

20.0 REQUIREMENTS RESULTING FROM FUKUSHIMA NEAR-TERM TASK FORCE RECOMMENDATIONS

This chapter addresses the Fukushima Near-Term Task Force (NTTF) recommendations that are applicable to the Turkey Point Units 6 and 7 Combined License (COL) application, submitted by the applicant, Florida Power and Light (FPL). The applicable recommendations address four topics: reevaluations of the seismic and flood hazard (related to Recommendation 2.1), mitigation strategies for beyond-design-basis external events (related to Recommendation 4.2), spent fuel pool (SFP) instrumentation (related to Recommendation 7.1), and emergency preparedness staffing and communications (related to Recommendation 9.3).

Background

In response to the events at Fukushima resulting from the March 11, 2011, Great Tohoku earthquake and tsunami in Japan, the U.S. Nuclear Regulatory Commission (NRC) established the NTTF to conduct a systematic and methodical review of NRC processes and regulations to determine whether the agency should make additional improvements to its regulatory system and to make recommendations to the Commission for policy direction. In July 2011, the NTTF issued a 90-day report, SECY-11-0093, "Near Term Report and Recommendations for Agency Actions Following the Events in Japan," identifying 12 recommendations. On September 9, 2011, in SECY-11-0124, "Recommended Actions to Be Taken Without Delay From NTTF Report," the staff provided to the Commission for its consideration NTTF recommendations that can and, in the staff's judgment, should be initiated, in part or in whole, without delay. In SECY-11-0124 the staff identified and concluded that the following subset of actions had the greatest potential for safety improvement in the near-term:

1. Recommendation 2.1: Seismic and Flood Hazard Reevaluations
2. Recommendation 2.3: Seismic and Flood Walkdowns
3. Recommendation 4.1: Station Blackout Regulatory Actions
4. Recommendation 4.2: Equipment covered under Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(hh)(2)
5. Recommendation 5.1: Reliable Hardened Vents for Mark I Containments
6. Recommendation 8: Strengthening and Integration of Emergency Operating Procedures, Severe Accidents Management Guidelines, and Extensive Damage Mitigation Guidelines
7. Recommendation 9.3: Emergency Preparedness Regulatory Actions (staffing and communications).

On October 3, 2011, in SECY-11-0137, "Prioritization of Recommended Actions to Be Taken in Response to Fukushima Lessons Learned," the staff identified two actions in addition to the actions discussed in SECY-11-0124 that had the greatest potential for safety improvement in the near-term. The additional actions are:

The staff determined that Recommendation 2.3 was not applicable to the Turkey Point Units 6 and 7 COL because the plant is not yet constructed, and Recommendation 5.1 was not applicable because it applies to boiling water reactor plant designs with Mark I and Mark II Containments. Recommendations 4.1 and 8 did not need to be further considered because SECY-11-0137 and its associated SRM direct that regulatory action associated with them be initiated through rulemaking.

In SECY-12-0025, the staff stated that it would request all COL applicants to provide the information required by the orders and requests for information through the review process. Accordingly, for the Turkey Point Units 6 and 7 COL application, the staff issued request for additional information (RAI) Letter No. 58 (ADAMS Accession No. ML12122A973) dated May 1, 2012. The May 1, 2012, RAI letter related to Implementation of Fukushima Near-Term Task Force Recommendations pertaining to seismic hazard reevaluation, mitigation strategies for beyond-design-basis external events, spent fuel pool instrumentation, and emergency preparedness staffing and communications based on Recommendations 2.1, 4.2, 7.1, and 9.3, as modified by SRM-SECY-12-0025. The following sections of this chapter present the staff's safety evaluation related to these areas.

20.1 Mitigation Strategies for Beyond-Design-Basis External Events (Based on Recommendation 4.2)

20.1.1 Introduction

On March 12, 2012, the staff issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ADAMS Accession No. ML12054A735), which directed then-current licensees to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities for a beyond-design-basis external event. Order EA-12-049 required a three-phase approach for mitigation of beyond-design-basis external events, as follows: The initial phase involves the use of installed equipment and resources to maintain or restore core cooling, containment, and SFP cooling without alternating current (ac) power. The transition phase involves providing sufficient, portable, onsite equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from offsite. The final phase involves obtaining sufficient offsite resources to sustain those functions indefinitely.

In SECY-12-0025, the staff indicated that it would ensure that any additional actions necessary to increase the capability of currently licensed plants to mitigate beyond-design-basis external events would be addressed for design certification and COL applications submitted under 10 CFR Part 52 that were then under active staff review prior to certification or licensing. The staff also indicated that it would request all COL applicants to provide the information required of a licensee by any such order. SECY-12-0025 notes that the AP1000 standard design (which is referenced for Turkey Point Units 6 and 7) includes passive design features that provide core cooling, containment, and SFP cooling capabilities for 72 hours, without reliance on ac power. The AP1000 design also includes equipment to maintain required safety functions in the long term (beyond 72 hours to 7 days). As such, a COL applicant referencing the AP1000 standard design needs to include in its application provisions to address the final phase defined in Order EA-049.

NRC Interim Staff Guidance (ISG) JLD-ISG-2012-01, Revision 0, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," endorses with clarifications, the methodologies described in the industry guidance document, Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0. JLD-ISG-2012-01 describes an acceptable approach for developing mitigation strategies for beyond-design-basis external events at nuclear power plants based on the guidance in NEI 12-06. The following documents the staff's evaluation of the applicant's proposal for mitigation strategies for a beyond-design-basis external event at proposed Turkey Point Units 6 and 7 in response to the above matters consistent with Order EA 12-049.

20.1.2 Summary of Application

The Turkey Point Units 6 and 7 Final Safety Analysis Report (FSAR), Revision 7, provides information on systems used to establish and sustain core cooling, containment, and SFP cooling capabilities for the proposed Turkey Point Units 6 and 7. For example, Section 6.3, "Passive Core Cooling System," of the FSAR discusses the passive core cooling system (PXS), which provides emergency core cooling following postulated design-basis events, and incorporates by reference Section 6.3 of the AP1000 design control document (DCD) Tier 2 with identified departures and supplements. The PXS is a seismic category 1, safety-related system that can establish and maintain safe shutdown conditions for 72 hours after an event without operator action and without the use of ac power and is described in AP1000 DCD Tier 2, Section 6.3. FSAR Section 6.2, "Containment Systems addresses containment systems and incorporates by reference Section 6.2.2, "Passive Containment Cooling System," of the AP1000 DCD Tier 2. The passive containment cooling system (PCS) is also a safety-related system and is located within the shield building structure, which is designed to withstand the effects of natural phenomena. The PCS maintains the containment temperature and pressure within its design limits by providing passive cooling of the containment vessel. The system has sufficient capacity to provide for 72-hour cooling without the need for ac power or operator action and is described in AP1000 DCD Tier 2, Section 6.2. FSAR Section 9.1.3, "Spent Fuel Pool Cooling System," addresses spent fuel pool cooling and describes how passive cooling of the spent fuel is achieved using the water inventory of the SFP and makeup from the cask washdown pit. The cooling of the spent fuel uses only safety-related makeup, and does not rely on active components or ac power.

As discussed above, in SECY-12-0025, the NRC staff indicated that it would review information provided by COL applicants to describe their mitigation strategies for beyond-design-basis external events. In light of SECY 12-0025, the staff issued RAI 1.05-2 in Letter No. 58 (ADAMS Accession No. ML12122A973) dated May 1, 2012, to request information regarding the Turkey Point Units 6 and 7 mitigation strategies to sustain core cooling, containment, and SFP cooling capabilities functions indefinitely.

The applicant provided an initial response to the RAI in a letter dated June 29, 2012 (ADAMS Accession No. ML121850685). In its initial response, the Turkey Point Units 6 and 7 COL applicant proposed a license condition related to mitigation strategies for beyond-design-basis conditions resulting from an extended loss of ac power and loss of access to the normal heat sink (referred to below as an ELAP event). Subsequent to that response, the applicant provided the NRC staff with the general mitigation strategy that will be used by Turkey Point Units 6 and 7, including the strategies for initial (0 to 72 hours) mitigation, in a letter dated October 29, 2015

(ADAMS Accession No. ML15306A159). The letter, which was a supplemental response to RAI Letter No. 58, provided the staff with a Westinghouse report (designated as APP-GW-GLR-171, "AP1000 Flex Integrated Plan," for the publicly available version) that included a description of the mitigating strategies for beyond-design-basis external events that will be applied at Turkey Point Units 6 and 7.

In Item 12, "Fukushima Response Actions," of Part 10, "Proposed License Conditions (including inspection, test, analysis, and acceptance criteria (ITAAC))," of the Turkey Point Units 6 and 7 COL application, the applicant proposed a license condition related to this subject.

20.1.3 Regulatory Basis

The regulatory basis for the staff review of mitigation strategies for beyond-design-basis external events is as follows:

- The Atomic Energy Act of 1954, as amended, Section 161, "General Provisions," which authorizes the Commission to regulate the possession and use of special nuclear materials as necessary or desirable to protect public health and to promote the common defense and security.
- 10 CFR 52.97(a)(1), which authorizes the Commission to issue a COL if it finds, among other things, that issuance of the license will not be inimical to the health and safety of the public. This regulation applies here because the Commission found in Order EA-12-049 that it is necessary for power reactor licensees to develop, implement and maintain guidance and strategies to restore or maintain core cooling, containment, and SFP cooling capabilities in the event of a beyond-design-basis external event in order to ensure adequate protection of the public health and safety.

The staff's guidance for beyond-design-basis external event mitigation strategies is as follows:

- SRM-SECY-12-0025, "Staff Requirements – SECY-12-0025 – Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," dated March 9, 2012, approves issuance of orders for beyond-design-basis external events, as necessary for ensuring continued adequate protection under the 10 CFR 50.109(a)(4)(ii) exception to the Backfit Rule.
- JLD-ISG-2012-01, Revision 0, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," issued August 29, 2012, endorses NEI 12-06, Revision 0, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" (issued August 21, 2012), with exceptions/clarifications.
- Order EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012. Although Order EA-12-049 does not apply to Turkey Point Units 6 and 7, the staff followed the current NRC and industry guidance for establishing mitigation strategies for beyond-design-basis external events at AP1000 reactors in evaluating the equipment used as part of the mitigation strategy for Turkey Point Units 6 and 7.

20.1.4 Technical Evaluation

The NRC staff reviewed the information submitted by Florida Power and Light (FPL) regarding its proposed mitigation strategies for beyond-design-basis conditions resulting from an ELAP event. To assess whether the proposed mitigation strategies provided an acceptable approach, the staff applied JLD-ISG-2012-01, Revision 0, which endorses, with clarifications, the methodologies described in industry guidance document NEI 12-06, Revision 0. Appendix F, "Guidance for AP1000 Design." NEI 12-06 outlines the process to be used by AP1000 COL licensees and applicants to define and implement the mitigation strategies for beyond-design-basis conditions resulting from an ELAP event.

Section 7.0, "Guidance for AP1000 Design," of JLD-ISG-2012-01 states that the guidance in Appendix F of NEI 12-06 provides an acceptable means to meet the requirements of Order EA-12-049 or license conditions imposing similar requirements for the AP1000 reactor design. Appendix F to NEI 12-06 specifies that the underlying strategies for coping with ELAP events for AP1000 plants involve a three-phase approach as follows:

1. Initial coping through installed plant equipment without ac power or makeup to the ultimate heat sink. From 0 to 72 hours, the certified AP1000 design includes passive systems that provide core cooling, containment, and SFP cooling.
2. Following the 72-hour passive system coping time, support is necessary to continue passive system cooling. From 3 to 7 days, this support can be provided by installed plant ancillary equipment or by offsite equipment installed to connections provided in the AP1000 design.
3. To extend the passive system cooling time beyond 7 days to an indefinite time, offsite assistance is necessary, such as the delivery of diesel fuel oil. Appendix F includes provisions related to the qualification and use of equipment intended to mitigate an ELAP event.

As mentioned in Appendix F to NEI 12-06, APP-GW-GLR-171, referenced above, indicates that core cooling, containment, and SFP cooling is provided for the initial time period of 0 to 72 hours through installed, safety-related plant equipment that is part of the certified design. These systems do not rely on ac power or on access to any external water sources, because the containment vessel and the passive containment cooling system serve as the safety-related ultimate heat sink. The NRC staff reviewed and found acceptable the site-specific functional design, qualification, and inservice testing program descriptions for this safety-related equipment for Turkey Point Units 6 and 7 as discussed in the applicable sections of this report.

Following the initial 72-hour coping period, APP-GW-GLR-171 indicates that support is necessary to continue passive system cooling, and this support can be provided by installed ancillary equipment or by offsite equipment interfacing with installed plant connections. For example, additional inventory for the passive containment cooling system (PCS) and SFP can be supplied from the onsite passive containment cooling ancillary water storage tank (PCCAWST) using the onsite PCS recirculation pumps, powered using the onsite ancillary diesel generators or offsite replacement generators. The installed ancillary equipment and stored cooling water are capable of supporting passive system cooling from 3 days after the

event to 7 days after the event. Beyond this time period, the report indicates that offsite assistance and resources are needed. For indefinite coping after 7 days, an offsite pump (PCCAWST makeup pump) and appropriate connection materials to refill the PCCAWST from the closest water source will be provided. In the event that the PCS recirculation pumps are unavailable, a second self-powered, offsite pump (PCS/SFP makeup pump) and appropriate connection materials will be available.

APP-GW-GLR-171 also includes several additional provisions related to the qualification and use of commercially procured equipment that will be used 72 hours after an ELAP event:

- Programmatic controls for this equipment include quality attributes, equipment design, equipment storage, procedure guidance, maintenance, testing, training, staffing, and configuration control.
- The quality assurance (QA) provisions in AP1000 DCD Tier 2, Table 17-1, "Quality Assurance Program Requirements for Systems, Structures, and Components Important to Investment Protection," will be applied to this AP1000 FLEX equipment.
- The graded approach to availability and testing as shown in AP1000 DCD Tier 2, Section 16.3, "Investment Protection," will be applied to the FLEX equipment.
- The design and maintenance of the FLEX equipment will be in accordance with Section 11.2, "Equipment Design," and Section 11.5, "Maintenance and Testing," respectively, of NEI 12-06.
- AP1000 DCD Tier 2, Section 1.9.5.4, "Additional Licensing Issue – Post-72 Hour Support Actions," describes procedures that address actions that would be necessary 72 hours subsequent to an ELAP event to maintain core, containment, and SFP cooling for an indefinite period of time.

The NRC staff reviewed the applicable sections of the Turkey Point Units 6 and 7 FSAR, along with their respective AP1000 DCD sections, the FSER for the AP1000 design certification, and other sections of this report to verify the above information. For example, Table 8.1-201, "Site-Specific Guidelines for Electric Power Systems," in the Turkey Point Units 6 and 7 FSAR indicates that station blackout is addressed as a design issue in the AP1000 DCD. The staff reviewed station blackout as part of its review of Chapter 8 of the AP1000 DCD Tier 2. Section 8.5.2.1, "Station Blackout," of the AP1000 FSER states that the AP1000 safety-related passive systems automatically establish and maintain safe-shutdown conditions for the plant following design-basis events, including the loss of ac power sources, and the passive systems can maintain these safe-shutdown conditions after design-basis events for 72 hours, without operator action, following a loss of both onsite and offsite ac power sources. The staff reviewed the applicability of this FSER conclusion to Turkey Point Units 6 and 7.

Section 8.3.2, "Direct Current Power and Uninterruptible Power Systems" of the AP1000 FSER, Supplement 2, states that Class 1E batteries will be sized adequately to perform their safety functions as designed and that ITAAC verifying that the batteries are adequately designed are identified in AP1000 DCD Tier 1, Table 2.6.3-3. APP-GW-GLR-171 discusses the connections for the onsite ancillary diesel generators and the offsite portable generators. Electrical isolation

between safety related power systems and power sources utilized in Phase 3 is addressed in APP-GW-GLR-171, which states that voltage regulating transformers are the connection point for the offsite portable generators. Section 8.3.2, "Direct Current Systems" of this document discusses how the voltage regulating transformer in combination with fuses and/or breakers will interrupt the input or output (ac) current under faulted conditions to achieve electrical isolation. As part of the license condition, part (c), as set forth in Section 20.1.5 of this SER, the capacity of the offsite portable generators will be assessed by FPL to ensure they are capable of providing power to the necessary loads described in AP1000 DCD Tier 2 Table 8.3.1-4, "Post-72 hours nominal load requirements." Section 9.5.3 of this document addresses plant lighting systems, specifically emergency lighting which provides illumination in areas where emergency operations are performed.

Emergency core cooling for the Turkey Point Units 6 and 7 is accomplished using the AP1000 PXS, which is described in Section 6.3 of the AP1000 DCD Tier 2. The Turkey Point Units 6 and 7 FSAR specifies that Section 6.3 of the AP1000 DCD Tier 2 was incorporated by reference with identified departures. The staff reviewed Turkey Point Units 6 and 7 FSAR Section 6.3, and finds that the departures have no impact on the capability of the PXS to establish and maintain safe-shutdown conditions for 72 hours following a loss of both onsite and offsite ac power sources, as explained in Section 6.3 of this FSER. Therefore, the staff finds that core cooling for the initial phase (0-72 hours) of mitigation for Turkey Point Units 6 and 7 will be accomplished by its safety-related PXS, per the Turkey Point Units 6 and 7 licensing basis.

The mitigation of a station blackout, as required by 10 CFR 50.63, addresses the capability of a nuclear power plant to provide adequate core cooling during a loss of ac power. In addition to core cooling, the recommendations for mitigation strategies for beyond-design-basis external events also address containment function and SFP cooling.

The control of containment pressure and temperature for Turkey Point Units 6 and 7 is accomplished using the AP1000 PCS, which is described in Section 6.2.2, "Passive Containment Cooling System," of the AP1000 DCD Tier 2. The staff observes that, with the exception of a departure related to the containment leak rate test program, Section 6.2.2 of the AP1000 DCD Tier 2 was incorporated by reference into the Turkey Point Units 6 and 7 FSAR. In Section 6.2.2 of the AP1000 FSER, the staff stated the principal design basis for the PCS is to maintain the containment internal pressure below the design value for 3 days following a design-basis accident. The staff review, as documented in Section 6.2.1.1, "Containment Pressure and Temperature Response to High-Energy Line Breaks," of the AP1000 FSER, found that the PCS met its design objectives. Therefore, the containment function for the initial phase of (0-72 hours) mitigation for Turkey Point Units 6 and 7 will be accomplished by its safety-related PCS per the Turkey Point Units 6 and 7 licensing basis.

The SFP cooling function for the Turkey Point Units 6 and 7 is accomplished by maintaining sufficient water inventory in the SFP to keep the fuel covered and, therefore, provide the necessary cooling in the event of an extended loss of SFP cooling due to the loss of ac power. In Section 9.1.3.2.3, "Increase in Number of Spent Fuel Storage Locations," in Supplement 2 of the AP1000 FSER, the staff concluded that the SFP will maintain water coverage above the spent fuel assemblies for at least 72 hours following a loss of nonsafety-related SFP cooling, using only safety-related makeup water. Therefore, initial phase mitigation is accomplished through passive means. However, as indicated in Note 9 in the DCD Tier 2 Table 9.1-4, "Station Blackout/Seismic Event Times," for the most limiting scenario (full core offload) the

need for operator action 18 hours into the event is specified. In Attachment 1, "Sequence of Events Timeline," to the AP1000 FLEX integrated plan, this action has been identified and the appropriate procedure cited to assure the task is performed. Hence, SFP cooling for the initial phase (0-72 hours) of mitigation for Turkey Point Units 6 and 7 will be accomplished by passive cooling of the SFP in accordance with the Turkey Point Units 6 and 7 licensing basis.

As described above, the NRC staff has reviewed the mitigation strategies for beyond-design-basis external events for Turkey Point Units 6 and 7 based on the information provided by the applicant, including referenced mitigation guidance for beyond-design-basis external events applicable to AP1000 reactors. Based on the foregoing, the staff finds that the Turkey Point Units 6 and 7 COL applicant has provided or referenced information to describe its mitigation strategies for beyond-design-basis external events in an acceptable manner. The staff recognizes that full implementation of the mitigation strategies for beyond-design-basis external events at AP1000 reactors cannot be established until after licensing (e.g., during procedure development). The staff prepared a license condition for implementation of the mitigation strategies for beyond-design-basis external events at Turkey Point Units 6 and 7, based on the applicant's proposed license condition with specific enhancements to provide consistency with the current NRC staff approach to mitigation strategies. Completion of the activities associated with the license condition, including lessons learned from initial AP1000 implementation, can be verified through NRC inspection activities.

20.1.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license condition related to the mitigation strategies program:

- License Condition (20-1) – Mitigation Strategies for Beyond-Design-Basis External Events:
 - a. The Licensee shall complete development of an overall integrated plan of strategies to mitigate a beyond-design-basis external event at least 1 year before the completion of the last ITAAC on the schedule required by 10 CFR 52.99(a).
 - b. The overall integrated plan required by this condition must include guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities. The overall integrated plan must include provisions to address all accident mitigation procedures and guidelines (including the guidance and strategies required by this section, emergency operating procedures, abnormal operating procedures, and extensive damage management guidelines).
 - c. The guidance and strategies required by this condition must be capable of (i) mitigating a simultaneous loss of all alternating current (ac) power and loss of normal access to the normal heat sink and (ii) providing for adequate capacity to perform the functions upon which the guidance and strategies rely for all units on the Turkey Point Units 6 and 7 site and in all modes at each unit on the site.

- d. Before initial fuel load, the Licensee shall fully implement the guidance and strategies required by this condition, including:
 - 1. Procedures;
 - 2. Training;
 - 3. Acquisition, staging, or installation of equipment and consumables relied upon in the strategies; and
 - 4. Configuration controls and provisions for maintenance and testing (including testing procedures and frequencies for preventative maintenance) of the equipment upon which the strategies and guidance required by this condition rely.
- e. The training required by condition d.2 must use a Systematic Approach to Training (SAT) to evaluate training for station personnel, and must be based upon plant equipment and procedures upon which the guidance and strategies required by this Condition rely.
- f. The Licensee shall maintain the guidance and strategies described in the application upon issuance of the license, and the integrated plan of strategies upon its completion as required by condition a. The Licensee may change the strategies and guidelines required by this Condition provided that the Licensee evaluates each such change to ensure that the provisions of conditions b and c continue to be satisfied and the Licensee documents the evaluation in an auditable form.

20.1.6 Conclusion

The NRC staff reviewed the mitigating strategies for Turkey Point Units 6 and 7 to provide assurance of core cooling, containment, and SFP cooling capabilities in the event of a beyond-design-basis external event resulting in an ELAP event. For the reasons set forth above, the staff finds that the approach for mitigating beyond-design-basis external events to be used at Turkey Point Units 6 and 7 is consistent with NRC Order EA-12-049 and both general and AP1000-specific NRC guidance (including NEI 12-06, Appendix F, as endorsed by the NRC staff). Therefore, the staff concludes that the mitigating strategies for beyond-design-basis external events described for Turkey Point Units 6 and 7 are acceptable. The NRC will impose a license condition as discussed in this SER section to verify the implementation of the mitigation strategies for beyond-design-basis external events at Turkey Point Units 6 and 7 as described in the specified documentation.

20.2 Reliable Spent Fuel Pool Instrumentation (Based on Recommendation 7.1)

20.2.1 Introduction

During the events in Fukushima, responders were without reliable instrumentation to determine the water level in the spent fuel pool (SFP). This caused concerns that the pool may have boiled dry, resulting in fuel damage, and highlighted the need for reliable SFP instrumentation. The SFP level instrumentation at United States (U.S.) nuclear power plants is typically narrow range and, therefore, only capable of monitoring normal and slightly off-normal conditions. Although the likelihood of a catastrophic event affecting nuclear power plants and the associated SFPs in the U.S. remains very low, beyond-design-basis external events could challenge the ability of existing spent fuel pool level instrumentation in providing emergency responders with reliable information on the condition of SFPs. Reliable and available level indication is essential to ensure plant personnel can effectively prioritize emergency actions.

SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami" states that the staff will request all COL applicants to provide the information required by the orders and request for information letters described in SECY-12-0025, as applicable, through the review process. With regard to Recommendation 7.1 for reliable spent fuel pool instrumentation, SECY-12-0025 notes that the AP1000 standard design includes two permanently fixed safety related level instruments with the capability for a third instrument connection.

JLD-ISG-2012-03, Revision 0, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation," endorses with exceptions and clarifications the methodologies described in the industry guidance document, NEI 12-02, Revision 1, "Industry Guidance for Compliance with Nuclear Regulatory Commission (NRC) Order EA-12-051, To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," and provides an acceptable approach for satisfying the applicable requirements.

20.2.2 Summary of Application

The NRC issued RAI Letter No. 58 dated May 1, 2012 (ADAMS Accession No. ML12122A973), concerning spent fuel pool instrumentation. The applicant responded to the staff's RAI in letters dated June 29, 2012 (ADAMS Accession No. ML121850685) and October 28, 2013 (ADAMS Accession No. ML13302C082). As part of the RAI response, the applicant submitted a Westinghouse report, APP-SFS-M3R-004, "Response to NRC Orders EA-12-051 and EA-12-063 and Background Information for Future Licensees on AP1000 Spent Fuel Instrumentation." The RAI responses also proposed adding supplemental information to the FSAR and proposed a license condition. The applicant updated FSAR Section 9.1.3.7 to describe its proposed spent fuel pool level instrumentation.

Supplemental Information

- PTN Supplement (SUP) 9.1-1

The applicant provided supplemental information PTN SUP 9.1-1 addressing spent fuel pool instrumentation in FSAR Section 9.1.3.7.

License Condition

- Part 10, License Condition 12.B

The applicant proposed a license condition related to personnel training for reliable spent fuel pool level instrumentation to Part 10 of the COL application.

20.2.3 Regulatory Basis and Guidance

The regulatory basis for the staff review of mitigation strategies for beyond-design-basis external events is as follows:

- The Atomic Energy Act of 1954, as amended, Section 161, "General Provisions," which authorizes the Commission to regulate the possession and use of special nuclear materials as necessary or desirable to protect public health and to promote the common defense and security.
- SRM-SECY-12-0025, which approves the issuance of orders for reliable SFP instrumentation under an administrative exemption to the Backfit Rule, 10 CFR 50.109, and the issue finality requirements in 10 CFR 52.63 and 10 CFR Part 52, Appendix D, Paragraph VIII.

The staff's guidance for beyond-design-basis external event mitigation strategies is as follows:

- JLD-ISG-2012-03, Revision 0, "Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation," issued August 29, 2012, endorses NEI 12-02, Revision 1, "Industry Guidance for Compliance with NRC Order EA-12-051, To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," with exceptions and clarifications.

20.2.4 Technical Evaluation

In light of the SECY-12-0025, the staff issued RAI Letter No. 58 (ADAMS Accession No. ML12122A973) dated May 1, 2012, requesting additional information in relation to the lessons learned from the Great Tohoku Earthquake and Tsunami. In RAI Letter No. 58, Question 1.5-3, the staff requested the applicant to:

- Provide sufficient reliable instrumentation, able to withstand design-basis natural phenomena, to monitor spent fuel pool water level, as described in Attachment 3 to Order EA-12-051.

In Commission Order EA-12-051, the Commission describes the key parameters used to determine that a level instrument is to be considered reliable. NEI 12-02, Appendix A4,

“AP1000 Spent Fuel Pool Instrumentation Guidance,” provides an AP1000-specific acceptable approach for satisfying the applicable requirements. In order to address the staff’s RAI, the applicant’s response references Westinghouse report APP-SFS-M3R-003, “Response to NRC Orders EA-12-051 and EA-12-063, and Background Information for Future Licensees on AP1000 Spent Fuel Pool Instrumentation,” Revision A, which discussed how the AP1000 SFP level instrument is designed to be reliable, following the guidance provided in NEI 12-02, Appendix A4. The applicant added supplemental information to Section 9.1.3.7 of the FSAR and created a new Part 10, License Condition 12.B.

Arrangement:

Commission Order EA-12-051, Attachment 2, Section 1.1 states that the spent fuel pool level instrument channels shall be arranged in a manner that provides reasonable protection of the level indication function against missiles that may result from damage to the structure over the spent fuel pool. This protection may be provided by locating the safety-related instruments to maintain instrument channel separation within the spent fuel pool area, and to utilize inherent shielding from missiles provided by existing recesses and corners in the spent fuel pool structure.

The applicant’s response states as follows: The AP1000 design has three safety-related SFP level instrument channels (AP1000 DCD Revision 19, Table 7.5-1 (Sheet 7 of 12)). All three channels and associated instrument tubing lines are located below the fuel handling area operating deck and the cask washdown pit as stated in the supplemental information added to Turkey Point Units 6 and 7 FSAR Section 9.1.3.7. This location provides level indication function protection from missiles that may result from damage to the structure over the spent fuel pool. In addition, the SFP level instruments associated with protection and safety monitoring system (PMS) Divisions A and C are physically separated from the SFP instrument associated with PMS Division B as stated in the supplemental information added to Turkey Point Units 6 and 7 FSAR Section 9.1.3.7.

The staff evaluated the instrument description provided in the DCD and the proposed supplemental information added to Turkey Point Units 6 and 7 FSAR Section 9.1.3.7.D and determined that the SFP level instrument will be arranged as described above (below the operating deck and cask washdown pit) in a manner that provides reasonable protection against missiles, and therefore, the staff concludes that these features are in conformance with Commission Order EA-12-051, and the guidance provided by JLD-ISG-2012-03.

The textual supplemental information found in FSAR Section 9.1.3.7 is complete, but is missing the left margin annotation (LMA) PTN SUP 9.1-1. The applicant has informed the staff by teleconference that it will follow up with a letter in which it will commit to add the LMA notation in a future revision of the FSAR. This confirmatory item is identified as Confirmatory Item 20.2-1.

Qualification:

Commission Order EA-12-051, Attachment 2, Section 1.2 states that the level instrument channels shall be reliable at temperature, humidity, and radiation levels consistent with the spent fuel pool water at saturation conditions for an extended period.

The applicant's response states as follows: The three safety-related SFP level instruments are seismically qualified and are located below the fuel handling area operating deck (AP1000 DCD Revision 19, Section 9.1.3.4.3.4 and Table 7.5-1 (Sheet 7 of 12)).¹ The environment in these areas is mild with respect to safety-related equipment qualification and affords access for post-accident actions. Even though they are not directly exposed to SFP boiling, the instruments are qualified to function at the conditions (temperature, humidity, and radiation) that could be seen where these instruments are located, including those caused by SFP boiling. This provides assurance that the SFP level transmitters exposed to these environmental conditions will remain available and functional for an extended period.

The staff reviewed the applicant's response and concludes that since the SFP level transmitters are not located on the pool area, they are not required to be designed to handle the pool area conditions. However, they must be designed to remain operational under the worst expected conditions for the area in which they are located. The AP1000 DCD does state that the instruments are designed to remain functional at the expected local conditions; therefore, the staff concludes that these features are in conformance with Commission Order EA-12-051, and the guidance provided by JLD-ISG-2012-03.

Power Sources:

Commission Order EA-12-051, Attachment 2, Section 1.3 states that the instrumentation channels shall provide for power connections from sources independent of the plant alternating current (ac) and direct current (dc) power distribution systems, such as portable generators or replaceable batteries. Power supply designs should provide for quick and accessible connection of sources independent of the plant ac and dc power distribution systems. Onsite generators used as an alternate power source and replaceable batteries used for instrument channel power shall have sufficient capacity to maintain the level indication function until offsite resource availability is reasonably assured.

The applicant's response states as follows: The AP1000 SFP level instruments are provided with Class 1E DC power supply for at least 72 hours of post-accident monitoring. One of these safety-related instruments is powered through PMS Division A which contains a 24-hour battery supply. The safety-related SFP level instrument PMS divisions are described in the supplemental information (PTN SUP 9.1-1) added to Turkey Point Units 6 and 7 FSAR Section 9.1.3.7. A description of the AP1000 Class 1E DC and UPS system is contained in AP1000 DCD Revision 19, Section 8.3.2.1.1. Beyond the initial 72 hours, instrument power can be supplied by the use of onsite permanently installed ancillary diesel generators or offsite portable generators with quick and accessible connection points. Permanently installed onsite ancillary diesel generators are capable of providing power for Class 1E post-accident monitoring including SFP level instrumentation. This capability is described in Westinghouse AP1000 DCD Revision 19, Section 8.3.1.1.1. As described in Westinghouse AP1000 DCD Revision 19, Section 1.9.5.4, offsite portable generators are capable of being connected to distribution panels or to a safety-related connection.

¹ The RAI responses for this topic discuss a departure from the AP1000 DCD related to environmental zones for the level instruments. The departure is evaluated in FSER Section 3.11.4.

As discussed in the applicant's response and as described in the AP1000 DCD, the safety related power distribution system has the capability of connecting to portable generators to power safety related distribution panels, which power the level instruments. These panels are Seismic Category I and designed to remain operational following a safe shutdown earthquake. Accordingly, the staff concludes that these design features are in conformance with Commission Order EA-12-051, and the guidance provided by JLD-ISG-2012-03.

Accuracy:

Commission Order EA-12-051, Attachment 2, Section 1.4 states that the instrument shall maintain its designed accuracy following a power interruption or change in power source without recalibration.

The applicant's response states as follows: The measured range of the SFP level by the safety-related instruments is from the top of the SFP to the top of the fuel racks, the level instruments are calibrated at a reference temperature suitable for normal SFP operation and will read conservatively at elevated temperatures, including during boiling conditions. These instruments are calibrated on a regular basis and their accuracy is not affected by power interruptions. All these design features are described in the supplemental information (PTN SUP 9.1-1) added to Turkey Point Units 6 and 7 FSAR Section 9.1.3.7.

Because the instruments are designed to remain within calibration upon a loss of power, the staff concludes that these design features are in conformance with Commission Order EA-12-051, and the guidance provided by JLD-ISG-2012-03.

Display:

Commission Order EA-12-051, Attachment 2, Section 1.5 states that the display shall provide on-demand or continuous indication of spent fuel pool water level.

The applicant's response states as follows: The safety-related SFP level sensors provide continuous indication of the SFP level to the main control room as well as the Remote Shutdown Workstation and are included in the Qualified Data Processing System PMS display as indicated in Westinghouse AP1000 DCD Revision 19, Table 7.5-1 (Sheet 7 of 12). Safety-related instrumentation gives an alarm in the main control room when the water level in the SFP reaches the low-low-level setpoint as stated in AP1000 DCD Revision 19, Section 9.1.3.7.D.

Based on the system description provided above, the staff concludes that these design features are in conformance with Commission Order EA-12-051, and the guidance provided by JLD-ISG-2012-03.

License Condition

Commission Order EA-12-051, Attachment 2, Section 2 states that the spent fuel pool instrumentation shall be maintained available and reliable through appropriate development and implementation of a training program. Personnel shall be trained in the use and the provision of alternate power to the safety-related level instrument channels.

The applicant's COLA Part 10 includes License Condition 12.B, which requires the development and implementation of a training program in accordance with the guidance contained in JLD-ISG-2012-03.

The applicant's proposed license condition states:

B. RELIABLE SPENT FUEL POOL LEVEL INSTRUMENTATION

Prior to initial fuel load, the licensee shall fully implement the following requirements for spent fuel pool level indication using the guidance contained in JLD-ISG-2012-03, Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation, Revision 0.

- The spent fuel pool instrumentation shall be maintained available and reliable through the development and implementation of a training program. The training program shall include provisions to ensure trained personnel can route the temporary power lines from the alternate power source to the appropriate connection points and connect the alternate power source to the safety-related level instrument channels.

The proposed license condition is consistent with the guidance provided in JLD-ISG-2012-03, and will ensure that the operators will be properly trained in the adequate equipment maintenance procedures and the proper operational procedures in order to establish the necessary alternate power connections. Accordingly, the staff concludes that the proposed license condition is acceptable because the development and implementation of a training program is consistent with Commission Order EA-12-051 and the guidance provided by JLD-ISG-2012-03.

20.2.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license condition related to development and implementation of a training program:

- License Condition (20-2) – Reliable Spent Fuel Pool Level Instrumentation

Prior to initial fuel load, the Licensee shall address the following requirements using the guidance contained in JLD-ISG-2012-03, Compliance with Order EA-12-051, Reliable Spent Fuel Pool Instrumentation, Revision 0:

The spent fuel pool instrumentation shall be maintained available and reliable through the development and implementation of a training program. The training program shall include provisions to ensure trained personnel can route the temporary power lines from the alternate power source to the appropriate connection points, and connect the alternate power source to the safety-related level instrument channels.

20.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff finds that the application includes all the information relevant to SFP instrument reliability, except in regard to Confirmatory Item 20.2-1 above. Except for Confirmatory Item 20.2-1, no outstanding information related to this section remains to be addressed in the Turkey Point Units 6 and 7 COL FSAR.

The staff evaluated the applicant's and the AP1000 design description of the SFP water level instrument and determined that the instruments are in accordance with the guidance provided in JLD-ISG-2012-03. Therefore, the staff concludes that the applicant's SFP level instruments are reliable, and able to withstand design-basis natural phenomena and monitor key SFP level parameters as described in Commission Order EA-12-051. In addition, the staff concludes that the information presented in the Turkey Point Units 6 and 7 COL FSAR is acceptable because it conforms to the guidance provided in JLD-ISG-2012-03. The staff based its conclusions on the following:

- PTN SUP 9.1-1 is acceptable because, when combined with the information in Table 7.5-1 and Sections 8.3.1.1.1 and 9.1.3.7.D of the AP1000 DCD, it includes provisions for SFP instrumentation arrangement, qualification, power sources, accuracy and display that are consistent with the requirements described in SECY-12-0025 and Commission Order EA-12-051.
- The proposed license condition is acceptable because it provides that, prior to fuel load, the licensee will have in place procedures for the proper maintenance of the level instruments and for the connection and use of an alternate power source in order to power the level instruments.

20.3 Emergency Preparedness (Based on Recommendation 9.3)

20.3.1 Introduction

The accident at Fukushima reinforced the need for effective emergency preparedness, the objective of which is to ensure the capability exists for a licensee to implement measures that mitigate the consequences of a radiological emergency and provide for protective actions of the public. The accident at Fukushima highlighted the need to determine and implement the required staff to fill all necessary positions of the emergency organization responding to a multi-unit event with impeded access to the site. Additionally, there is a need to ensure that the communication equipment relied on has adequate power to coordinate the response to an event during an extended loss of ac power. An application for a COL must describe these matters.

20.3.2 Summary of Application

In Revision 7 of the Turkey Point Units 6 and 7 COL application, Part 10, the applicant proposed License Condition 12.C, related to emergency preparedness communications and staffing, to address Fukushima NTTF Recommendation 9.3.

20.3.3 Regulatory Basis

The requirements for EP for beyond-design-basis external events are established or described in the following:

- 10 CFR 50.47(b)(1) states, in part, that each principal response organization has staff to respond and to augment its initial response on a continuous basis.
- 10 CFR 50.47(b)(2) states, in part, that adequate staffing to provide initial facility accident response in key functional areas is maintained at all times, and timely augmentation of response capabilities is available.
- 10 CFR 50.47(b)(6) states that provisions exist for prompt communications among principal response organizations to emergency personnel and to the public.
- 10 CFR Part 50, Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," Section IV. E. 9, states, in part, that adequate provisions shall be made and described for emergency facilities and equipment, including at least one onsite and one offsite communications system, and that each system shall have a backup power source.

The guidance for EP for beyond-design-basis external events are established or described in the following:

- SECY-12-0025 states, in part, that the staff will also request all COL applicants to provide the information required by the orders and request for information letters described in this paper, as applicable, through the review process.
- NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities," Revision 0, May 4, 2012 (ADAMS Accession No. ML12125A412).
- NUREG-0654/FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," Section B, "Onsite Emergency Organization," states, in part, the following:
 5. Each licensee shall specify the positions or title and major tasks to be performed by the persons to be assigned to the functional areas of emergency activity. These assignments shall cover the emergency functions in Table B-1 entitled, "Minimum Staffing Requirements for Nuclear Power Plant Emergencies." The minimum on-shift staffing levels shall be as indicated in Table B-1. The licensee must be able to augment on-shift capabilities within a short period after declaration of an emergency. This capability shall be as indicated in Table B-1.

- NUREG-0696, "Functional Criteria for Emergency Response Facilities," offers guidance on how to meet the requirements of 10 CFR Part 50, Appendix E, and describes the onsite and offsite communications requirements for the licensee's emergency response facilities.

20.3.4 Technical Evaluation

The NRC issued RAI Letter No. 58 dated May 1, 2012 to the applicant, concerning implementation of the Fukushima NTTF Recommendation 9.3 in the combined license application for Turkey Point Units 6 and 7. In response, the applicant proposed a license condition in the Turkey Point Units 6 and 7 COL application, to address the 10 CFR 50.54(f) request for information letters sent to existing licensees regarding communications and staffing for NTTF Recommendation 9.3. This license condition was subsequently revised in the license application. As part of its proposed license condition, the applicant committed to perform assessments for NTTF Recommendation 9.3 using NEI 12-01, Revision 0. By letter from the NRC to NEI dated May 15, 2012, the NRC stated that the guidance in NEI 12-01, Revision 0, provides an acceptable method for licensees to employ when responding to the 10 CFR 50.54(f) letters regarding NTTF Recommendation 9.3. The applicant proposed the license condition on communications and staffing in License Condition 12.C in Part 10 of the Turkey Point Units 6 and 7 COL application. The staff reviewed the applicant's submitted information and documented its evaluation and conclusions involving the staffing levels and communications in Sections 13.3.4.2 and 13.3.4.6, respectively, of this SER.

20.3.5 Post Combined License Activities

Post-combined license activities consist of two staff-proposed license conditions to address NTTF Recommendation 9.3, which are provided in Section 13.3.4.2 of this SER.

20.3.6 Conclusion

The staff's conclusions regarding how the applicant addressed NTTF Recommendation 9.3 is provided in Section 13.3.4.2 of this SER.