1E Response to NRC Post-Fukushima Recommendations

1E.1 Introduction

In response to the accident at the Fukushima Daiichi Nuclear Power Plant caused by the March 2011, Magnitude 9 Tohoku earthquake and subsequent tsunami, the Nuclear Regulatory Commission established a Near-Term Task Force (NTTF) to review NRC processes and regulations to determine if improvements to its regulatory system were needed. The NTTF developed a set of recommendations intended to clarify and strengthen the regulatory framework for protection against natural phenomena. These recommendations were issued in SECY-11-0093 (Reference 1E-9).

SECY-11-0124 and SECY-11-0137 provided the NRC Commissioners with the Staff's recommendations, including prioritization for implementation. Subsequently, SECY-12-0025 was issued describing proposed orders to be issued to licensees and a draft request for information pursuant to 10 CFR 50.54(f). SECY-12-0025 stated that combined license plants under review would address the three orders and the request for information through the review process. On March 9, 2012, the Commission issued a Staff Requirements Memorandum (SRM) for SECY-12-0025 (Reference 1E-4) approving issuance of the orders and request for information with some modifications.

This appendix addresses the Tier 1 recommendations and Orders contained in SECY-12-0025, the Tier 2 recommendations contained in SECY-11-0137, and the modifications documented in the SRM consistent with the as issued orders (EA-12-049, 050 and 51) and request for information dated March 12, 2012. The NRC Recommendation in each of the following subsections is a summary of the recommendation from the NRC documents. The response to each recommendation discusses how STP 3 & 4 addresses the recommendation. The numbers in parentheses of subsection headings correspond to the NTTF recommendation number.

1E.2 Tier 1 NRC Recommendation/Responses

1E.2.1 Seismic and Flooding Reevaluations (2.1)

1E.2.1.1 Seismic

NRC Recommendation

Perform a reevaluation of the seismic hazards using present-day NRC requirements and guidance to develop a Ground Motion Response Spectrum (GMRS). The new consensus seismic source models from the Central and Eastern United States Seismic Source Characterization (CEUS), NUREG-2115, may be used to characterize the hazards.

Response

Present-day regulatory guidance and methodologies, including the approach described in Regulatory Guide (RG) 1.208, "A Performance Based Approach to Define the Site-Specific Earthquake Ground Motion," were used to evaluate seismic hazards for the STP 3 & 4 site as discussed in Chapters 2 and 3. The evaluation conducted in conformance with RG 1.208 is discussed in Subsection 2.5S.2.6.

STP 3 & 4 reviewed the updated information provided in the CEUS and confirmed that it does not identify any new hazards that are not adequately considered in Chapters 2 and 3, and is not materially different than the GMRS discussed in 2.5S.2.6. Additionally, it was verified that both the existing STP 3 & 4 FSAR results and the estimated CEUS SSC results for the STP sites are enveloped by the STP 3 & 4 SSE design spectrum.

1E.2.1.2 Flooding

NRC Recommendation

Perform a reevaluation of all appropriate external flooding sources, including the effects from local intense precipitation on the site, probable maximum flood (PMF) on streams and rivers, storm surges, seiches, tsunami, and dam failures. It is requested that the reevaluation apply present-day regulatory guidance and methodologies being used for ESP and COL reviews including current techniques, software, and methods used in present-day standard engineering practice to develop the flood hazard.

The recommendation also noted that flooding risks are of concern because the safety consequences of a flooding event may increase sharply with a small increase in flooding level.

Response

Present-day regulatory guidance and methodologies were used to evaluate flooding hazards relative to the STP 3 & 4 site as discussed in Section 2.4S. Scenarios evaluated include:

- Dam Break Analysis (FSAR 2.4S.4)
- Main Cooling Reservoir (MCR) Embankment Breach Analysis (FSAR 2.4S.4.2.2)
- Probable Maximum Flood on Streams and Rivers (FSAR 2.4S.3)
- Local Probable Maximum Precipitation (FSAR 2.4S.2.3)
- Probable Maximum Surge and Seiche (FSAR 2.4S.5)
- Probable Maximum Tsunami (FSAR 2.4S.6)
- Ice Induced Flooding (FSAR 2.4S.7)
- Channel Diversions (FSAR 2.4S.9)
- Low Water Considerations (FSAR 2.4S.11)

Conservatisms in the STP 3 & 4 analyses of possible flooding resulting from these events and the plant design minimize the likelihood of even a small increase in flooding level. The postulated MCR embankment breach has been determined to be the design basis flood (DBF) for STP 3 & 4. Very conservative assumptions regarding both the maximum breach size and the speed at which the breech occurs make it highly improbable that the predicted flood level could be exceeded during an actual MCR breach. MCR embankment breach analysis is described in FSAR Subsection 2.4S.4.2.2.

Although the above discussion demonstrates the improbability of a flood exceeding the design basis flood levels, STP 3 & 4 also performed an analysis to determine at what flood level (Cliff Edge) the ability to cool the core would be lost. Although unachievable in any realistic scenario, this level demonstrates the margin beyond design that is built into STP 3 & 4. The flood level that the EDGs would be lost, and therefore, the ability to cool the core would be lost, was determined to be 51 feet.

1E.2.2 Seismic and Flooding Walkdowns (2.3)

NRC Recommendations

Perform seismic walkdowns in order to identify and address plant specific degraded, nonconforming, or unanalyzed conditions and verify the adequacy of strategies, monitoring, and maintenance programs such that the nuclear power plant can respond to external events. The walkdown will verify current plant configuration with the current licensing basis, verify the adequacy of current strategies, maintenance plans, and identify degraded, non-conforming, or unanalyzed conditions. The walkdown procedure should be developed and submitted to the NRC. The procedure may incorporate current plant procedures, if appropriate. Prior to the walkdown, licensees should develop acceptance criteria, collect appropriate data, and assemble a team with relevant technical skills.

The NRC also requests that each addressee confirm that they will use the industry developed, NRC endorsed, flood walkdown procedures or provide a description of plant specific walkdown procedures.

Response

This recommendation is not applicable since the STP 3 & 4 units have not yet been built. However, seismic and flooding plant walkdowns will be conducted after construction as documented in COL Information Item 19.9.5.

1E.2.3 Station Blackout (SBO) Rulemaking (4.1)

NRC Recommendation

Strengthen the station blackout (SBO) mitigation capability at all operating and new reactors for design-basis and beyond-design-basis events. This includes (1) a minimum coping time of 8 hours for loss of all AC, (2) establishing the equipment, procedures, and training necessary to implement an extended coping time of 72 hours for core and spent fuel cooling and for reactor coolant system and primary containment integrity, and (3) pre-planning and pre-staging offsite resources to support uninterrupted core and spent fuel cooling, and RCS and primary containment integrity under conditions involving significant degradation of offsite transportation infrastructure associated with a significant natural disaster. This recommendation will be implemented by rulemaking.

SECY-12-0025 adds the requirement that the loss of the Ultimate Heat Sink (UHS) should be evaluated as part of the SBO evaluation.

Response

(1) The STP 3 & 4 design can withstand an SBO for an indefinite period of time using an alternate AC power source, the Combustion Turbine Generator (CTG), as described in DCD and FSAR Appendix 1C (Table 1C-3). Additionally, the STP 3 & 4 design can withstand a sustained loss of all AC power, including the loss of both CTGs, for 72 hours while maintaining core cooling, as described in DCD Subsection 19E.2.2.3.

The STP 3 & 4 design has a number of features that mitigate an SBO and extended loss of all AC power:

- The primary mitigation for an extended SBO is provided by a CTG, which is independent from the Emergency Diesel Generators (EDGs) and can be connected to the 4.16 KV Class 1E buses. This CTG has black start capability and can be available for use within 10 minutes. There is one CTG per unit, they can be crosstied, and one CTG can supply the safety loads for both units. The CTGs are housed in International Building Code structures which are protected from the design basis flood and adverse weather conditions. (DCD Tier 1 Subsection 2.12.11 and DCD and FSAR Tier 2 Appendix 1C).

- The batteries have a capacity of 8 hours (DCD Subsection 8.3.2.1.3.1). This capacity can be extended well beyond 8 hours if load shedding is performed.

- The Reactor Core Isolation Cooling system can provide core cooling for at least 8 hours during SBO conditions without reliance on AC power (DCD Appendix 19E.2.1.2.2).

- The Alternating Current-Independent Water Addition (ACIWA) system is a seismically qualified system with an external permanent diesel-driven pump and water supply capable of providing water to the Residual Heat Removal (RHR) system for core and containment cooling without reliance on AC power. Operation of the ACIWA system is described in DCD Subsection 5.4.7.1.1.10.

- Seismically-qualified external connections on opposite sides of the Reactor Building can be used to provide makeup water and sprays to the Spent Fuel Pool (SFP) with the use of staged portable diesel driven water supply pumps as described in Part 11 (Mitigative Strategies Report) Sections 6.1 and 6.2.

(2) STP 3 & 4 has the installed equipment (e.g., ACIWA system) to implement an extended coping time in excess of 72 hours without reliance on AC power for core and spent fuel cooling and for reactor coolant system and primary containment integrity as documented in Subsection 19E.2.2.3. The 72 hours of core cooling can be provided without reliance on the UHS. Relevant procedures and training will be developed per the Operational Program Development Plan described in FSAR Section 13.4S and DCD and FSAR Section 13.5.

(3) Pre-planning and pre-staging resources to support uninterrupted core and spent fuel pool cooling, and RCS and primary containment integrity under conditions involving significant degradation of the onsite facilities associated with large fires and explosions are documented in Part 11. Additionally, as discussed in the next section, STP will arrange for sufficient offsite resources to sustain core, containment, and spent fuel pool cooling indefinitely. These plans and resources will provide this capability under circumstances involving significant degradation of offsite transportation infrastructure associated with a significant natural disaster.

Detailed procedures and training associated with strengthening SBO mitigation capabilities in accordance with the SBO Rule will be developed during implementation of operational programs as described in FSAR Section 13.5.

1E.2.4 Mitigating Strategies for Beyond Design Basis Events (4.2)

NRC Recommendation

NRC issued Order EA-12-049 (Reference 1E-5) to power reactor licensees and holders of construction permits requiring a three-phase approach for mitigating beyond-design-basis external events. The initial phase requires the use of installed equipment and resources to maintain or restore core cooling, containment and spent fuel pool (SFP) cooling capabilities. The transition phase requires 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 requires obtaining sufficient offsite resources to sustain those functions indefinitely.

Response

STP 3 & 4 incorporates three staged AC independent portable pumping systems:

- Two pumps (a fire truck and a trailer mounted portable pump) shared between STP 3 & 4 provide core, SFP, and containment cooling water to the RHR system via the ACIWA system. Operation of the ACIWA system is discussed in DCD Subsection 5.4.7.1.1.10.
  - The fire truck is stored in the Turbine Building Truck Bay and is protected from site hazards with the exception of floods.
  - The trailer mounted portable diesel-driven pump is stored in a Seismic Category I structure as required for protection from severe weather events (FSAR Subsection 19.4.6). In addition, one of the two diesel driven pumps to

be procured in accordance with FLEX guidance will be stored in a Seismic Category I structure. These pumps will be included in the DRAP.

- One trailer mounted pump shared between STP 1, 2, 3, & 4 provides water in the event of the loss of large areas of the plant (Part 11, Subsection 5.1.2).
  - This trailer mounted pump is protected primarily by distance.
- In addition to the above pumps, two additional portable high capacity pumps will be procured as described in the paragraph below. This will result in one high capacity portable trailer mounted diesel driven pump stored in a Seismic Category I structure in each unit, two fire trucks stored in a turbine building, and one trailer mounted diesel driven pump shared between the four units.

Additional equipment to be procured to provide defense in depth mitigation capability includes:

- Two diesel driven high capacity pumps (one/unit) one of which will be required to be kept in a Seismic Category I structure
- Six portable diesel generators (three/unit)
- Four portable DC power supplies (two/unit)
- Eight handheld satellite phones (four/unit)
- Various hoses, fittings, cables, and jumpers necessary to connect the above equipment

The STP 3 & 4 approach for mitigating a Beyond Design Basis External Event (BDBEE) is described in Reference 1E-14, STP 3&4 ABWR FLEX Integrated Plan. This plan is patterned after the industry FLEX program (Reference 1E-3). This industry program was endorsed by the NRC (with comments) in Reference 1E-13.

The STP 3 & 4 FLEX Integrated Plan provides guidance and strategies to restore core cooling, containment cooling, and spent fuel cooling following a BDBEE involving one or both STP 3 & 4 units. The strategies are capable of mitigating a simultaneous loss of all alternating current (ac) power (including both CTGs) and loss of normal access to the ultimate heat sink, and are capable of being implemented in all operating modes. The equipment required to mitigate the BDBEE will be adequately protected from external events.

The guidance utilizes a two-phase approach.

- Phase 1 uses installed equipment and resources to maintain or restore core, containment, and spent fuel pool (SFP) cooling capabilities. Phase 1 will be 36 hours in length. Since the FLEX equipment can be delivered from the offsite Regional Response Center to the site within 32 hours, there is no need for a Phase

2 using onsite portable equipment and there is a direct transition from Phase 1 to Phase 3 at 36 hours.

- The final phase 3 will obtain sufficient offsite resources to sustain the core cooling, containment cooling, and spent fuel cooling functions indefinitely.

As described in the introduction to the STP 3&4 FLEX Integrated Plan, the plan does not take credit for the Combustion Turbine Generators (CTGs) that are part of the STP 3&4 design, even though it is believed that one, if not both, would survive a BDBEE and would clearly be the initial approach in responding to such an event. The FLEX Plan as described in Reference 1E-14 credits the installed Reactor Core Isolation Cooling (RCIC), AC Independent Water Addition (ACIWA), and the Containment Overpressure Protection (COPS) systems to provide core, containment, and spent fuel cooling during Phase 1 and Phase 3 in accordance with the NRC Order.

To support the implementation of the FLEX Plan, the following system design requirements will be incorporated into the STP Units 3&4 final design:

- RCIC piping expansion calculations will be performed at 250°F.
- The CTGs will be protected from design basis hurricane and tornado missiles.
- Battery jumper connections will be installed and normally disconnected cabling will be installed as necessary to allow the four divisions of the Class 1E 125 VDC battery systems to be connected to the Division 1 battery bus to provide extended 125 VDC power.
- The Condensate Storage Tank (CST) for each unit will be constructed to withstand the site-specific Safe Shutdown Earthquake (SSE) of 0.13g, missile, flood, high wind and other site specific severe weather hazards.
- The ACIWA System (including the fuel supply tank) will be protected against site flood and severe weather events. The ACIWA diesel fuel storage tank will have sufficient storage capacity to support 36 hours of operation for both units.
- Both Fire Water Storage Tanks will be constructed to withstand the site-specific SSE of 0.13g, missile, flood, high wind, and other site specific severe weather events.
- Permanent piping to allow the ACIWA System to take suction from the water volume in the UHS Basins will be sub-surface piping installed during plant construction with the appropriate separation of safety related and non-safety related systems. This piping will be robust and consistent with the design requirements of the ACIWA system (Reference DCD Subsection 19I.4).
- One plant stack radiation monitor will be powered by Division 1E power
- Internal plant radio communications will be powered by the non-Class 1E 250 VDC battery located in the Control Building for at least 36 hours. The non-Class 1E

battery will be constructed to withstand the site-specific Safe Shutdown Earthquake (SSE) of 0.13g, missile, flood, high wind and other site specific severe weather hazards.

- Permanent electrical connections will be installed to allow the Phase 3 FLEX 480V 1500 kW DGs to be connected outside the Reactor Building and provide power to ESF Load Centers. The input circuit breaker from the 4160/480 VAC transformer to the applicable 480VAC power centers will be opened to isolate the FLEX DGs from the rest of the safety related distribution system.

The detailed procedures and training to support the FLEX Program will be developed during implementation of Operational Programs as discussed in FSAR Section 13.4S in cooperation with STP Units 1 & 2 as a 4 unit site. Personnel will be trained to perform the job specific functions necessary for their assigned tasks. The Systematic Approach to Training will be used to determine the initial and continuing elements of required training as well as the population to be trained.

1E.2.5 Reliable Hardened Vents (5.1)

NRC Recommendation

NRC issued an Order to operating Boiling-Water Reactor (BWR) licensees with Mark I and Mark II containments requiring them to have a reliable hardened vent to remove decay heat and maintain control of containment pressure within acceptable limits following events that result in the loss of active containment heat removal capability or prolonged Station Blackout (SBO). The hardened vent system is required to be accessible and operable under a range of plant conditions, including a prolonged SBO and inadequate containment cooling.

Response

This recommendation does not apply since STP 3 & 4 does not have a Mark I or Mark II containment.

However, each STP 3 & 4 unit does have a passive, reliable hardened vent as part of the Containment Overpressure Protection System (COPS). COPS is Seismic Category I and is qualified for accident pressures. The vent paths for the units are not shared. This design is described in DCD and FSAR Subsection 6.2.5.2.6 and its use in conjunction with long term cooling without AC power to prevent fuel damage is demonstrated in DCD Appendix 19E.2.2.

1E.2.6 Spent Fuel Pool (SFP) Instrumentation (7.1)

NRC Recommendation

NRC issued an order to power reactor licensees and holders of construction permits requiring them to have a reliable indication of the water level in associated spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel: (1) level that is adequate to support operation of the normal fuel pool cooling system, (2) level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck, and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred.

Response

The certified ABWR design includes reliable level and temperature monitors in the SFP that provide indication and annunciation via the process computer in the Main Control Room (MCR). Additionally, STP 3 & 4 SFP level indication independent of the process computer will be provided at the remote shutdown system panel or other appropriate and accessible location. The instruments will be powered by Class 1E batteries. Although not Post Accident Monitoring (PAM) instruments, the SFP level instrumentation channels will be designed and qualified to PAM Category 1 requirements (see DCD, Section 7.5).

STP 3 & 4 will also enhance the spent fuel pool instrumentation to ensure that it provides a reliable indication of the water level in the spent fuel storage pools capable of supporting identification of the following pool water level conditions by trained personnel: (1) level that is adequate to support operation of the normal fuel pool cooling system, (2) level that is adequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck, and (3) level where fuel remains covered and actions to implement make-up water addition should no longer be deferred. These enhancements will be consistent with the guidance provided in NEI 12-02, Revision 1 (Reference 1E-11), and JLD-ISG-2012-03 (Reference 1E-12).

1. The spent fuel pool level instrumentation will include the following design features:

    1.1 Instruments: The instrumentation will consist of two permanent, fixed instrument channels with level indication from the top of the fuel racks to above the normal operating level of the spent fuel pool. Level instrumentation will include high and low water level alarms that annunciate in the Control Room and level indication independent of the process computer at the remote shutdown system panel or other appropriate and accessible location. The level channels will be functional in all plant operating modes.

    1.2 Arrangement: The spent fuel pool level instrument channels will 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 will be provided by maintaining instrument channel separation within the spent fuel pool area, and will utilize inherent shielding from missiles provided by existing corners in the spent fuel pool structure. The channel separation guidance contained in NEI 12-02, Revision 1 Section 3.2 will be considered in determining sensor locations.

    1.3 Mounting: Installed instrument channel equipment within the spent fuel pool will be mounted to retain its design configuration during and following the maximum seismic ground motion considered in the design of the spent fuel pool structure. The seismic design of the mounting will be consistent with the

SFP seismic design and will include an evaluation of other hardware stored in the SFP to ensure it will not create adverse interaction with the fixed instrument locations.

1.4 Qualification: The instrument channels will be reliable at temperature, humidity, and radiation levels consistent with normal operation, event, and post-event conditions. This reliability will be established through use of an augmented quality assurance process (e.g., a process similar to that applied to the site fire protection program). Verification that the instrument channel design and installation is adequate from shock and vibration and seismic perspectives will be demonstrated as discussed in NEI 12-02, Revision 1 and JLD-ISG-12-03. In addition, these instrument channels will be included in the Design Reliability Assurance Program (DRAP).

1.5 Independence: The instrument channels will be physically and electrically independent of each other.

1.6 Power supplies: The level instrumentation channels will be powered by separate Class 1E batteries. The STP 3 & 4 Class 1E batteries are capable of providing 125 VDC power for over 76 hours post-event utilizing deep load shedding and division cross-connection strategies.

FLEX equipment is expected to arrive on site approximately 32 hours after event initiation. At this time, 480 VAC FLEX diesel generators will be installed and used to power the battery chargers and other select ESF loads, thereby assuring battery functionality indefinitely.

In addition, the instrument channel design will provide for quick and accessible power connections from alternate sources independent of the plant AC and DC power distribution systems. This design will also allow for isolating the instrument channels from their normal power supplies. The independent alternate sources used for instrument channel power will have sufficient capacity to maintain the level indication function until offsite resource capability is reasonably assured. These power supplies will be stored in diverse robust structures.

1.7 Accuracy: The instrument channels will maintain their designed accuracy following a power interruption or change in power source without recalibration. Considerations in determining required instrument accuracy should include SFP conditions, e.g., saturated water or steam conditions. Instrument accuracy will also be sufficient to allow trained personnel to determine when the actual level reaches the specified lower level of each indicating range (Levels 1, 2 and 3) without conflicting or ambiguous indication.

1.8 Testing: The instrument channel design will provide for routine testing and calibration which can be accomplished in-situ.

1.9 Display: Trained personnel will be able to monitor the spent fuel pool water level from the control room and either in the vicinity of Remote Shutdown System room or other appropriate and accessible location. The display will provide on-demand or continuous indication of spent fuel pool water level.

2. The spent fuel pool instrumentation will be maintained available and reliable through appropriate development and implementation of the following programs:

2.1 Training: Personnel will be trained to perform the job specific functions necessary for their assigned tasks (maintenance, calibration, surveillance, etc.) including the use and the provision of alternate power to the instrument channels. The Systematic Approach to Training will be used to determine the initial and continuing elements of required training as well as the population to be trained.

2.2 Procedures: Procedures shall be established and maintained for the testing, calibration, and use of the spent fuel pool level instrument channels. These procedures will also address any known potential abnormal response issues associated with the instrumentation.

2.3 Testing and Calibration: Processes will be established and maintained for scheduling and implementing necessary testing and calibration of the spent fuel pool level instrument channels to maintain the instrument channels at the design accuracy. Additionally, the out of service provisions contained in NEI 12-02, Revision 1, Section 4.3 will be implemented for the SFP level channels. The spent fuel pool level instrument channels will be included in the Design Reliability Assurance Program (DRAP).

1E.2.7 Emergency Procedures Rulemaking (8.0)

NRC Recommendation

Strengthen and integrate onsite emergency response capabilities such as emergency operating procedures (EOPs), severe accident management guidelines (SAMGs), and extensive damage mitigation guidelines (EDMGs). This includes modification of Technical Specifications to reference the approved EOP technical guidelines and providing more realistic, hands-on training on SAMGs and EDMGs.

Response

STP 3 & 4 procedure development will integrate the EOPs, SAMGs, and EDMGs by using the following guidance:

- Industry (BWROG) guidance as endorsed by applicable NRC regulatory guides consistent with the Task Force recommendation (SECY-11-0124).
- Plant Specific Technical Guidelines (PSTGs), EOPs and SAMGs development activities using as inputs the standard ABWR guidelines (DCD and FSAR Sections 13.5 and 1A.2) and generic industry guidance per NEI 91-04, Revision 1, Severe Accident Issue Closure Guidelines, which includes the industry commitment to

incorporate severe accident strategies into the overall accident management program.

- EDMGs development as described in NEI 06-12 (Mitigative Strategies Report).

Chapter 13 describes the procedure development plan.

The STP 3 & 4 Technical Specifications meet the requirement to reference the approved EOP Guidelines. (Technical Specifications 5.5.1.1.b)

Training development requirements in DCD and FSAR Section 13.2 and FSAR Section 13.4S will meet the applicable requirements for realistic hands-on training.

1E.2.8 Enhanced Emergency Plan Staffing and Communication (9.3)

NRC Recommendation

Assess current communications systems and equipment used during an emergency event assuming the potential onsite and offsite damage as a result of a large scale natural event resulting in a loss of all alternating current (AC) power It is also requested that consideration be given to any enhancements that may be appropriate for the emergency plan with respect to communications requirements of 10 CFR 50.47, Appendix E to 10 CFR Part 50, and the guidance in NUREG-0696 in light of the assumptions stated above. Also consider the means necessary to power the new and existing communications equipment during a multi-unit event, with a loss of all AC power.

Assess current staffing levels and determine the appropriate staff to fill all necessary positions for responding to a multi-unit event during a beyond design basis natural event and determine if any enhancements are appropriate given the considerations of NTTF Recommendation 9.3.

Response

The Emergency Plan for STP 3 and 4 will be part of a site-wide emergency plan for Units 1 through 4. NEI 12-01 (Guidelines for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities) will be used in assessing staff and communications capabilities necessary to respond to a beyond design basis multi-unit event. The results of the assessment will be addressed in the detailed Emergency Plan procedures developed during implementation of operational programs as described in FSAR Section 13.4S and in concert with STP Units 1 and 2.

1E.3 Tier 2 NRC Recommendations/Responses

1E.3.1 Other Natural External Hazards (2.1)

NRC Recommendation

Reevaluate and upgrade as necessary the design basis of structures, systems, and components important to safety for protection against natural external hazards other than seismic and flooding.

Response

The hazards and natural phenomena potentially affecting the STP 3 & 4 site have been identified, screened and evaluated in accordance with the latest revisions of the Standard Review Plan. The review and conclusions are documented in Chapters 2 and 3 along with the appropriate design features necessary to mitigate the events. The natural events of particular interest at the STP site are hurricane wind and missiles. STP 3 & 4 meets the latest regulatory guidance document (RG 1.221) for hurricane winds and missiles, which is based on an extreme hurricane (FSAR Subsections 2.3S.1.3.3.2 and 3H.11).

1E.3.2 Safety-related AC electrical power for the SFP makeup system (7.2)

NRC Recommendation

NRC to issue an order requiring safety related AC power for the SFP makeup system.

In accordance with SECY-11-0137, Recommendation 7.2 will be implemented by rulemaking to provide reliable SFP instrumentation and makeup capabilities

Response

The STP 3 & 4 design provides emergency makeup to the SFP using any of the three trains of the RHR system, which are powered by safety-related AC power (FSAR Subsection 2.4.1).

1E.3.3 Technical Specifications requirement for onsite emergency power (7.3)

NRC Recommendation

NRC to issue an order to revise technical specifications to require that one train of onsite emergency power be operable for SFP makeup and instrumentation whenever spent fuel is in the SFP, regardless of the operational mode of the reactor.

In accordance with SECY 11-0137, Recommendation 7.3 will be implemented by rulemaking to provide reliable SFP instrumentation and makeup capabilities.

Response

The STP 3 & 4 Technical Specifications require at least one Emergency Diesel Generator and one Residual Heat Removal (RHR) pump to be operable in all modes. The safety related RHR system is backed by the emergency diesel generators and can also be powered by the Combustion Turbine Generator. The RHR system is capable of providing makeup to the SFP.

1E.3.4 Spent Fuel Pool Spray (7.4)

NRC Recommendation

NRC to issue order requiring seismically qualified means to spray water into the spent fuel pools, including an easily accessible connection to supply the water (e.g., using a portable pump or pumper truck) at grade outside the building

In accordance with SECY 11-0137, Recommendation 7.4 will be implemented by rulemaking to provide reliable SFP instrumentation and makeup capabilities

Response

STP 3 & 4 has committed to install a diverse spent fuel pool makeup and spray system as described in Part 11 (Mitigative Strategies Report), Section 6.0 that meets the criteria specified in this recommendation

1E.4 DC Electrical Equipment Loading Considerations

As discussed in Section 2.4 of this appendix, the ability of the Division 1 safety-related battery was evaluated to support the required loads during Phase 1 of an ELAP. In order to extend the time the safety related batteries can support an extended station blackout (SBO) required loads, a battery analysis was performed which includes deep load shed of each Divisional battery with the following loads remaining: Division I Remote Shutdown Panel; Division I Reactor and Control building lighting; Division I safety relief valves (SRV); and Division I RCIC valves. The deep load shed will be completed by procedure within one hour by operators; therefore, the duty cycle for the first hour is assumed to be the normally connected DC loads. The duty cycle after one hour is a constant load for the Remote Shutdown panel, Reactor and Control building lighting and SRVs (conservatively considered to be constantly energized). The RCIC valves are assumed to be cycled open and closed periodically throughout the scenario.

The required duty cycle for the extended SBO analysis will be longer than the typical battery discharge information provided by battery vendors. However, battery vendors have tested their batteries for longer discharge cycles and vendor published data for extended discharge lengths was used in the extended SBO analysis.

The battery sizing analysis for an extended station blackout scenario uses the methodology given in IEEE 485, ‘Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications.’ The methodology is used to determine the length of time the divisional batteries can provide adequate voltage and power to the needed DC loads.

The minimum acceptable battery voltage to run all safety related loads has been determined by the Class 1E battery sizing and voltage drop calculation. The analysis determines the minimum voltage that the battery needs to provide and the allowable voltage drops between the battery and various end loads. The extended SBO analysis uses the same minimum battery voltage to size the battery and ensure adequate voltage is provided to the end loads.

1E.5 References

1E-1 SECY-11-0137, “Prioritization of Recommended Actions to be taken in response to Fukushima Lessons Learned” October 3, 2011.

1E-2 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”.

1E-3 NEI 12-06 [Revision 0] "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" August, 2012.

1E-4 SRM for 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, Tohoku Earthquake and Tsunami” March 9, 2012.

1E-5 EA-12-049, “Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design-Basis External Events,” March 12, 2012.

1E-6 EA-12-050, “Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents” March 12, 2012.

1E-7 EA-12-051, “Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,” March 12, 2012.

1E-8 NUREG-2115, “Central and Eastern United States Seismic Source Characterization”.

1E-9 SECY-11-0093, “The Near-Term Report and Recommendations for Agency Actions Following the Events in Japan,” July 12, 2011.

1E-10 NEI 12-01, Guidelines for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities.

1E-11 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” August 2012.

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1E-14 STP 3&4 ABWR FLEX Integrated Plan.