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 William States Lee III Nuclear Station (WLS) Units 1 and 2 Combined License (COL). 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 which had the greatest potential for safety improvement in the near-term. The additional actions are:

1. Inclusion of Mark II containments in the staff's recommendation for reliable hardened vents associated with NTTF Recommendation 5.1

2. The implementation of SFP instrumentation proposed in Recommendation 7.1

The staff also prioritized the NTTF recommendations into Tier 1, Tier 2, and Tier 3, where the recommendations in Tier 1 represent those that the staff determined should be started without unnecessary delay, while recommendations in Tier 2 are those that could not be initiated in the near term, and recommendations in Tier 3 require further study to support regulatory action.

On February 17, 2012, in 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," the staff provided the Commission with proposed orders and requests for information to be issued to all power reactor licensees and holders of construction permits.

On March 9, 2012, the Commission then approved issuance of the proposed orders with some modifications in the staff requirements memorandum (SRM) to SECY-12-0025. As set forth in the Orders in SRM-SECY-12-0025, additional requirements are needed to provide adequate protection to public health and safety or to significantly enhance the protection of public health and safety. In accordance with its statutory authority under Section 161 of the Atomic Energy Act of 1954, as amended (the Act), the Commission may impose these requirements.

On March 12, 2012, the NRC issued Orders EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" and EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation" to the appropriate licensees and permit holders.

The staff also issued the request for information pursuant to 50.54(f) regarding Recommendations 2.1, 2.3 and 9.3, as described in SECY-12-0025, to the appropriate licensees and permit holders in letters dated March 12, 2012.

The following Tier 1 recommendations in SECY-11-0137 as addressed in SECY-12-0025 were considered in determining those that are applicable to the WLS COL review:

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 10 CFR 50.54(hh)(2)
5. Recommendation 5.1: Reliable Hardened Vents for Mark I and Mark II Containments
6. Recommendation 7.1: Spent Fuel Pool Instrumentation
7. Recommendation 8: Strengthening and Integration of Emergency Operating Procedures, Severe Accidents Management Guidelines, and Extensive Damage Mitigation Guidelines

8. Recommendation 9.3: Emergency Preparedness Regulatory Actions (staffing and communications)

Staff determined that the following three recommendations were applicable and should be addressed by the WLS COL applicant:

1. Recommendation 4.2: Equipment covered under 10 CFR 50.54(hh)(2) - Order licensees to provide reasonable protection for equipment currently provided pursuant to 10 CFR 50.54(hh)(2) from the effects of design-basis external events and to add equipment as needed to address multiunit events while other requirements are being revised and implemented.

2. Recommendation 7.1: Spent fuel pool instrumentation - Order licensees to provide reliable spent fuel pool level instrumentation.

3. Recommendation 9.3: Emergency preparedness regulatory actions (staffing and communications) - Order licensees to do the following until rulemaking is complete:

    - Determine and implement the required staff to fill all necessary positions for response to a multi-unit event.

    - Provide a means to power communications equipment needed to communicate onsite (e.g., radios for response teams and between facilities) and offsite (e.g., cellular telephones and satellite telephones) during a prolonged station blackout.

The staff determined that the remaining Tier 1 recommendations did not need to be further considered in the WLS COL review.

The applicant evaluated the seismic and flood hazards using the current guidance and methodologies. For the seismic hazard, consistent with guidance in Regulatory Guide 1.208, “A Performance-Based Approach to Define the Site- Specific Earthquake Ground Motion,” regarding the need to consider the latest information in the evaluation of seismic hazard, this included consideration of the NUREG–2115, “Central and Eastern United States Seismic Source Characterization for Nuclear Facilities,” (CEUS-SSC) model as described in FSER Chapter 2, Section 2.5.2. Further, FSER Section 3.7 addresses the staff’s evaluation of the seismic analyses of NI structures and adjacent seismic Category II structures based on the WLS Units 1 and 2 seismic hazard. For flood hazard, as evaluated in FSER Chapter 2, Sections 2.4.5 and 2.4.6, the applicant used Regulatory Guide 1.59, “Design Basis Floods for Nuclear Power Plants,” as supplemented by best current practices, as it relates to providing assurance that natural flooding phenomena that could potentially affect the site have been appropriately identified and characterized. Thus, the staff determined that the applicant has already addressed the seismic and flood hazard reevaluation portion of Recommendation 2.1. Therefore, there are no additional requirements left to be addressed in Recommendation 2.1 for seismic and flood hazard reevaluations applicable to the WLS Units 1 and 2 Site COL application.

Additionally, the staff determined that Recommendation 2.3 was not applicable to the WLS COL because the plant is not yet constructed, and Recommendation 5.1 was not applicable because it applied to boiling water reactor type 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 request for information letters through the review process. Accordingly, for the WLS COL application, the staff issued request for additional information (RAI) Letter No. 105, dated April 25, 2012, 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 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

NRC Commission Paper SECY-12-0025 states that the NRC 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. For mitigation strategies for beyond-design-basis external events, SECY-12-0025 outlined a three-phase approach for mitigating beyond-design-basis external events. 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.

SECY-12-0025 notes that the AP1000 standard design (which is referenced for WLS) 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, provisions related to the final phase must be addressed.

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.

20.1.2 Summary of Application

The WLS Units 1 and 2 Final Safety Analysis Report (FSAR) provides information on systems used to establish and sustain core cooling, containment, and SFP cooling capabilities for the WLS Units 1 and 2. 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 DCD Tier 2 with identified departures and supplements. FSAR Section 6.2, "Containment Systems," and Section 9.1, "Fuel Storage and Handling," address containment systems and fuel storage and handling systems, respectively, and incorporate by reference Section 6.2.2, "Passive Containment Cooling System," and Section 9.1.3, "Spent Fuel Pool Cooling System," of the AP1000 DCD Tier 2.

In SECY-12-0025, the NRC staff indicated its intent to 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 Letter No. 105, dated April 25, 2012, to request information regarding the WLS Units 1 and 2 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 11, 2012. In its initial response, the WLS Units 1 and 2 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 WLS, including the strategies for initial (0 to 72 hours) mitigation, in a letter dated May 7, 2015. The letter, which was a supplemental response to RAI Letter No. 105, 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 WLS Units 1 and 2.

In Item 12, "Fukushima Response Actions," of Part 10, "Proposed License Conditions (including ITAAC)," of the WLS COL application, the applicant proposed a license condition related to this subject.

20.1.3 Regulatory Basis

The requirements and guidance for mitigation strategies for beyond-design-basis external events are established or described in the following:

- Atomic Energy Act of 1954, as amended, § 161, authorizes the Commission to regulate the utilization of special nuclear material in a manner that is protective of public health and in accord with 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.

- 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 WLS Units 1 and 2, 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 WLS Units 1 and 2.

20.1.4 Technical Evaluation

The NRC staff reviewed the information submitted by the WLS COL applicant 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," to 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.

In Section 7.0, "Guidance for AP1000 Design," of JLD-ISG-2012-01, the NRC staff 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 WLS Units 1 and 2 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 WLS 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 WLS Units 1 and 2 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 WLS Units 1 and 2.

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 DEC 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 WLS Units 1 and 2 is accomplished using the AP1000 PXS, which is described in Section 6.3 of the AP1000 DCD Tier 2. The WLS Units 1 and 2 FSAR specifies that Section 6.3 of the AP1000 DCD Tier 2 was incorporated by reference with identified departures. The staff reviewed WLS Units 1 and 2 FSAR Section 6.3, and found 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. Therefore, core cooling for the initial phase (0-72 hours) of mitigation for WLS Units 1 and 2 will be accomplished by its safety-related PXS, per the WLS Units 1 and 2 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 WLS Units 1 and 2 is accomplished using the AP1000 PCS, which is described in Section 6.2.2, "Passive Containment Cooling System," of the AP1000 DCD Tier 2. In its review of the WLS Units 1 and 2 FSAR, the staff found, with the exception of a departure related to the containment leak rate test program, that Section 6.2.2 of the AP1000 DCD Tier 2 was incorporated by reference into the WLS Units 1 and 2 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 WLS Units 1 and 2 will be accomplished by its safety-related PCS per the WLS Units 1 and 2 licensing basis.

The SFP cooling function for the WLS Units 1 and 2 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 WLS Units 1 and 2 will be accomplished by passive cooling of the SFP in accordance with the WLS Units 1 and 2 licensing basis.

The NRC staff has reviewed the mitigation strategies for beyond-design-basis external events for WLS Units 1 and 2 based on the information provided by the WLS COL applicant, including referenced mitigation guidance for beyond-design-basis external events applicable to AP1000 reactors. The staff finds that the WLS 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 WLS Units 1 and 2, based on the applicant's proposed license condition with specific enhancements to provide consistency with current NRC staff expectations. 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 WLS Units 1 and 2 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 WLS Units 1 and 2 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. The staff finds that the approach for mitigating beyond-design-basis external events to be used at WLS Units 1 and 2 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 WLS Units 1 and 2 are acceptable. The staff 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 WLS Units 1 and 2 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 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 instrumentation in providing emergency responders with reliable information on the condition of SFPs. Reliable and available 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 combined license (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. 105 dated April 25, 2012, concerning spent fuel pool instrumentation. The applicant responded to the staff's RAI in letters dated June 11, 2015. 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.

Supplemental Information

- WLS Supplement (SUP) 9.1-1

The applicant provided supplemental information WLS 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 requirements and guidance for reliable spent fuel pool instrumentation are established or described in the following:

- 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 reliable spent fuel pool instrumentation under an

administrative exemption to the Backfit Rule and the issue finality requirements in 10 CFR 52.63 and 10 CFR Part 52, Appendix D, Paragraph VIII.

- Atomic Energy Act of 1954, as amended, (the Act), § 161, authorizes the Commission to regulate the utilization of special nuclear material in a manner that is protective of public health and in accord with the common defense and security.

- 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. 105 requesting additional information in relation to the lessons learned from Great Tohoku Earthquake and Tsunami. In RAI Letter No. 105, Question 1.5-1, third bullet, the staff requested the applicant to:

- Provide sufficient reliable instrumentation, able to withstand design-basis natural phenomena, to monitor key spent fuel pool parameters (i.e., water level, temperature, and area radiation levels) from the control room (detailed Recommendation 7.1 - Enclosure 6 of SECY-12-0025).

Out of these parameters, the most indicative of SFP conditions is the water level. The radiation monitors are used to confirm the integrity of the stored fuel, but cannot be used to determine how much time remains before the fuel integrity is compromised. The SFP water temperature can be used to monitor SFP water temperature from normal range up to boiling temperature. After the SFP water reaches the boiling point it will remain constant while the pool boils dry, therefore, water temperature cannot be used to determine how much time remains before the fuel integrity is compromised. SFP water level is the most useful parameter to indicate SFP condition. The water stored in the pool provides spent fuel cooling and radiation shielding for the operators on the SFP deck. Therefore, the SFP water level can be used to determine how much time remains before the fuel integrity is compromised.

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 submitted a series of letters that discussed how the Lee SFP level instrument is designed to be reliable, following the guidance provided in NEI 12-02, Appendix A4, and the applicant added supplemental information WLS SUP 9.1-1 to Section 9.1.3.7 of the FSAR.

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 that 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 WLS SUP 9.1-1 added to WLS Units 1 and 2 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 the WLS FSAR Section 9.1.3.7.

The staff evaluated the instrument description provided in the DCD and the proposed supplemental information added to WLS FSAR Section 9.1.3.7 and determined that the SFP level instrument will be arranged 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.

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 that 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. 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

[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.

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 that 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 (WLS SUP 9.1-1) added to the WLS 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.

As discussed in the applicant's response and as described in the AP1000 DCD, the safety related power distribution system has the capability of using 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. Based on the system description, 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 that 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 (WLS SUP 9.1-1) added to WLS FSAR Section 9.1.3.7.

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.

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 that 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, DEC 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 insure 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 is intended to 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. Based on this, 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) – 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's review confirmed that the applicant addressed the required information relating to SFP instrument reliability, and there is no outstanding information expected to be addressed in the WLS 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 considered reliable, 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 WLS COL FSAR is acceptable because it conforms to the guidance provided in JLD-ISG-2012-03. The staff based its conclusions on the following:

- WLS 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 (or COL applicant) 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.

20.3.2 Summary of Application

In Revision 11 of the WLS COL application, Part 10, the applicant proposed a license condition related to emergency preparedness communications and staffing. The staff's discussion is located in the Technical Evaluation section below.

20.3.3 Regulatory Basis

The requirements and guidance for emergency preparedness for beyond-design-basis external events are established or described in the following:

- 10 CFR 50.47(b)(1) states, in part: ". . . 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: ". . . adequate staffing to provide initial facility accident response in key functional areas is maintained at all times, 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 that adequate provisions shall be made and described for emergency facilities and equipment, including "at least one onsite and one offsite communications system; each system shall have a backup power source."

- 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 – By NRC letter from David Skeen, Director, Japan Lessons-Learned Directorate, to NEI, Susan Perkins-Grew, Director, Emergency Preparedness, dated May 15, 2012, NRC finds the guidance in NEI 12-01 to be an acceptable method for licensees to employ when responding to the 10 CFR 50.54(f) letters regarding NTTF Recommendation 9.3.

- 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:

    5. Each licensee shall specify . . . 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 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," issued February 1981, offers guidance on how to meet the requirements of Appendix E to 10 CFR Part 50 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. 105 dated April 25, 2012 to the applicant, concerning implementation of the Fukushima NTTF Recommendation 9.3 in the combined license application for WLS. In response, the applicant proposed a license condition in the WLS COL application, to address the 10 CFR 50.54(f) request for information letters sent to existing licensees – including COL applicants - 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, Section C to Part 10 of the WLS COL application. The staff reviewed the applicant's proposed license condition and revised it to reflect the NRC's expectation when addressing NTTF Recommendation 9.3 as stated below in Section 20.4.5 of this SER. The NRC staff has revised the timeframe of the completion of this license condition to be consistent with the schedules provided in 10 CFR 52.99(a) and 10 CFR 52.103(a).

20.3.5 Post Combined License Activities

The license condition language in this section has been clarified from previously considered language. In a letter dated March 22, 2016 (ADAMS Accession No. ML16084A099), the applicant did not identify any concerns with the clarified license condition language. The changes do not affect the staff's above analysis of the conditions, and therefore, for the reasons discussed in the technical evaluation section above, the staff finds the following license conditions acceptable:

- License Condition (20-3) – No later than eighteen (18) months before the latest date set forth in the schedule submitted in accordance with 10 CFR § 52.99(a) for completing the inspections, tests, and analyses in the ITAAC, the licensee shall have performed an assessment of the on-site and augmented staffing capability for response to a multi-unit event. The staffing assessment shall be performed in accordance with NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities," Revision 0.

  No later than one hundred eighty (180) days before the date scheduled for initial fuel load, as set forth in the notification submitted in accordance with 10 CFR § 52.103(a), the licensee shall revise the Emergency Plan to include the following:

  (a) Incorporation of corrective actions identified in the staffing assessment required by this license condition; and
  (b) Identification of how the augmented staff will be notified, given degraded communications capabilities.

- License Condition (20-4) – No later than eighteen (18) months before the latest date set forth in the schedule submitted in accordance with 10 CFR § 52.99(a) for completing the inspections, tests, and analyses in the ITAAC, the licensee shall have performed an assessment of on-site and off-site communications systems and equipment relied upon during an emergency event to ensure communications capabilities can be maintained during an extended loss of alternating current power. The communications capability assessment shall be performed in accordance with NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities," Revision 0.

No later than one hundred eighty (180) days before the date scheduled for initial fuel load set forth in the notification submitted in accordance with 10 CFR § 52.103(a), the licensee shall have completed implementation of corrective actions identified in the communications capability assessment, including revisions to the Emergency Plan.

20.3.6 Conclusion

Based on the staff's review, the staff finds that the license condition, as revised by the staff above, is acceptable because it conforms to the guidance provided in SECY-12-0025 and NEI 12-01 regarding communications and staffing to address NTTF Recommendation 9.3, in NUREG-0654/FEMA-REP-1, and in NUREG-0696, and meets the applicable requirements in 10 CFR 50.47(b) and Appendix E to 10 CFR Part 50.