioactive waste. Specifically, Contentions 7 and 8 concerned the environmental and safety aspects, respectively, of storing class B and C low-level radioactive waste onsite beyond two years.[26] The Board ultimately dismissed both contentions as moot after Progress Energy developed a plan for handling low-level radioactive waste beyond the initial two years of plant operation; Joint Intervenors did not appeal the dismissals.[27] The issues litigated in Contentions 4A, 7, and 8 were resolved via the contested proceeding; therefore, we do not consider them further.

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[25] LBP-13-4, 77 NRC at 209-20.

[26] LBP-09-10, 70 NRC at 121-25. We upheld the Board's decision to admit these two contentions but narrowed both to exclude consideration of greater-than-class-C waste. CLI-10-2, 71 NRC 27, 47-48 (2010).

[27] The Board dismissed Contention 7 as moot following issuance of the Draft EIS. Order (Granting Motion for Summary Disposition of Contention 7 as Moot) (Sept. 8, 2010) (unpublished). The Joint Intervenors subsequently proposed Contention 7A, which asserted that the low-level radioactive waste analysis in the Draft EIS did not comply with NEPA. The Board found Contention 7A to be untimely and declined to admit it. Memorandum and Order (Denying Contention 7A) (Mar. 16, 2011) (unpublished).

Contention 8 was dismissed by consent and replaced by Contention 8A, which challenged the adequacy of Progress Energy's initial low-level radioactive waste management plan. *See* Memorandum and Order (Ruling on Joint Intervenors' Motion to File and Admit New Contention 8A) (Aug. 9, 2010) (unpublished). The Board denied Progress Energy's initial motion for summary disposition of Contention 8A, concluding that, as a matter of law, the plan did not contain enough information to enable the NRC to resolve whether Progress Energy's means for controlling and limiting effluents and radiation exposures would be within 10 C.F.R. Part 20 limits. *See* LBP-10-20, 72 NRC 571 (2010), *reconsideration denied*, Memorandum and Order (Denying Motion for Reconsideration of LBP-10-20) (Dec. 22, 2010) (unpublished). The Board

Joint Intervenors unsuccessfully sought to litigate several other matters after they filed their initial intervention petition. In 2011, the Board rejected as untimely a proposed Contention 12A that challenged the alternative site analysis in the Draft EIS.[28] The Board likewise rejected as untimely a proposed Contention 14/14A, in which Joint Intervenors claimed that the plant's proposed use of the Cross Florida Barge Canal would violate several federal and state statutes.[29] And the Board rejected motions to admit a proposed Contention 13, which related to the agency's activities following the Fukushima Dai-ichi accident and to reconsider a previously rejected Contention 5, which concerned consideration in the environmental review of the impacts of an accident at the neighboring Crystal River Energy Complex.[30] The Joint Intervenors did not appeal these decisions.

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granted a second motion for summary disposition following Progress Energy's further revision of its plan. LBP-11-31, 74 NRC 643 (2011).

[28] *See* Memorandum and Order (Denying Contention 12A) (Mar. 29, 2011) (unpublished). The Joint Intervenors asserted that the Staff improperly concluded that none of the alternative sites was preferable to the Levy site because the Staff, in the Draft EIS, did not adequately consider the consequences of placing the cooling water intake structure in the Cross Florida Barge Canal. *Id.* at 1-2.

[29] Memorandum and Order (Ruling on Motion for Leave to File Proposed Contentions 14 and 14A) (Mar. 19, 2012) (unpublished).

[30] Memorandum and Order (Denying Motion to Admit Contentions 13 and 5 and Granting Motion to Supplement) (Dec. 15, 2011) (unpublished). Contention 13 asserted that the Environmental Report and Draft EIS did not satisfy NEPA because they failed to address "the new and significant environmental implications of the findings and recommendations raised by NRC's Fukushima Task Force Report." *Id.* at 3 (internal quotations omitted). Crystal River Unit 3 (the only nuclear unit on the Crystal River Energy Complex, located approximately 9.6 miles from the Levy site) shut down permanently in February 2013.

Certain intervenors also joined unsuccessful petitions for Commission action filed on several licensing dockets following the Fukushima Dai-ichi accident.[31] Relatedly, NIRS joined several petitioners that sought to suspend reactor licensing decisions pending the resolution of a petition for rulemaking concerning the environmental impacts of the expedited transfer of spent fuel from the spent fuel pool to dry cask storage.[32] We denied the suspension petition and provided direction on related requests.[33]

Also during the pendency of the contested proceeding, the U.S. Court of Appeals for the District of Columbia Circuit vacated and remanded our 2010 Waste Confidence Decision and Temporary Storage Rule, which for this and other NRC licensing actions served as part of the environmental analysis of the impacts of spent fuel storage after the end of a reactor's license term pending ultimate disposal in a repository.[34] NIRS and the Ecology Party of Florida joined a suspension petition filed on multiple dockets and a proposed "continued storage" contention.[35]

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[31] *Union Electric Co. d/b/a Ameren Missouri* (Callaway Plant, Unit 2), CLI-11-5, 74 NRC 141 (2011); Environmental Impacts of Severe Reactor and Spent Fuel Pool Accidents, 80 Fed. Reg. 48,235 (Aug. 12, 2015) (internal quotations omitted).

[32] *See Petition to Suspend Reactor Licensing Decisions and Reactor Re-licensing Decisions Pending Completion of Rulemaking Proceeding Regarding Environmental Impacts of High-Density Pool Storage of Spent Fuel and Mitigation Measures* (Feb. 27, 2014).

[33] *See DTE Electric Co.* (Fermi Nuclear Power Plant, Unit 3), CLI-14-7, 80 NRC 1 (2014). The rulemaking petition was subsequently denied. Generic Determinations Regarding the Environmental Impacts of Spent Fuel Storage and Disposal When Considering Nuclear Power Reactor License Applications, 81 Fed. Reg. 31,532 (May 19, 2016).

[34] *See New York v. NRC*, 681 F.3d 471 (D.C. Cir. 2012). *See generally* Consideration of Environmental Impacts of Temporary Storage of Spent Fuel After Cessation of Reactor Operation; Final Rule, 75 Fed. Reg. 81,032 (Dec. 23, 2010); Waste Confidence Decision Update, 75 Fed. Reg. 81,037 (Dec. 23, 2010).

[35] *Intervenors' Motion for Leave to File a New Contention Concerning Temporary Storage and Ultimate Disposal of Spent Reactor Fuel at Levy Nuclear Power Plant* (July 9, 2012).

In light of the D.C. Circuit's vacatur and remand of the rule, and in response to the suspension petitions, we held in abeyance the issuance of final licensing decisions for affected matters while we addressed the court's remand.[36]

To address the remand and provide comprehensive analysis of the environmental impacts of continued storage, we issued a final Continued Storage Rule and supporting Generic Environmental Impact Statement.[37] Concurrent with this action, we lifted the licensing suspension and dismissed, or directed licensing boards to dismiss, proposed contentions that had been filed with the multi-docket suspension petitions and held in abeyance.[38] The Board dismissed the "continued storage" contention filed by NIRS and the Ecology Party of Florida in this proceeding consistent with our direction.[39] The Ecology Party of Florida and NIRS also

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[36] *Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC* (Calvert Cliffs Nuclear Power Plant, Unit 3), CLI-12-16, 76 NRC 63, 67-69 (2012); *see Petition to Suspend Final Decisions in All Pending Reactor Licensing Proceedings Pending Completion of Remanded Waste Confidence Proceedings* (June 18, 2012).

[37] *Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC* (Calvert Cliffs Nuclear Power Plant, Unit 3), CLI-14-8, 80 NRC 71, 77 (2014). *See generally* Continued Storage of Spent Nuclear Fuel; Final Rule, 79 Fed. Reg. 56,238 (Sept. 19, 2014); Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel, 79 Fed. Reg. 56,263 (Sept. 19, 2014); "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel" (Final Report), NUREG-2157, vols. 1 and 2 (Sept. 2014) (ML14196A105 and ML14196A107) (Continued Storage GEIS). The D.C. Circuit recently upheld the Continued Storage Rule. *New York v. NRC*, No. 14-1210 (D.C. Cir. June 3, 2016), *reh'g en banc denied per curiam* (Aug. 8, 2016).

[38] *Calvert Cliffs*, CLI-14-8, 80 NRC at 79-81.

[39] Memorandum and Order (Dismissing Environmental Waste Confidence Contention) (Oct. 1, 2014) (unpublished); *see Duke Energy Carolinas, LLC* (William States Lee III Nuclear Station, Units 1 and 2), CLI-15-15, 81 NRC 803 (2015) (declining to admit a "placeholder" contention in this and other proceedings in anticipation that the court of appeals would overturn the 2014 Continued Storage Rule).

joined other unsuccessful multiple-docket petitions related to continued storage that were later denied.[40] In March 2015, the Board terminated the contested proceeding.[41]

D. Uncontested Proceeding

All safety and environmental matters relevant to the combined license application, except those resolved in the contested proceeding, are subject to our review in the uncontested proceeding.[42] The uncontested portion of the proceeding begins once the Staff has completed both its environmental and safety reviews; here, because the Final EIS was completed in 2012, the release of the Final Safety Evaluation Report (FSER) on May 31, 2016, triggered the uncontested proceeding.[43] Shortly after the FSER was released, we received the Staff's statement in support of the uncontested hearing, which serves as the Staff's initial testimony and provides an overview of its safety and environmental review of this application.[44] Consistent with the design-centered review approach, the Staff's paper focused on "non-routine matters, such as unique features of the facility or novel issues that arose as part of the review process."[45]

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[40] *DTE Electric Co.* (Fermi Nuclear Power Plant, Unit 3), CLI-15-4, 81 NRC 221 (2015) (holding that the Commission is not required, under the Atomic Energy Act, to make predictive findings regarding the technical feasibility of spent fuel disposal as part of its reactor licensing decisions); *DTE Electric Co.* (Fermi Nuclear Power Plant, Unit 3), CLI-15-10, 81 NRC 535 (2015) (declining to order the supplementation of final EISs to reference the Continued Storage GEIS).

[41] LBP-15-8, 81 NRC 393 (2015).

[42] *See, e.g.*, *Fermi*, CLI-15-13, 81 NRC at 564-65.

[43] *See* Exs. NRC-007A & NRC-007B, "Final Safety Evaluation Report for Combined Licenses for Levy Nuclear Plant Units 1 and 2" (May 2016) (ML16214A176 and ML16214A177) (FSER). Chapter 19 of the FSER is non-public and was admitted into the record as NRC-008.

[44] Ex. NRC-001, Staff Information Paper.

[45] *Id*. at 2.

1. Pre-Hearing Activities

We issued a Notice of Hearing on June 17, 2016, which set a schedule for the Staff and Duke to file their witness lists and for Duke to file its pre-hearing testimony.[46] The Notice of Hearing also invited interested states, local government bodies, or federally recognized Indian tribes to provide a statement of issues for us to consider as part of the uncontested proceeding.[47] We also issued pre-hearing questions to both the Staff and Duke.[48] Finally, the Secretary of the Commission transmitted a scheduling note to the Staff and Duke setting the hearing topics and order of presentations.[49]

2. The Hearing

The hearing presentations were made by witness panels. The first panel of witnesses for Duke and the Staff gave an overview of the license application and the Staff's review, respectively. The second panel focused on safety-related issues, and the third panel focused on environmental issues. Overall, the Staff made available eighty-five witnesses at the hearing,

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[46] Duke Energy Florida, LLC, Levy Nuclear Plant, Units 1 and 2; Combined License Application, 81 Fed. Reg. 39,720 (June 17, 2016) (Notice of Hearing); *see also* Ex. DEF-001, *Duke Energy Florida's Corrected Pre-Filed Testimony in Support of the Mandatory Hearing for the Levy Nuclear Plant Units 1 and 2 Combined Licenses* (July 7, 2016) (ML16214A164) (Duke Pre-Filed Testimony); Ex. DEF-002, *Curriculum Vitae of Robert H. Kitchen* (ML16214A165).

[47] Notice of Hearing, 81 Fed. Reg. at 39,721. We received no responses to this invitation.

[48] *See* Order (Transmitting Pre-Hearing Questions) (June 24, 2016) (unpublished) (Pre-Hearing Question Order); Ex. DEF-003, *Duke Energy Florida's Responses to Pre-Hearing Questions* (July 7, 2016) (ML16214A167) (Duke Pre-Hearing Responses); Ex. NRC-004, *NRC Staff Responses to Pre-Hearing Questions* (July 7, 2016) (ML16214A175) (Staff Pre-Hearing Responses).

[49] Scheduling Note, "Hearing on Combined Licenses for Levy Nuclear Project Units 1 and 2: Section 189a. of the Atomic Energy Act Proceeding (Public Meeting)" (July 20, 2016) (ML16202A515).

including scheduled panelists.[50] Seven witnesses offered testimony on behalf of Duke at the hearing and in pre-filed written testimony.[51]

Duke's overview panelists discussed the general qualifications of Duke and the choice to reference the AP1000 design;[52] information regarding the Levy site's location, size, proximity to the Crystal River Energy Complex, and water intake and discharge systems and locations;[53] emergent issues related to the AP1000 design based on issues discovered through construction of AP1000 plants at the Vogtle and V.C. Summer sites and in China;[54] and the environmental impacts of the proposed project.[55]

The Staff panelists provided background on the review of the combined license application.[56] These panelists discussed the focus of the Staff's review on the plant-specific aspects of the application—operational programs, site-specific design features, combined license information items, and departures from the certified design;[57] the ACRS review of the

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[50] *See Revised NRC Staff Witness List* (July 22, 2016). Five of the listed witnesses did not appear at the hearing. Tr. at 12 (Mr. Roach); *NRC Staff Motion to Correct the Hearing Transcript and to Admit Exhibit NRC-013* (Aug. 9, 2013), attach. at 1 n.1.

[51] *See Duke Energy Florida's Witness List* (filed July 7, 2016); Ex. DEF-001, Duke Pre-Filed Testimony.

[52] Tr. at 17-20 (Mr. Fallon); *id.* at 30-31 (Mr. Kitchen); Ex. DEF-004, Levy Nuclear Plant—Overview Panel (July 28, 2016), at 7 (ML16214A168) (Duke Overview Presentation).

[53] Tr. at 24-26 (Mr. Kitchen); Ex. DEF-004, Duke Overview Presentation, at 2-6.

[54] Tr. at 31-33 (Mr. Kitchen); Ex. DEF-004, Duke Overview Presentation, at 8.

[55] Tr. at 34-35 (Mr. Snead); Ex. DEF-004, Duke Overview Presentation, at 10.

[56] Tr. at 49-67; Ex. NRC-010, Combined License Application Review LNP Units 1 and 2—Overview Panel (July 28, 2016) (ML16214A183) (Staff Overview Presentation).

[57] Tr. at 53 (Dr. Uhle); Ex. NRC-010, Staff Overview Presentation, at 5.

application, its recommendations, and the Staff's responses;[58] and the Staff's safety and environmental findings under 10 C.F.R. § 52.97(a), NEPA sections 102(2)(A), (C), and (E), and 10 C.F.R. § 51.107(a).[59]

The safety panel focused on aspects of the Levy COL application requiring special engineering solutions, including the geologic and geotechnical characteristics of the site; design and construction of the proposed roller compacted concrete foundation; and a departure from the certified design associated with the passive core cooling system condensate return.[60] The environmental panel discussed alternative sites and the U.S. Fish and Wildlife Service's Biological Opinion for the project.[61] These issues are discussed further in sections II.B.1.a. through c. and II.B.2.a. and b.

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[58] Tr. at 54-57 (Mr. Akstulewicz); Ex. NRC-010, Staff Overview Presentation, at 6-7.

[59] Tr. at 58-60 (Mr. Akstulewicz), 64-67 (Mr. Lee); Ex. NRC-010, Staff Overview Presentation, at 8-10, 17-20.

[60] Tr. at 80-82 (Mr. Thrasher), 82-84 (Mr. Kitchen), 86-89 (Dr. Stirewalt), 89-93 (Mr. Thomas), 93-97 (Mr. Travis); *see* Ex. DEF-005, Levy Nuclear Plant—Safety Panel (July 28, 2016) (ML16214A169) (Duke Safety Presentation); Ex. NRC-011-R, Combined License Application Review Levy Nuclear Plant Units 1 and 2—Safety Panel (July 28, 2016) (ML16214A186) (Staff Safety Presentation).

[61] Tr. at 114-17 (Mr. Snead), 118-21 (Ms. Sutton), 121-25 (Mr. Kugler); *see* Ex. NRC-012, Combined License Application Review Levy Units 1 and 2—Environmental Panel (July 28, 2016) (ML16214A182) (Staff Environmental Presentation); Ex. DEF-006, Levy Nuclear Plant—Environmental Panel (July 28, 2016) (ML16214A170).

3. Post-Hearing Activities

After the hearing, we posed a single additional question to the Staff concerning the project's impacts to wetlands.[62] The Staff's written response was admitted as an exhibit, and after adopting corrections to the hearing transcript, we closed the evidentiary record.[63]

II. DISCUSSION

Although our review encompassed the entire application, we discuss here a brief selection of topics. We first consider Duke's requested exemptions from our regulatory requirements and departures from the AP1000 certified design. Our discussion then turns to site-specific and novel issues.

A. Exemptions and Departures

Duke requested seven exemptions and identified eleven departures from the AP1000 certified design.[64] Where a combined license applicant references a certified design, changes to the design may be made in the combined license if proposed as a departure from the certified design. Some departures from the certified design may be made without prior Commission approval.[65] However, departures that involve a change to the design as described in the rule certifying the design require an exemption from our regulations.[66] The Staff may approve an

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[62] Order (Transmitting Post-Hearing Question) (Aug. 4, 2016) (unpublished) (Post-Hearing Order).

[63] Order (Adopting Proposed Transcript Corrections, Admitting Post-Hearing Exhibits, and Closing the Record of the Proceeding) (Sept. 12, 2016) (unpublished).

[64] Ex. NRC-001, Staff Information Paper, at 17.

[65] 10 C.F.R. pt. 52, app. D, VIII.B.5.a.

[66] *Id.* pt. 52, app. D, VIII.A.4. The requirements that combined license applicants must meet when seeking an exemption from the Commission's regulations are found at 10 C.F.R. § 52.93.

exemption where it finds that the exemption is authorized by law, will not present an undue risk to the public health and safety, is consistent with the common defense and security, and special circumstances exist that warrant the exemption.[67] In addition, the Staff must determine that the special circumstances outweigh any decrease in safety resulting from the reduction in standardization that may result from the exemption.[68]

1. Exemptions

Duke requested two exemptions that are similar to those previously granted to other combined license holders. The first of these corresponds to standard departure STD DEP 1.1-1, which relates to the numbering and organization of the application.[69] The second exempts the combined license holder from certain requirements pertaining to material control and accounting for special nuclear materials, such that the same requirements apply to both Part 52 and Part 50 licensees.[70]

Additionally, Duke requested five exemptions that are common to other combined license applicants referencing the AP1000 design.[71] The Staff's technical evaluation of these exemptions is described in FSER Chapter 21.[72] The ACRS reviewed these exemptions, found

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[67] *See id.* §§ 52.63(b)(1), 52.7, 50.12(a).

[68] *Id.* § 52.63(b)(1).

[69] Ex. NRC-007A, FSER § 1.5.4, at 1-44 to 1-46; *see* Ex. NRC-001, Staff Information Paper, at 18.

[70] Ex. NRC-007A, FSER § 1.5.4, at 1-46 to 1-47; *see Southern Nuclear Operating Co.* (Vogtle Electric Generating Plant, Units 3 and 4), CLI-12-2, 75 NRC 63, 84 (2012) (citations omitted); Ex. NRC-001, Staff Information Paper, at 18.

[71] *See* Ex. NRC-001, Staff Information Paper, at 19-21.

[72] Ex. NRC-007B, FSER, ch. 21.

them necessary to enable components of the certified design to perform their intended functions, and recommended their approval.[73]

The first of the five exemptions concerns modifications to the passive core cooling system condensate return.[74] This exemption involves a proposed design departure, LNP DEP 3.2-1, which would add components to the condensate return system to increase the amount of recovered condensate from the containment shell to the in-containment refueling water storage tank during accident scenarios.[75] The exemption also involves a second departure, LNP DEP 6.3-1, that would change the duration that the passive residual heat removal heat exchanger can maintain safe shutdown from an "indefinite" period of time to "at least [fourteen] days."[76] This issue is discussed further in section II.B.1.c., *infra*.

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[73] 2016 ACRS Letter at 1. We asked the Staff and Duke prior to the hearing whether the cumulative risk of the design changes associated with these five exemptions had been assessed. *See* Pre-Hearing Question Order at 19. Duke explained that because the design changes were all "implemented to restore the design to comply with the design basis assumptions . . . their cumulative risk impact is deemed insignificant." Ex. DEF-003, Duke Pre-Hearing Responses, at 32. The Staff stated that because a qualitative analysis of each design change confirmed that each was too small to affect core damage frequency or large release frequency, and the number of changes is limited, the cumulative risk impact is too small to require revising the risk assessment. *See* Ex. NRC-004, Staff Pre-Hearing Responses, at 22.

The Staff testified that two AP1000 combined license holders are expected to seek the same exemptions and departures for the units currently under construction. *See* Tr. at 57-58 (Mr. Akstulewicz).

[74] *See* Ex. NRC-001, Staff Information Paper, at 19, 25-27; Tr. at 93-97 (Mr. Travis); *see also* Ex. NRC-004, Staff Pre-Hearing Responses, at 21-26; Ex. DEF-003, Duke Pre-Hearing Responses, at 32-43.

[75] Ex. NRC-001, Staff Information Paper, at 19; *see* Ex. NRC-007B, FSER § 21.1.2.

[76] *See* Ex. NRC-007B, FSER § 21.1.2.

The second exemption common to AP1000 applicants concerns the main control room habitability dose analysis. According to the Staff, the vendor for the AP1000 design, Westinghouse Electric Company, identified inaccuracies in its design basis accident dose analyses due to a failure to account for the main control room emergency habitability system filter direct dose and because the radiation monitor in the control room did not account for all release scenarios.[77] As a result, Duke submitted site-specific revisions to the AP1000 design and associated dose consequence analyses to ensure that operator dose following a design basis accident is maintained below regulatory limits.[78] The Staff evaluated Duke's exemption request and found that it met the regulatory requirements for approval.[79] Duke also submitted a site-specific departure, LNP DEP 6.4-1, to reflect the revised dose analyses and associated design changes.[80]

The third common exemption concerns design changes necessary to limit heating in the control room during a design basis event. According to the Staff, Westinghouse identified additional potential heat sources not accounted for in the original control room habitability analysis.[81] The Staff considered the design changes and determined that the changes support

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[77] Ex. NRC-001, Staff Information Paper, at 19. Prior to the hearing, the parties responded to several questions about this exemption. *See* Ex. DEF-003, Duke Pre-Hearing Responses, at 43-47; Ex. NRC-004, Staff Pre-Hearing Responses, at 26-29. At the hearing, we asked the Staff about the instruments used to monitor control room radiation levels and the level of burden the monitoring would impose on plant staff. *See* Tr. at 99-103.

[78] *See* Ex. DEF-001, Duke Pre-Filed Testimony, at 7; *see also* Ex. NRC-007B, FSER § 21.2.2.

[79] Ex. NRC-007B, FSER § 21.2.4.A.3, at 21-32 to 21-36.

[80] Ex. NRC-001, Staff Information Paper, at 19.

[81] *Id*. at 19-20; *see also* Ex. NRC-007B, FSER § 21.3; *id.* § 21.3.4.A.3, at 21-59 to 21-63.

the system's intended design functions and will ensure that the system will maintain heat loads inside the control room within design-basis assumptions. Departure LNP DEP 6.4-2 is associated with this exemption.[82]

The fourth common exemption concerns the need to revise the Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) in the AP1000 DCD for control of containment hydrogen concentrations during a beyond-design-basis event.[83] According to the Staff, the applicant identified inconsistencies between the current detailed design and the ITAAC for hydrogen vents inside containment.[84] The Staff found that a change to the acceptance criteria for certain primary ventilation paths and the proximity of those paths to the containment shell would maintain the design margins of the containment hydrogen control system; the changes therefore would support the intended design function.[85] The exemption relates to departure LNP DEP 6.2-1.[86]

The fifth common exemption concerns revision of the boron dilution block safety system bypass to comply with Institute of Electrical and Electronics Engineers (IEEE) standard 603-1991, Clause 6.6, "Operating Bypasses." That standard requires that where conditions exist to allow a safety system to be bypassed, the safety system must automatically reset if conditions

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[82] Ex. NRC-007B, FSER § 21.3.2.

[83] *Id.* § 21.4.2, at 21-88.

[84] Ex. NRC-001, Staff Information Paper, at 20; *see also* Ex. NRC-007B, FSER § 21.4.2, at 21-88.

[85] *See* Ex. NRC-007B, FSER § 21.4.4.A.3, at 21-91 to 21-94.

[86] *See id.* § 21.4.2.

change so that bypassing the safety system is no longer permissible.[87] The AP1000 certified design does not comply with the IEEE standard in that it allows manual bypass of the boron dilution block safety system without including a mechanism to restore the function automatically when plant conditions require it.[88] The Staff evaluated the exemption and found that the design changes enable the plant-specific technical specifications to meet the requirements of IEEE 603-1991.[89] Departure LNP DEP 7.3-1 describes the changes to the final safety analysis report (FSAR) and technical specifications associated with this exemption.[90]

2. Departures

In addition to seven departures relating to the exemptions described above, the applicant proposed four additional departures from the AP1000 DCD. Two departures are standard for all combined license applicants adopting the AP1000 design.[91] A third departure "corrects an inconsistency in a DCD table" and does not involve a change to the reactor design.[92] The fourth departure, LNP DEP 3.7-1, unique to the Levy combined license

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[87] *See* Ex. NRC-001, Staff Information Paper, at 20. More specifically, the safety system must either restore plant conditions so that the bypass is permissible, remove the active bypass, or initiate the safety function. *Id*.; *see also* Ex. NRC-007B, FSER § 21.5.1.

[88] Ex. NRC-007B, FSER § 21.5.1; *see also* 2016 ACRS Letter at 4.

[89] *See* Ex. NRC-007B, FSER § 21.5.4.A.3, at 21-103 to 21-105.

[90] *Id.* § 21.5.2.

[91] STD DEP 1.1-1 relates to organization of the application. Ex. NRC-007A, FSER § 1.5.4, at 1-44 to 1-46; *see* Ex. NRC-001, Staff Information Paper, at 21. STD DEP 8.3-1 involves using breakers and fuses to isolate current in Class 1E voltage regulating transformers and was previously evaluated with respect to the Vogtle and Summer COL applications. Ex. NRC-007A, FSER §§ 8.3.2.4, 8.3.2.6; *see* Ex. NRC-001, Staff Information Paper, at 23.

[92] Ex. NRC-001, Staff Information Paper, at 23; *see* Ex. NRC-007A, FSER § 3.11.4, at 3-115 to 3-116.

application, involves the foundation design for the Annex and Turbine buildings.[93] It permits the use of site-specific horizontal seismic response spectra for the design of drilled shafts supporting the seismic Category II structures.[94] The Staff assessed the departure, and specifically, how the departure will impact the potential seismic interaction between the nuclear island and the adjacent structures.[95] The Staff determined that there was "reasonable assurance that the drilled shaft design under the horizontal site-specific seismic demands will be adequate to support the adjacent structures to the [nuclear island] so as to preclude seismic interaction under the [Levy Nuclear Plant] site-specific seismic demands."[96] Accordingly, the Staff found the departure acceptable.[97]

B. Site-Specific Issues Addressed in the Proceeding

1. Safety-Related Issues

a. Site Characteristics

The FSAR identified one geologic hazard at the Levy site: the potential for subsurface voids due to the dissolution of limestone (or karst development) in the foundation rock unit known as the Avon Park Formation.[98] The Staff provided an overview of site characteristics at the hearing and noted that its conclusions supported Duke's expectation that the majority of the

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[93] *See* Ex. NRC-001, Staff Information Paper, at 21-22.

[94] *See id*. at 22; Ex. NRC-007A, FSER § 3.7.2.4, at 3-52 to 3-53; *see also* Ex. NRC-004, Staff Pre-Hearing Responses, at 8-10; Ex. DEF-003, Duke Pre-Hearing Responses, at 13-14, 16-18.

[95] Ex. NRC-007A, FSER § 3.7.2.4, at 3-52 to 3-53.

[96] *Id.* § 3.7.2.5, at 3-53.

[97] *Id.*

[98] *See* Ex. NRC-006B, FSAR § 2.5.0.1.2, at 2.5-4; Ex. NRC-007A, FSER § 2.5.1.2.2.6; *see also* Ex. NRC-011-R, Staff Safety Presentation, at 4; Tr. at 81 (Mr. Thrasher), 86 (Dr. Stirewalt).

karst features are less than one foot in diameter and stated that the "subsurface voids will not detrimentally affect the stability or the suitability of the Avon Park."[99]

The Staff concluded that Duke had provided a "thorough and accurate description of the potential for tectonic and non-tectonic surface deformation at the site."[100] The Staff has proposed a license condition under which Duke will perform geologic mapping during safety-related excavations at the site.[101] Prior to the hearing, we sought further information on the need for the license condition.[102] The Staff responded that the data it has reviewed is sufficient to support its safety finding, but additional site-specific information regarding geologic features will be available once excavations are completed.[103] And the Staff explained that if excavations reveal potentially detrimental geologic features, our regulations may require Duke to conduct additional site investigations.[104] At the hearing, the Staff further explained that the site characterization is based on both surface characteristics and borehole data, which do not give as complete a picture as will be available after completion of the foundation excavation.[105]

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[99] Tr. at 86-89 (Dr. Stirewalt); *see id.* at 86-88 (Dr. Stirewalt); *see also id.* at 81 (Mr. Thrasher).

[100] Ex. NRC-007A, FSER § 2.5.3.4.8.

[101] Ex. NRC-002-R2, Draft Combined License, Levy Nuclear Plant Unit 1, Duke Energy Florida, LLC, Docket No. 52-029 (Sept. 6, 2016), at 15 (ML16258A238) (Draft Combined License).

[102] Pre-Hearing Question Order at 2-3; *see* Ex. NRC-002-R2, Draft Combined License, at 15.

[103] Ex. NRC-004, Staff Pre-Hearing Responses, at 2-3.

[104] *Id.* at 3; *see* 10 C.F.R. § 100.23(d)(2).

[105] Tr. at 110-11 (Dr. Stirewalt).

Nonetheless, the Staff continues to support its finding that Duke provided an adequate description of the potential for tectonic and non-tectonic surface deformation at the Levy site.[106]

b. Roller Compacted Concrete Foundation

Duke has proposed a roller compacted concrete bridging mat for the Levy site.[107] The bridging mat, a structure not previously used at a nuclear plant, is the only safety-related structure outside the scope of the certified design.[108] The bridging mat, which will be constructed below the nuclear island, will address unique geologic characteristics and a lack of subsurface uniformity that could otherwise affect the stability of the nuclear island.[109] The thirty-five-foot-thick mat is proposed to be constructed on top of the Avon Park Formation.[110] It will replace undifferentiated soils and sediments and bridge conservatively postulated voids between the nuclear island basemat and the grouted portion of the Avon Park Formation.[111] Duke designed the roller compacted concrete bridging mat to transmit the nuclear island loads to the grouted portion of the Avon Park Formation.[112]

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[106] *See id.* at 111 (Dr. Stirewalt).

[107] Ex. NRC-001, Staff Information Paper, at 24-25; *see* Tr. at 89-90 (Mr. Thomas).

[108] Ex. NRC-001, Staff Information Paper, at 25; Ex. NRC-007A, FSER § 3.2.1.2; *see* 2011 ACRS Letter at 3; Tr. at 90 (Mr. Thomas), 106 (Mr. Thomas).

[109] *See* Tr. at 90 (Mr. Thomas); Ex. NRC-007A, FSER § 2.5.4.4.12.

[110] Ex. NRC-001, Staff Information Paper, at 24-25; Tr. at 81-82 (Mr. Kitchen), 90 (Mr. Thomas); *see* 2011 ACRS Letter at 3.

[111] Ex. NRC-001, Staff Information Paper, at 25; Tr. at 90 (Mr. Thomas).

[112] Ex. NRC-001, Staff Information Paper, at 25; Tr. at 90 (Mr. Thomas).

Prior to the hearing, the Staff explained that the bridging mat is designed to be able to bridge a ten-foot diameter dissolution cavity in the Avon Park Formation.[113] The Staff found this design sufficient because the ten-foot diameter is a conservative estimate for cavity size at the Levy site.[114] Additionally, Duke will place a waterproof membrane between the bridging mat and the mudmat.[115] The Staff assessed both Duke's and Westinghouse's calculations and analysis and found that the stability of the nuclear island is not vulnerable to potential soil liquefaction.[116] The Staff also approved an ITAAC covering the interfaces between the roller compacted concrete bridging mat, waterproof membrane, and concrete mudmat to ensure the stability of the nuclear island against sliding.[117] The Staff added that Duke has committed to construct the bridging mat according to industry codes and standard methods, including American Concrete Institute code requirements.[118]

Given the novelty of this design concept in nuclear construction, we asked how other commercial uses of the roller compacted concrete foundation informed Duke's proposed

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[113] Ex. NRC-001, Staff Information Paper, at 25; *see* Ex. NRC-007A, FSER § 2.5.4.4.3.7 (explaining that the Staff concluded "that the foundation system is designed to accommodate isolated voids of up to [ten feet] in size, which is at least double the conservatively estimated lateral dimension of any actual void intercepted"); *see also* 2011 ACRS Letter at 3.

[114] *See, e.g.*, Ex. NRC-007A, FSER § 2.5.1.4.2.5.2; *see also* Ex. NRC-001, Staff Information Paper, at 25; 2011 ACRS Letter at 3.

[115] *See* Ex. NRC-007A, FSER § 3.8.5.4, at 3-69; *see* Ex. NRC-001, Staff Information Paper, at 25.

[116] Ex. NRC-001, Staff Information Paper, at 25.

[117] *Id.*

[118] Tr. at 91 (Mr. Thomas); *see* Ex. NRC-001, Staff Information Paper, at 25; Ex. NRC-007A, FSER § 3.8.5.4, at 3-75.

design.[119] The Staff explained that Duke has studied the use of roller compacted concrete in dams and pavements.[120] Duke concurred that results from other uses of the roller compacted concrete foundation will inform Duke's construction of the foundation at the Levy site.[121] Additionally, Duke proposed a license condition for testing the roller compacted concrete bridging mat, as well as an ITAAC, both of which the Staff has included in the draft combined licenses.[122]

c. Condensate Return Design Change

General Design Criterion (GDC) 34, Residual Heat Removal, requires that nuclear power plant designs include "a system capable of removing residual heat, defined such that the decay heat does not exceed design limits for the fuel and pressure boundary" in the event of an accident unrelated to the loss of coolant.[123] In the event of such an accident, the AP1000 is designed to perform passive heat removal through closed-loop cooldown.[124] Reactor coolant circulates through a passive residual heat removal (PRHR) heat exchanger in the in-

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[119] Tr. at 105-06 (Chairman Burns).

[120] *Id.* at 106 (Mr. Thomas); *see* Ex. NRC-007A, FSER § 3.8.5.4, at 3-75.

[121] Tr. at 106 (Mr. Thrasher); *see* Ex. NRC-006B, FSAR § 3.8.5.11.1.

[122] Ex. NRC-002-R2, Draft Combined License, at 16 (requiring Duke to complete roller compacted concrete strength verification and constructability testing and provide the results to the NRC no later than 180 days before beginning construction); Ex. NRC-007A, FSER, at 3-130 tbl. 3.8-1 (requiring inspection of the bridging mat placement, roller compacted concrete mix and bedding mix, and the as-built roller compacted concrete thickness); *see* Ex. NRC-002-R2, Draft Combined License, at C-19.

[123] Ex. NRC-001, Staff Information Paper, at 25; *see* 10 C.F.R. pt. 50, app. A, Criterion 34; Tr. at 95 (Mr. Travis).

[124] *See* Tr. at 83 (Mr. Kitchen), 93-94 (Mr. Travis); *see* 2016 ACRS Letter at 2.

containment refueling water storage tank (IRWST).[125] The PRHR heat exchanger then converts IRWST water to steam, which condenses on the interior surface of the containment vessel, passively transferring residual heat by conduction through the containment wall.[126] In order for this closed-loop cooling to work effectively, sufficient condensed water must return to the IRWST to continue the PRHR process.[127]

The AP1000 design assumes a condensate return rate of ninety percent, with a constant loss rate of ten percent.[128] At the hearing, Duke explained that Westinghouse determined thorough testing involving full-scale mock-ups that the percent of condensate returning to the IRWST would be "much lower" than that assumed in the DCD.[129] The existing approved design, therefore, could not meet the design goal of passively bringing the reactor to a safe shutdown condition of 420 degrees or lower within thirty-six hours following a non-loss-of-coolant accident.[130] In 2013 and 2014, Duke submitted to the NRC proposed design changes to

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[125] 2016 ACRS Letter at 2; *see* Tr. at 93-94 (Mr. Travis); Ex. NRC-001, Staff Information Paper, at 25; Ex. NRC-007B, FSER § 21.1.1.

[126] 2016 ACRS Letter at 2; *see* Ex. NRC-001, Staff Information Paper, at 26; *see* Ex. NRC-007B, FSER § 21.1.1; Tr. at 83 (Mr. Kitchen).

[127] 2016 ACRS Letter at 2; *see* Ex. NRC-007B, FSER § 21.1.1; *see* Tr. at 94 (Mr. Travis).

[128] Tr. at 83 (Mr. Kitchen); *see* 2016 ACRS Letter at 3.

[129] Tr. at 83 (Mr. Kitchen) *see also* Letter from Christopher M. Fallon, Progress Energy, to NRC Document Control Desk (Apr. 18, 2013) (ML13109A533) (regarding submittal of exemption request and design change description for departure from AP1000 DCD Revision 19 to address containment condensate return cooling design) (Condensate Return Exemption Request), attach. 2, Westinghouse APP-GW-GLR-607 (non-proprietary) (Westinghouse APP-GW-GLR-607).

[130] *See* Westinghouse APP-GW-GLR-607 at 2; Ex. NRC-001, Staff Information Paper, at 26.

improve the amount of condensate returned by adding gutters, downspouts, and dams.[131] The proposed design changes would also block drain holes where condensate loss occurred during testing.[132]

The AP1000 design specifies that the PRHR heat exchanger will operate "indefinitely" after a non-loss-of-coolant accident.[133] Duke found that with the proposed design change, the system would operate with a "[seventy-two hour] safety-related period of operation and a [fourteen day] non-safety-related design requirement."[134] The Staff explained that the seventy-two-hour period is consistent with the NRC's approach to compliance with GDC 34.[135] With

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[131] *See* Condensate Return Exemption Request; Letter from Christopher M. Fallon, Duke Energy, to NRC Document Control Desk (June 3, 2014) (ML13156A007) (supplementing the request); Letter from Christopher M. Fallon, Duke Energy, to NRC Document Control Desk (Feb. 7, 2014) (ML14042A034); *see also* Ex. NRC-007B, FSER § 21.1.4, at 21-3; Tr. at 83-84 (Mr. Kitchen).

The two other current applicants for combined licenses referencing the AP1000 design have requested the same exemption and departure. Tr. at 57 (Mr. Akstulewicz); *see* Ex. NRC-001, Staff Information Paper, at 19. And the Staff stated that licensees for AP1000 units under construction have committed to seek license amendments to implement these design changes. Tr. at 57-58 (Mr. Akstulewicz).

[132] Ex. NRC-007B, FSER § 21.1.4, at 21-3.

[133] Ex. NRC-001, Staff Information Paper, at 26; *see* Tr. at 96 (Mr. Travis); AP1000 DCD, Tier 2 Chapter 19—Probabilistic Risk Assessment—Sections 19.59 PRA Results and Insights, at 19.59-80 tbl.19.59-18.

[134] *See* Ex. NRC-004, Staff Pre-Hearing Responses, at 21, *see also* Ex. NRC-007B, FSER §§ 21.1.4.B.1.2.1, 21.1.4.B.1.3; Ex. NRC-001, Staff Information Paper, at 26.

[135] The Staff also confirmed that the seventy-two hour period is consistent with GDC 44. *See* 10 C.F.R. pt. 50, app. A, Criterion 44 (requiring that each plant design include a system to transfer heat from safety-related structures, systems, and components under normal operating and accident conditions with sufficient redundancies to ensure operation); "Regulatory Treatment of Nonsafety Systems for Passive Advanced Light Water Reactors," NUREG-0800, Standard Review Plan 19.3, rev. 0 (June 2014) (ML14035A149); *see also* Ex. NRC-001, Staff Information Paper, at 26.

regard to the fourteen-day duration, the Staff stated that it had verified the calculations that Duke provided, although it noted that "[o]peration of the [passive core cooling system] for [fourteen] days in closed loop mode is not required to satisfy Commission regulations."[136] Further, at the hearing, the Staff explained that its analyses confirmed that the PRHR heat exchanger will perform safely with a condensate return rate even lower than the rate proposed in the departure.[137] The Staff stated that the system as a whole can still provide indefinite performance by switching to open-loop cooling by actuating the automatic depressurization system.[138]

The Staff testified that the ACRS has reviewed the Staff's evaluation of this design change, found that the Staff's analysis confirmed Westinghouse's calculations, and concluded that the departure was necessary for the certified design to perform as planned.[139] Additionally, the Staff stated that Duke responded to a number of requests for additional information on this topic and that Duke updated its FSAR to track changes associated with these requests.[140] As a

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We have previously approved the Staff's use of the seventy-two-hour safety-related period of operation of passive safety systems. *See, e.g.,* Staff Requirements—SECY-95-132—Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Designs (SECY-94-084) (June 28, 1995) (ML003708019).

[136] Ex. NRC-007B, FSER § 21.1.4.B.1.3; *see* "Audit Summary, Review of Levy Nuclear Plant, Units 1 and 2, Design Change Related to the Containment Condensate Return Pathway" (July 2015) (ML15187A248).

[137] Tr. at 98-99 (Mr. Travis).

[138] *Id.* at 99 (Mr. Travis).

[139] *Id.* at 97 (Mr. Travis); *see* 2016 ACRS Letter at 2-3.

[140] Tr. at 97 (Mr. Travis).

result of its review, the Staff concluded that the proposed condensate return system design change conforms to our regulatory requirements.[141]

2. Environmental Issues

The Staff's environmental review considered information from Duke's Environmental Report; consultation with federal, state, tribal, and local agencies; the Staff's independent review; and the Staff's consideration of comments received during the public scoping process and the comment period on the Draft EIS. At the hearing, the Staff addressed two particular alternative sites and the U.S. Fish and Wildlife Service (Fish and Wildlife) Biological Opinion. We briefly address below those issues as well as two other matters that were addressed at the hearing—the proposed project's impacts to wetlands and non-concurrences that were filed during the Staff's environmental review.

a. U.S. Fish and Wildlife Service Biological Opinion

Section 7 of the Endangered Species Act requires federal agencies to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any listed endangered or threatened species or designated critical habitat.[142] This process requires consultation with Fish and Wildlife or the National Marine Fisheries Service (NMFS)—or both—for actions that "may affect" listed species.[143] The Staff initiated consultation

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[141] Ex. NRC-007B, FSER § 21.1.4.A.3; *see* Tr. at 97 (Mr. Travis). Duke and the Staff responded to several additional pre-hearing questions regarding this design change, including questions related to the review process for the departure, the likelihood of certain protective screens becoming blocked, the use of extrapolated predictions of condensate return losses, and whether final position of the polar crane will affect condensate return. *See* Ex. DEF-003, Duke Pre-Hearing Responses, at 31-43; Ex. NRC-004, Staff Pre-Hearing Responses, at 22-26.

[142] 16 U.S.C. § 1536.

[143] 50 C.F.R. § 402.14(a).

with Fish and Wildlife and NMFS in 2008.[144] During the consultation, the Staff submitted biological assessments to both agencies.[145] NMFS concurred with NRC's conclusion that the Levy project "may affect but is not likely to adversely affect" species under its jurisdiction.[146] This concluded the consultation and fulfilled the Staff's obligations under section 7 of the Endangered Species Act for listed species and critical habitats under NMFS's purview.[147]

For its part, Fish and Wildlife concluded that issuance of the licenses would adversely affect a bird species, the Florida scrub-jay.[148] Accordingly, it recommended additional surveys for the species and ultimately issued a Biological Opinion for the project, which identifies terms and conditions for the protection of the Florida scrub-jay.[149] The Staff and Fish and Wildlife cooperated to develop environmental protection plan conditions, which will be part of each COL and will implement those terms and conditions.[150] The environmental protection plan provides

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[144] Ex. NRC-001, Staff Information Paper, at 27. *See* Tr. at 118 (Ms. Sutton).

[145] Letter from Robert G. Schaaf, NRC, to Linda Walker, Fish and Wildlife (Aug. 5, 2010) (ML102020483); Ex. NRC-009C, Final EIS, app. F, at F-119 to F-194 (biological assessment submitted to Fish and Wildlife); Letter from Robert G. Schaaf, NRC, to David Bernhart, NMFS (Aug. 5, 2010) (ML102020516); Ex. NRC-009C, Final EIS, app. F, at F-65 to F-117 (biological assessment submitted to NMFS).

[146] Letter from Roy E. Crabtree, Regional Administrator, NMFS, to Robert G. Schaaf, NRC and Gordon A. Hambrick, III, Corps (Nov. 26, 2010) (ML103370190) (concluding NMFS consultation); *see also* Tr. at 119 (Ms. Sutton).

[147] Ex. NRC-001, Staff Information Paper, at 27; *see also* Tr. at 119 (Ms. Sutton).

[148] Ex. NRC-009C, Final EIS, app. F, at F-195 to F-221; *see* Tr. at 119 (Ms. Sutton).

[149] Ex. NRC-009C, Final EIS, app. F, at F-216; *see* Ex. NRC-001, Staff Information Paper, at 27; Tr. at 119-20 (Ms. Sutton). The Staff has not previously received a Biological Opinion for a new reactor license application. Ex. NRC-001, Staff Information Paper, at 27.

[150] Ex. NRC-001, Staff Information Paper, at 27; Tr. at 120-21 (Ms. Sutton); Ex. NRC-004, Staff Pre-Hearing Response, at 33; *see* Ex. NRC-002-R2, Draft Combined License, app. B.

for protection of the Florida scrub-jay, the sand skink, and the indigo snake, as well as two plant species, Britton's beargrass and longspurred mint.[151]

b. Alternative Sites

As part of its review, the Staff assessed the applicant's process for selecting the Levy site.[152] The applicant first established the region of interest, the "geographic area considered in searching for potential and candidate sites."[153] Next, the applicant selected nine candidate areas, defined as one or more areas within the region of interest remaining after the exclusion from consideration of unsuitable areas.[154] The applicant identified potential sites from among the candidate areas, after which it narrowed the selection to eight candidate sites.[155] From among the candidate sites, the applicant selected five alternative sites and identified the Levy site as the proposed site.[156] The Staff performed an independent analysis of the applicant's site selection process and concluded that the process was reasonable.[157]

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[151] Ex. NRC-002-R2, Draft Combined License, app. B, at B-2 to B-3; *see* Ex. NRC-001, Staff Information Paper, at 27-28; Ex. NRC-004, Staff Pre-Hearing Responses, at 40.

[152] Ex. NRC-009B, Final EIS § 9.3; *see* Ex. NRC-001, Staff Information Paper, at 28; Tr. at 121 (Mr. Kugler).

[153] "Environmental Standard Review Plan," NUREG-1555 (July 2007) § 9.3, at 9.3-1 (ML071800223) (ESRP); *see* Ex. NRC-009B, Final EIS § 9.3.1.1.

[154] Ex. NRC-009B, Final EIS § 9.3.1.2; *see* ESRP § 9.3, at 9.3-1 to 9.3-2.

[155] Ex. NRC-009B, Final EIS §§ 9.3.1.3, 9.3.1.4; *see* ESRP § 9.3, at 9.3-2.

[156] Ex. NRC-009B, Final EIS §§ 9.3.1.5, 9.3.1.6., 9.3.1.7.

[157] *Id.*; *see* Tr. at 121 (Mr. Kugler); *see also* ESRP § 9.3.

After the Staff issued the Draft EIS, the Staff identified and further examined issues regarding the Highlands and Crystal River alternative sites.[158] As to Highlands, the South Florida Water Management District stated in comments on the Draft EIS that water availability was limited at the Highlands site.[159] The Staff considered these comments and determined that the Water Management District's determination was consistent with the Staff's own preliminary conclusion that water use at the Highlands site would result in moderate environmental impacts.[160]

After the Staff published the Final EIS for the Levy application, the Water Management District provided additional information regarding the Highlands site.[161] In the course of its review for another combined license application for a Florida site, the Staff reviewed an alternative site a few miles away from the Highlands site. During that review, the Water Management District discussed the possibility (previously not considered) of developing a water

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[158] Ex. NRC-001, Staff Information Paper, at 28; Tr. at 122 (Mr. Kugler).

[159] Letter from James J. Golden, South Florida Water Management District, to Chief, Rules, Rulemaking and Directives Branch, NRC (Oct. 6, 2010), at 2 (ML102980009) (stating that the Highlands site "could negatively impact hydrological conditions of the [Kissimmee River Restoration] area that is immediately upstream"); *see* Ex. NRC-009B, Final EIS § 9.3.4.2, at 9-156; Ex. NRC-009C, Final EIS, app. E § E.1.24, at E-193 to E-194; *see* Ex. NRC-001, Staff Information Paper, at 29; Ex. NRC-012, Staff Environmental Presentation, at 8; Tr. at 122 (Mr. Kugler).

[160] Ex. NRC-001, Staff Information Paper, at 29; Ex. NRC-012, Staff Environmental Presentation, at 8-9; Tr. at 122 (Mr. Kugler).

[161] Letter from Rod A. Braun, South Florida Water Management District, to Alicia Williamson, NRC (June 29, 2012) (ML12191A171) (Water Management Letter) (providing comments on the pending Turkey Point combined license application); *see* Tr. at 123 (Mr. Kugler); Ex. NRC-001, Staff Information Paper, at 29; Ex. NRC-012, Staff Environmental Presentation, at 9.

source for that alternative site.[162] The Staff stated that a similar strategy—use of "a combination of surface water and groundwater resources to meet the cooling-water needs" to avoid impacts to water restoration projects—could be used at the Highlands alternative site.[163] The Staff found this new information to be consistent with its earlier decision to retain the analysis of the Highlands site in the Final EIS and that no alteration of the analysis for the Highlands alternative site was warranted.[164]

As to the Crystal River site, adjacent to the Crystal River Energy Complex,[165] concurrent with the Staff's environmental analysis, the Corps performed review activities for a Clean Water Act section 404(b)(1) permit application.[166] Then-applicant Progress Energy determined (and communicated to the Corps) that the Crystal River site was impracticable; Progress Energy expressed concern that the concentration of a large fraction of its total generating capacity at one site could be subject to disruption by a single event.[167] Based on this concern, the Corps

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[162] Water Management Letter at 1; *see* Ex. NRC-001, Staff Information Paper, at 29.

[163] "Environmental Impact Statement for Combined Licenses (COLs) for Turkey Point Nuclear Plant Units 6 and 7" (Draft Report for Comment), NUREG-2176, vol. 2 (Feb. 2015) § 9.3.1.7, at 9-42 (ML15055A109); *see id.* § 9.3.4.2, at 9-161; Ex. NRC-004, Staff Pre-Hearing Responses, at 46-47.

[164] Tr. at 123 (Mr. Kugler); Ex. NRC-001, Staff Information Paper, at 29; Ex. NRC-012, Staff Environmental Presentation, at 9.

[165] Tr. at 123 (Mr. Kugler); Ex. NRC-001, Staff Information Paper, at 29; Ex. NRC-012, Staff Environmental Presentation, at 10.

[166] Ex. NRC-001, Staff Information Paper, at 29.

[167] Tr. at 123-24 (Mr. Kugler); Ex. NRC-001, Staff Information Paper, at 30; Ex. NRC-012, Staff Environmental Presentation, at 10. During the Staff's preparation of the Final EIS, the Crystal River Energy Complex had five operating units, including Crystal River Unit 3. Ex. NRC-001, Staff Information Paper, at 29.

did not include Crystal River among the least environmentally damaging practicable alternatives for the purpose of its Clean Water Act review.[168]

The Staff considered the same information in the course of its environmental review but ultimately chose to include Crystal River in the Final EIS's alternative site analysis.[169] The Staff based this decision on the environmental impacts associated with the site and the viability of the site as an alternative for new nuclear construction.[170] In so doing, the Staff noted that Clean Water Act standards differ from the NEPA standards; thus, the Corps' conclusion under the Clean Water Act did not compel the same NEPA determination.[171]

Since the Staff published the Final EIS, operations have permanently ceased at Crystal River Unit 3; Duke also announced plans to retire two coal-fired units and to construct a new natural gas combined cycle plant adjacent to the Crystal River site, resulting in the retirement of 1730 MWe and the addition of 1640 MWe of generating capacity.[172] The environmental review team considered this new information and determined that its conclusions regarding the Crystal

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[168] Letter from Robert Kitchen, Progress Energy, to Gordon Hambrick, III, Corps (June 30, 2010), encl. 2 at 1 (ML101820645); *see* Tr. at 124 (Mr. Kugler); Ex. NRC-012, Staff Environmental Presentation, at 10.

[169] Tr. at 124 (Mr. Kugler); Ex. NRC-001, Staff Information Paper, at 30; Ex. NRC-012, Staff Environmental Presentation, at 11.

[170] Ex. NRC-009B, Final EIS § 9.3.2; *see id.* § 9.3.1.6 (stating that Levy and Crystal River sites were the two highest ranked of the sites the applicant considered); Tr. at 124 (Mr. Kugler); Ex. NRC-001, Staff Information Paper, at 30; Ex. NRC-012, Staff Environmental Presentation, at 11.

[171] Tr. at 124 (Mr. Kugler); Ex. NRC-001, Staff Information Paper, at 30; Ex. NRC-012, Staff Environmental Presentation, at 11.

[172] *See* Letter from Jon A. Franke, Duke Energy, to NRC Document Control Desk (Feb. 20, 2013) (ML13056A005) (providing certification of permanent cessation of power operations and that fuel has been permanently removed from the reactor vessel); *see* Ex. NRC-001, Staff Information Paper, at 30.

River alternative site are unaffected by this information; the site would continue to "have a high concentration of the applicant's generating capacity."[173]

c. Environmental Impacts to Wetlands

The U.S. Environmental Protection Agency (EPA) provided comments on the Draft EIS; these comments centered on wetlands impacts and particularly noted that "changes to the current site layout or application of mitigation measures . . . could reduce the environmental impacts [to wetlands]."[174] The Final EIS reflects that the Staff and the Corps coordinated with EPA to identify mitigation measures for wetlands impacts; these mitigation measures are identified in the Final EIS.[175]

Even taking into account these mitigation measures, the Final EIS finds that a larger area of wetlands on the site itself (approximately 450 acres) will be affected than was identified in the Draft EIS (403 acres).[176] The Staff stated that this change in the Final EIS reflected not greater impacts but rather the use of more accurate wetland delineation data.[177] In the FEIS, the Staff estimated that 668 acres of wetlands may reasonably be impacted, including impacts to offsite wetlands resulting from associated offsite support facilities, as well as impacts to

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[173] Ex. NRC-001, Staff Information Paper, at 30; *see* DEF-003, Duke Pre-Hearing Responses, at 51-52.

[174] Ex. NRC-009C, Final EIS, app. E, at E-84; *see id.*, app. E, at E-84 to E-86.

[175] Ex. NRC-009C, Final EIS, app. E, at E-84; *see* Ex. NRC-009A, Final EIS § 4.3.1.7; Ex. NRC-004, Staff Pre-Hearing Responses, at 42.

[176] Ex. NRC-004, Staff Pre-Hearing Responses, at 42. *Compare* Ex. NRC-009A, Final EIS § 4.3.1, at 4-32, *with* "Draft Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2 (Draft Report for Comment), NUREG-1941, vol. 1 (Aug. 2010) § 7.3.1.1, at 7-22 (ML102140231).

[177] Ex. NRC-004, Staff Pre-Hearing Responses, at 42.

wetlands on the Levy site itself.[178] At the hearing, we asked the Staff whether a reduction in impacts was realized as a result of work done between publication of the Draft EIS and the Final EIS.[179] The Staff stated that, to offset the impacts to wetlands, the applicant purchased credits from wetland mitigation banks, as well as developed a supplemental mitigation plan to create ninety-one acres of wetlands on the Levy site. As a result, the Staff's assessment that the project would have moderate impact on wetlands did not change.[180]

Following the hearing, we asked the Staff "to clarify for the record the extent of wetlands that are expected to be impacted by the proposed [Levy Nuclear Plant] project."[181] The Staff explained that after publication of the Final EIS, the Corps and Duke continued to collaborate to identify wetlands impacts with greater precision for the purpose of completing the review for a Section 404 Clean Water Act permit.[182] These efforts identified twenty-two additional acres of wetlands impacts, bringing the total of wetlands impacts—both onsite and offsite—to 690 acres.[183] The Staff found the increase in impacts did not affect the Staff's conclusion in the Final EIS that environmental impacts to wetlands would be moderate.[184]

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[178] Ex. NRC-009A, Final EIS, § 4.3.1.8, at 4-70; *see* Ex. NRC-014, NRC Staff Response to Commission Post-Hearing Question (Aug. 11, 2016), attach. (ML16258A236) (Staff Post-Hearing Response).

[179] Tr. at 125-26 (Chairman Burns).

[180] *Id.* at 127 (Ms. Sutton); *see* Ex. NRC-007B, Final EIS § 7.3.1.

[181] Post-Hearing Order at 2.

[182] Ex. NRC-014, Staff Post-Hearing Response, attach. at 2.

[183] *Id.*

[184] *Id.*

d. Staff Non-Concurrences Associated with the General License to Construct an Independent Spent Fuel Storage Installation

During the Staff's environmental review, two related non-concurrences were filed by members of the Staff working on the review.[185] Both non-concurrences related to whether additional steps were warranted under NEPA, the National Historic Preservation Act, and the Endangered Species Act, in view of the possibility that an independent spent fuel storage installation (ISFSI) could be constructed on the site at some future time.[186] In response to a pre-hearing question, the Staff advised that agency management reviewed the concerns raised by the non-concurrences and concluded that no additional actions were required to meet the NRC's statutory responsibilities. Nonetheless, in preparation for the mandatory hearing, the Staff held an additional conversation with the Florida State Historic Preservation Officer (SHPO).[187] In particular, the NRC Staff notified the SHPO that the Levy project could include an ISFSI.[188] The Staff stated at the hearing that the SHPO was not concerned with the potential

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[185] The non-concurrences, NCP-2016-006 and NCP-2016-008, which are not publicly available, were attached to the Staff's Information Paper.

[186] NRC regulations grant a general license to construct and operate an ISFSI to certain licensees, including combined license holders. The non-concurrence centered on the concern that the consultations on the project did not include a specific discussion that an ISFSI potentially could be constructed onsite under the general license. Tr. at 133-36; *see* 10 C.F.R. § 72.210.

[187] Tr. at 138-39. Shortly before the hearing, the Florida SHPO also transmitted to the NRC a letter reiterating its view that the project review was conducted in accordance with NHPA Section 106 and its implementing regulations. *See* Ex. NRC-013, Letter from Timothy A. Parsons, Director, Division of Historical Resources and State Historic Preservation Officer, Florida Department of State, to Rochelle C. Bavol, Acting Secretary, NRC (July 27, 2016) (ML16258A235).

[188] Tr. at 136.

construction of an ISFSI because he considered the consultation to include the entire site.[189] According to the Staff, consultation included all ground-disturbing activities across the entire site and is focused on properly identifying and surveying all areas that may be disturbed rather than the specific activity occurring at any given location.[190] The Staff further represented that the non-concurring staff members' concerns were resolved by this additional outreach step, and that the non-concurring individuals ultimately concurred in the Staff's review.[191]

C. Findings

We have conducted an independent review of the sufficiency of the Staff's safety findings, with particular attention to the topics discussed above. Our findings, however, are based on the entire record. Based on the evidence presented in the uncontested hearing, including the Staff's review documents and the testimony provided, we find that the applicable standards and requirements of the AEA and NRC regulations have been met. The required notifications to other agencies or bodies have been duly made.[192] We find that Duke is technically and financially qualified to engage in the activities authorized. We further find that there is reasonable assurance that the facility will be constructed and operated in conformity

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[189] *Id.* at 138.

[190] *Id.* at 139-40.

[191] Ex. NRC-004, Staff Pre-Hearing Responses, at 44.

[192] The Staff notified the Florida Public Service Commission about the combined license application in 2011. Ex. NRC-001, Staff Information Paper, at 31 (citing Letter from Brian Anderson, NRC, to Ann Cole, Florida Public Service Commission (Dec. 15, 2011) (ML112521258)). The Staff published notices of the application in *The Newscaster/Nature Coast News*, the *Ocala Star Banner*, the *Levy County Journal*, and the *Citrus County Chronicle*. *Id.* In addition, pursuant to 10 C.F.R. § 50.43(a)(3), the Staff published notices of the application in the *Federal Register* on November 18, 2011, November 25, 2011, December 2, 2011, and December 9, 2011 (at 76 Fed. Reg. 71,608; 76 Fed. Reg. 72,725; 76 Fed. Reg. 75,566; and 76 Fed. Reg. 77,021, respectively). Ex. NRC-001, Staff Information Paper, at 31.

with the licenses, the provisions of the AEA, and the NRC's regulations and that issuance of the licenses will not be inimical to the common defense and security or to the health and safety of the public. In addition, we find that the Staff's proposed regulatory exemptions meet the standards in 10 C.F.R. § 50.12. And finally, we find that the Staff's proposed license conditions are appropriately drawn and sufficient to provide reasonable assurance of adequate protection of public health and safety.

We also conducted an independent review of the Staff's environmental analysis in the Final EIS, taking into account the particular requirements of NEPA. NEPA section 102(2)(A) requires agencies to use "a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts" in decision-making that may impact the environment.[193] We find that the environmental review team used the systematic, interdisciplinary approach that NEPA requires.[194] The environmental review team consisted of individuals with expertise in disciplines including ecology, geology, hydrology, radiological health, socioeconomics, and cultural resources.[195]

NEPA section 102(2)(C) requires us to assess the relationship between short-term uses and long-term productivity of the environment, to consider alternatives, and to describe the unavoidable adverse environmental impacts and the irreversible and irretrievable commitments

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[193] 42 U.S.C. § 4332(2)(A).

[194] *See, e.g.*, Tr. at 60-67 (Mr. Lee) (providing an overview of the Staff's environmental review methodology); Ex. NRC-010, Staff Overview Presentation, at 11-20.

[195] Ex. NRC-009C, Final EIS, app. A. The team consisted of individuals from the NRC and the Corps. *Id.*

of resources associated with the proposed action.[196] The discussion of alternatives is in Chapter 9 of the Final EIS; the other items are discussed in Chapter 10.[197] The review team found the principal short-term benefit of the project to be the production of electrical energy.[198] The review team also found that the site would have much greater economic productivity hosting the reactors than it would if used for agriculture or other probable uses of the site.[199] While the review team noted that there would be an impact to long-term productivity when the plant is not immediately dismantled at the end of operation, the team found that "the enhancement of regional productivity resulting from the electrical energy produced by the plant is expected to generate a correspondingly large increase in regional long-term productivity that would not be equaled by any other long-term use of the site."[200]

NEPA section 102(2)(E) calls for agencies to study, develop, and describe appropriate alternatives.[201] The alternatives analysis is the "heart of the environmental impact statement."[202] Based on the discussion in the Final EIS and the Staff's testimony at the hearing, we find that the Staff identified an appropriate range of alternatives with respect to alternative power sources, alternative sites, and alternative system designs and adequately described the

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[196] 42 U.S.C. § 4332(2)(C)(ii)-(v).

[197] *See* Ex. NRC-009B, Final EIS, chs. 9-10.

[198] *Id.* § 10.3, at 10-13 to 10-14.

[199] *Id.* § 10.3, at 10-14.

[200] *Id.* The review team also noted that "most long-term impacts resulting from land-use preemption by plant structures can be eliminated by removing these structures or by converting them to other productive uses." *Id.*

[201] 42 U.S.C. § 4332(2)(E).

[202] 10 C.F.R. pt. 51, app. A § 5.

environmental impacts of each alternative.[203] We find reasonable the Staff's conclusion that none of the alternatives considered is environmentally preferable to the proposed action.[204]

Chapter 10 of the Final EIS includes tables listing the unavoidable adverse environmental impacts during preconstruction, construction, and operation, along with actions to mitigate those impacts.[205] The review team found that the unavoidable impacts during preconstruction and construction would be small for the following resource areas: water use, water quality, ecological resources (aquatic), demography, environmental justice, historic and cultural resources, meteorology and air quality, nonradiological health, radiological health, and nonradioactive waste.[206] The impacts for physical and aesthetic resources would be small to moderate, with the impacts from only NRC-regulated activities being small.[207] The impacts for infrastructure and community services would be small to moderate.[208] And the impacts for land use and ecological (terrestrial) would be moderate, with the impacts from only NRC-regulated activities being small.[209] The impacts for economics would be beneficial and small to moderate.[210]

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[203] *See, e.g.,* Tr. at 121-25 (Mr. Kugler); Ex. NRC-009B, Final EIS, ch. 9.

[204] *See, e.g.,* Tr. at 121 (Mr. Kugler); Ex. NRC-009B, Final EIS § 9.2.5, at 9-27; *id.* § 9.3.6.3, at 9-243; *id.* § 9.4, at 9-251.

[205] Ex. NRC-009B, Final EIS, tbls.10-1 & 10-2.

[206] *Id.* tbl.10-1.

[207] *Id.*

[208] *Id.*

[209] *Id.*

[210] *Id.* Beneficial economic impacts from NRC-regulated activities are small.

For operation, the review team found that the unavoidable adverse impacts would be small for all resource areas except ecological (terrestrial), physical and aesthetic, and infrastructure and community services, where the impacts would be small to moderate.[211] And the impacts for economics would be beneficial and small to large.[212]

Finally, with regard to irreversible and irretrievable commitments of resources, the review team concluded that disposal of radioactive and nonradioactive wastes would require a long-term or irreversible commitment of land and over 28,600 gallons per minute of cooling water would be lost through evaporation during operation.[213] While there would be both temporary and long-term changes to the abundance and distribution of terrestrial biota at the site, populations of these species would not suffer adverse effects despite localized permanent loss of habitat.[214]

With respect to aquatic biota, the review team expects that preconstruction and construction would temporarily adversely affect the abundance and distribution of the aquatic community including essential fish habitat in the Cross Florida Barge Canal near the cooling-water intake structure, barge slip, and discharge pipeline placement.[215] But the review team predicts that operation activities would not adversely impact the abundance and distribution of the aquatic community, including essential fish habitat in both the Cross Florida Barge Canal

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[211] *Id.* tbl.10-2.

[212] *Id.*

[213] *Id.* §§ 10.4.1.1, 10.4.1.2.

[214] *Id.* § 10.4.1.3

[215] *Id.*

and in the Crystal Bay shore area near the Gulf of Mexico.[216] The review team expects that the aquatic habitat and populations would recover after the units cease operations and are decommissioned.[217]

The review team also concluded that during the construction of the plant, the materials used, "while irretrievable, would be of small consequence with respect to the availability of such resources."[218] With regard to operation of the proposed units, the review team determined that uranium would be irretrievably committed, but the amount would be negligible in comparison to the availability of uranium ore and existing stockpiles of highly enriched uranium in the United States and Russia that could be processed into fuel.[219]

We must weigh these unavoidable adverse environmental impacts and resource commitments—the environmental "costs" of the project—against the project's benefits.[220] Considering the need for power in the region and the expected increase in productivity, jobs and tax revenue as described in the hearing and in the Final EIS, we find that the benefits of the project outweigh the costs described above. Moreover, we have considered each of the requirements of NEPA section 102(2)(C) and find nothing in the record that would contradict the Staff's conclusions on those requirements.

In sum, for each of the environmental topics discussed at the hearing and in this decision, we find that the Staff's review was reasonably supported in logic and fact and

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[216] *Id.*

[217] *Id.*

[218] *Id.* § 10.4.2.

[219] *Id.*

[220] 10 C.F.R. § 51.107(a).

sufficient to support the Staff's conclusions. Based on our review, we also find that the remainder of the Final EIS was reasonably supported and sufficient to support the Staff's conclusions.

Therefore, as a result of our review of the Final EIS, and in accordance with the Notice of Hearing for this uncontested proceeding, we find that the requirements of NEPA section 102(2)(A), (C), and (E), and the applicable regulations in 10 C.F.R. Part 51, have been satisfied with respect to the combined license application. We independently considered the final balance among conflicting factors contained in the record of this proceeding. We find, after weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, that the combined licenses should be issued.

III. CONCLUSION

We find that the Staff's review of Duke's combined license application was sufficient to support the findings in 10 C.F.R. §§ 52.97(a) and 51.107(a). We *authorize* the Director of the Office of New Reactors to issue the combined licenses for the construction and operation of Levy Nuclear Plant, Units 1 and 2. We *authorize* the Staff to issue the record of decision.

IT IS SO ORDERED.

For the Commission

NRC Seal

/RA/

Annette L. Vietti-Cook
Secretary of the Commission

Dated at Rockville, Maryland,
this 20th day of October 2016.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **COMMISSION NOTICE OF ERRATUM FOR CLI-16-16** have been served upon the following persons by Electronic Information Exchange.

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[Original signed by Clara Sola]
Office of the Secretary of the Commission

Dated at Rockville, Maryland
this 1st day of December 2016

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of DUKE ENERGY FLORIDA, LLC (Levy Nuclear Plant, Units 1 and 2)	Docket Nos. 52-029-COL 52-030-COL

NOTICE OF ERRATUM

On page 20 of CLI-16-16, issued on October 20, 2016, the phrase "design basis event" should read "beyond-design-basis event." The corrected decision, attached here, will replace the versions containing the error in ADAMS and on the NRC's public website.

IT IS SO ORDERED.

NRC Seal

/RA/

Annette L. Vietti-Cook
Secretary of the Commission

Dated at Rockville, Maryland,
this 1st day of December 2016.