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April 16, 2014
U7-C-NINA-NRC-140009

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Submittal of STP 3 & 4 ABWR FLEX Integrated Plan, Revision 1

Attached is Revision 1 to the Nuclear Innovation North America, LLC (NINA) STP 3 & 4 ABWR FLEX Integrated Plan.

This revision contains changes in response to discussions with the NRC Staff and Request for Additional Information responses.

There are no COLA changes associated with this submittal.

There are no commitments in this submittal.

If you have any questions, please contact me at (979) 316-3011 or Bill Mookhoek at (979) 316-3014.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 4/16/14

Scott Head
Manager, Regulatory Affairs
NINA STP Units 3&4

Attachment:

STP 3 & 4 ABWR FLEX Integrated Plan

D091
NRO

cc: w/o attachment except*
(paper copy)

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STP 3&4 ABWR FLEX Integrated Plan

Revision 1

4/15/2014

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Approved by: Scott Head

A General Overview of the South Texas Project Units 3 & 4 FLEX Integrated Plan

In response to the events at the Fukushima Dai-ichi plants, the NRC issued Order EA-12-049 which requires that US nuclear power plants provide an integrated plan for adding mitigation strategies that will increase the defense-in-depth for beyond-design basis external event (BDBEE) scenarios to address an Extended Loss of AC power (ELAP) and loss of normal access to the ultimate heat sink (LUHS) occurring simultaneously at all units on a site.

NEI worked with the NRC to develop NEI Report 12-06, Revision 0, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" which was endorsed as a means of complying with the NRC order, (with comments) in Interim Staff Guidance Document JLD-ISG-2012-01, Revision 0. The NEI guidance recommends a three-phase strategy, with Phase 1 using installed plant equipment, Phase 2 using portable on-site equipment, and Phase 3 using equipment from offsite.

PLANT DESCRIPTION

The STP 3&4 site is located in south-central Matagorda County west of the Colorado River, 8 miles north-northwest of the town of Matagorda and about 89 miles southwest of Houston. It consists of approximately 12,220 acres of land and includes areas being used for STP Units 1&2, a railroad, and a cooling reservoir. The plant will be located about 12 miles south-southwest of Bay City and about 13 miles east-northeast of Palacios between FM (farm-to-market road) 1095 and the Colorado River.

Each of the two STP 3&4 units will be an Advanced Boiling Water Reactor (ABWR). The site features a 7,000-acre Main Cooling Reservoir (MCR) which is fully enclosed with an embankment. The MCR contains baffle dikes that direct the flow of water. The units will be located at the north end of the MCR with condenser cooling water being discharged into the western half of the MCR and returned to the power plant intake through the eastern half of the MCR.

All of the site-specific external hazards identified in NEI 12-06 are applicable to STP Units 3&4, including seismic, external flooding, storms, extreme cold, and extreme heat. The design basis external flooding hazard is a breach of the Main Cooling Reservoir, which adds 4.8 feet of water to the site, and is predicted to recede below plant grade in approximately 20 hours.

UNIQUE ABWR DESIGN FEATURES RELEVANT TO THE NRC ORDER

The ABWR certified design incorporates some unique design features that directly address extended station blackout (SBO) scenarios. Specifically, each ABWR unit is equipped with a Combustion Turbine Generator (CTG) that is diverse and independent from the normal and emergency AC power systems and can power the plant safe shutdown loads. The CTGs require no plant support systems to start or run. The ABWR design also incorporates an AC Independent Water Addition (ACIWA) system that can provide water directly via the RHR system piping to the core, the containment, or spent fuel pool using a diesel driven pump in the Fire Protection System. The diesel driven pump is designed to withstand a design basis earthquake. The NRC Final Safety Evaluation Report (FSER) NUREG-1503 for the ABWR concluded that the CTG in combination with ACIWA "virtually eliminates SBO as a consideration." The ABWR also includes a hardened containment vent as part of the Containment Overpressure Protection System (COPS). This passive vent will provide containment cooling once the rupture disk is actuated.

At STP 3&4, the 20 MWe CTGs are housed in structures which protect them from design floods and site severe weather events. Although the CTGs are not seismically designed, they are located in their respective unit Turbine Buildings, both of which are Seismic II/I structures designed to the certified ABWR Safe Shutdown Earthquake (SSE) of 0.3g which is greater than the site-specific SSE of 0.15g. Since similar CTG emergency equipment in the 20 MWe class is available packaged in trailers for air, rail, or truck transport for deployment in field locations, the units are robust in nature such that they can reasonably be expected to withstand a BDBEE as discussed in NEI 12-06 (Section 11.2.2). Although the CTGs are not specifically protected from wind generated missiles, at STP 3&4, the CTGs are located in the Turbine Buildings separated by approximately 900 feet and failure of both due to wind generated missiles is considered to be extremely unlikely. Either one of the two CTGs can provide the safe shutdown loads for both units and can power an ESF bus in either or both units. Each CTG has fuel oil supply storage for 7 days which is separate from the emergency diesel fuel supplies. The CTGs are routinely tested as part of the site program for predictive and preventive maintenance. The CTGs are described in FSAR Subsection 9.5.11 and Appendix 1C.

The primary purpose of the CTGs is SBO mitigation. The CTGs do not have a normal plant safety-related or power generation function. NEI 12-06 states that FLEX cannot credit any installed ac source including any alternate ac source as defined in 10 CFR 50.2. However, NEI 12-06 also states, "While initial approaches to FLEX strategies will take no credit for installed ac power supplies, longer term strategies may be developed to prolong Phase 1 coping that will allow greater reliance on permanently installed, bunkered or hardened ac power supplies that are adequately protected from external events."

In addition the STP 3&4 Ultimate Heat Sink (UHS) is a seismic Category 1 structure, with an enclosed concrete flood-protected basin, and with UHS pumps and valves located in a subsurface protected structure. Finally the STP 3&4 design includes a Reactor Core Isolation Cooling System (RCIC) that is steam powered and provides cooling flow to the core.

Because of the robust nature of both the CTGs and the UHSs, they would be expected to survive a beyond design basis external event, and the STP 3&4 units would not be subject to an ELAP or a LUHS as described in the NRC order.

Nonetheless, because the NRC order explicitly specifies loss of ALL AC and loss of normal access to the UHS, and because the STP 3&4 design has other installed systems such as RCIC, ACIWA, and COPS that can mitigate a simultaneous ELAP and LUHS, the FLEX coping strategy that is discussed in the remainder of this document **does not take credit for the CTGs** or normal access to the UHSs even though they would be the first systems relied upon in such an event.

SYSTEMS CREDITED FOR FLEX

As a result of the advanced design features of RCIC, ACIWA, and COPS, STP 3&4 can support a Phase 1 coping ability of at least 36 hours using permanently installed plant equipment. ACIWA is the only system credited in this plan that is shared between the units. All other systems discussed in this plan are unit-specific and service that unit only. Because Phase 1 is 36 hours in duration and offsite supplies can be delivered to the site from the Regional Response Center within 32 hours from the start of the event, there is no requirement for temporary portable equipment to provide core, containment, or spent fuel cooling for a Phase 2, and thus there will be a direct transition into Phase 3 at the end of Phase 1. The two phases are:

1) Initially cope by relying on installed plant equipment. (Phase 1) – 36 hours
2) Obtain additional capability and redundancy from off-site equipment until power, water, and coolant injection systems are restored or commissioned. (Phase 3) – Indefinite

Despite the fact that no portable Phase 2 equipment is needed or credited in this plan, STP 3&4 does in fact have portable equipment (including diesel powered pumps, power supplies, hoses and fittings, and portable diesel generators) that provide additional defense-in-depth for mitigating a simultaneous ELAP and LUHS. This additional equipment is described in FSAR Subsection 1E.2.4.

FLEX COPING STRATEGY

An overview of the phased strategy for maintaining core, containment, and spent fuel cooling after a simultaneous ELAP and LUHS is provided below:

Core Cooling

Phase 1 makes use of the steam driven RCIC and ACIWA systems to provide core cooling during the initial 36 hours. A reactor scram occurs upon initiation of the ELAP. The Main Steam Isolation Valves (MSIVs) close and the Reactor Internal Pumps (RIPs) coast down. Feedwater pumps will also coast down and the Reactor Pressure Vessel (RPV) water level begins to decrease. When the water level reaches Level 2, the RCIC system starts injecting into the RPV taking suction from the Condensate Storage Tank (CST). The steam generated in the core is discharged to the suppression pool through the Safety Relief Valves (SRVs) and by RCIC turbine exhaust.

As directed by procedure, the Operations staff will determine that an ELAP event has occurred within 30 minutes. They will then conduct a deep load shed of the ESF DC batteries to extend battery life. This deep load shed in conjunction with a cross-tie of the batteries, will provide more than 72 hours of Class 1E 125V DC power. It is expected that battery chargers will be re-energized and operating at about 36 hours into the event so sufficient battery margin is available. This load shed will include the digital I&C system and as a result, command and control of the event will be shifted from the Main Control Room to the Remote Shutdown System (RSS) room. An operator will be dispatched to operate the RCIC pump manually.

After the Suppression Pool level high alarm set point is reached, RCIC suction will automatically be switched to the Suppression Pool. RCIC suction will remain aligned to the Suppression Pool until the pool temperature approaches 250°F. Operators will then shift RCIC suction back to the CST at approximately 10 hours. A plant cooldown to approximately 350 psig will be initiated.

The suppression pool temperature and pressure will continue to increase until the COPS rupture disk opens at a nominal pressure of approximately 90 psig. This will occur at approximately 20 hours. COPS will then vent the containment from the wetwell via the plant stack and provide containment cooling. At this point, core cooling is still being provided by RCIC with suction from the CST.

When the CST approaches the end of its usable volume, operators will align the ACIWA system for injection into the RPV. The RPV will be depressurized by opening at least one SRV to discharge steam to the suppression pool and reducing pressure below the shutoff head of the ACIWA system. Once the ACIWA is injecting into the RPV, the RCIC pump will be secured. This transition to ACIWA is predicted to occur at about 36 hours.

The CST has sufficient water volume, and RCIC and ACIWA have sufficient pumping capacity to provide cooling for the entire 36 hour Phase 1 period, which is beyond the approximately 20 hour duration of the design basis flood caused by the Main Cooling Reservoir embankment failure or duration of extreme weather conditions.

After 36 hours, Phase 3 begins with core cooling being provided by ACIWA. As Phase 3 proceeds, operator action would be necessary to shift ACIWA suction to the volume of water in the approximately 16 million gallon UHS basin. Operators would also need to transfer diesel fuel from one of the three Emergency Diesel Generator fuel oil storage tanks to the ACIWA fuel storage tank using a staged portable pump and small portable diesel generator. Two FLEX 480V 1500 KW diesel generators from offsite would be connected and started to provide AC power for battery charger operation, limited ventilation system operation, and other limited uses. Command and control is expected to be shifted back to the Main Control Room early in Phase 3.

Containment Cooling

The ABWR containment is a carbon steel lined reinforced concrete containment vessel with an upper and lower drywell. The containment design pressure is 45 psig, the ultimate strength of the containment is 133.7 psig, and the drywell head allowable pressure is 96.7 psig. Containment structural integrity is maintained during the event by the COPS rupture disk which actuates at approximately 90 psig prior to exceeding the drywell head and the ultimate strength pressure limits.

During Phase 1, containment structural integrity is maintained by the normal design features of the containment, such as the COPS and the containment isolation valves. After the suppression pool water becomes saturated, the containment will begin to heat up and pressurize. Additionally, the suppression pool level rises due to the transfer of inventory to the suppression pool (via RCIC and then ACIWA). The containment will continue to pressurize to approximately 90 psig at which point the COPS rupture disk will actuate and containment venting will commence at approximately 20 hours after event initiation.

Containment structural integrity is maintained throughout the duration of the ELAP/LUHS. No non-permanently installed equipment is required to maintain the containment during Phase 1.

The same methods used in Phase 1 are used in Phase 3 to maintain containment structural integrity.

Spent Fuel Pool Cooling

There are no required actions during Phase 1 other than monitoring of spent fuel pool (SFP) level. Fuel in the SFP is cooled by boiling the water in the pool (approximately 23 feet above the fuel during normal operation). Assuming a full core offload and no makeup, the SFP level will not reach 10 feet above the top of the fuel racks in the first 36 hours of the event.

During Phase 3, the ACIWA system would be aligned to provide water to the SFPs as necessary while still providing core cooling. Calculations show that it would take 76 hours total from event start for the water level to drop to 10 feet above the top of the fuel racks assuming no makeup.

Table 1 provides a summary of the ABWR FLEX capability. Figure 1 provides a FLEX Mitigating Strategy Summary Timeline.

Table 1 - ABWR FLEX Baseline Capability Summary

Safety Function		Method	Baseline Capability
Core Cooling	Reactor Core Cooling	• RCIC • Depressurize RPV for Injection with installed AC Independent Water Addition System (ACIWA) • Sustained Source of Water	• Use of installed equipment for initial coping • Means to depressurize RPV • Use of alternate water supply to support core heat removal makeup • Deep load shed to maintain battery life
Core Cooling	Key Reactor Parameters	• RPV Level • RPV Pressure • CST Level	• Control shifted to Remote Shutdown System • Hard wired instruments • Other instruments for plant-specific strategies
Containment	Containment Pressure Control /Heat Removal	• Containment Overpressure Protection System	• Hardened vent capability
Containment	Key Containment Parameters	• Drywell Pressure • Suppression Pool Temperature • Suppression Pool Level	• Hard wired instruments
SFP Cooling	Spent Fuel Cooling	• Makeup with installed ACIWA	• Makeup direct to pool via "C" train RHR using installed ACIWA
SFP Cooling	SFP Parameters	• SFP Level	• Two (2) channels with remote indication

Figure 1 - FLEX Mitigating Strategy Summary Timeline

CORE COOLING

0	< 2 Min	10 hr.	36 hr.	72 hr.
RCIC on CST suction	RCIC on SP suction	RCIC on CST suction	ACIWA on FWST suction Phase 3 FLEX DG operating	ACIWA on UHS suction

CONTAINMENT

0	20 hr.	72 hr.
Containment Pressure Increasing	Containment Vented after COPS actuation	

SPENT FUEL POOL

0	20	72 hr.
No SFP fill required	ACIWA available to fill SFP as necessary	

Determine Applicable Extreme External Hazard

Ref: NEI 12-06 section 4.0 -9.0
JLD-ISG-2012-01 section 1.0

Input the hazards applicable to the site; seismic, external flood, high winds, snow, ice, cold, high temps. Describe how NEI 12-06 sections 5 – 9 were applied and the basis for why the plant screened out for certain hazards.

STP 3&4 screens in on all external hazards as follows:

In accordance with Section 4 of NEI 12-06, Rev. 0, the applicability of potential beyond-design-basis external events (BDBEE) identified in Sections 5 – 9 were evaluated and all of the site-specific external hazards identified in Section 4.1 are applicable to STP Units 3&4. The BDBEEs which must be considered for the STP Units 3&4 site are:

- Seismic – Applicable since NEI 12-06 Section 5.2 requires all sites to address seismic hazards. The seismic criteria for STP 3&4 are contained in FSAR Section 2.5S. The site-specific Design Basis Earthquake (DBE) (Safe Shutdown Earthquake) for STP 3&4 is defined as 0.15g. The ABWR certified design Safe Shutdown Earthquake is defined as 0.3g.
- External Flooding – Applicable as defined in FSAR Section 2.4S.2. Specific individual flooding BDBEEs which will be considered include:
  - Main Cooling Reservoir (MCR) Embankment Failure – This is the design basis flooding event for the site
  - Local Intense Precipitation
  - Probable Maximum Flooding on Streams and Rivers
  - Probable Maximum Storm Surge
  - Seiche
  - Tsunami
- Storms such as hurricanes, high winds and tornados – All three of these BDB hazards are applicable to the site, in accordance with NEI 12-06, Section 7, including Figures 7-1 and Figure 7-2. FSAR Section 2.3S contains the defined extreme wind condition for STP 3&4.
- Snow, Ice and Extreme Cold – Based on Figure 8-1 of NEI 12-06, snow is not considered applicable for the STP 3&4 site. However, since the STP site is in the Level 3 (yellow) region of Figure 8-2 of NEI 12-06, the hazard from ice storms must be considered to be applicable. While the probability of occurrence of extreme cold is rare, it is also considered to be applicable. FSAR Section 2.3S contains the defined extreme snow, ice, and extreme cold condition for STP 3&4.
- Extreme Heat – As required by NEI 12-06, Section 9.2, all sites must consider the impact of high temperatures. FSAR Section 2.3S contains the defined extreme heat condition for STP 3&4.

Coincident Beyond-Design-Basis events are not considered to be applicable to the STP 3&4 site.

In conclusion, in accordance with NEI 12-06, Section 2.2, all of the postulated BDBEEs identified as applicable in this section will be considered for:

- Protection of the equipment
- Deployment of the FLEX equipment
- Procedural Interfaces
- Utilization of off-site resources

Key Site assumptions to implement NEI 12-06 strategies.

Ref: NEI 12-06 section 3.2.1

Provide key assumptions associated with implementation of FLEX Strategies:

- Robust as used in this document means that the design of the Structure System or Component (SSC) either meets the current plant design basis for the applicable external hazards or has been shown by analysis or test to meet or exceed the current design basis. This definition is consistent with NEI 12-06.
- Personnel resources are assumed to already be onsite for predicted severe weather events or other slower moving events and begin arriving at the site after 6 hours for fast moving events with full staffing reached at 24 hours. The FLEX coping strategy will provide the capability to sustain functions "indefinitely", which will assure that, for the first 36 hours, onsite supplies of water and fuel will be sufficient to operate without outside resupply.
- The Regional Response Center will be able to provide equipment to the site within 30 hours of requesting the equipment. The 30 hours is based on 24 hours for equipment and resources to arrive at the offsite STP staging location and an assumed 6 hours to relocate the equipment to the site. The 6 hours accounts for the time required for possible removal of flood or severe weather related debris to enable equipment transport from the offsite location to the onsite location.
- Per NEI 12-06, Section 3.2 Performance Attributes, "...installed equipment that is designed to be robust with respect to DBEE is assumed to be fully available".
- Section 3.2.1.3 Initial Conditions, (6) states "Permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods and high winds and associated missiles are available."
- Section 3.2.1.3 (8) states "Installed electrical distribution systems...remain available provided they are protected..."
- The remaining items in Section 3.2.1.3 of NEI 12-06 are incorporated in this document.
- All protected equipment, including the Reactor Core Isolation Cooling (RCIC) and Alternating Current Independent Water Addition (ACIWA) systems will perform as designed, except the equipment assumed to be lost as dictated by NRC order EA-12-049.

As stated in the guidance: "Each plant has unique features and for this reason, the implementation of FLEX capabilities will be site-specific." The unique features of STP units 3&4 are:

1. The design basis flood which adds up to 4.8 feet of water (34 to 38.8 feet above Mean Sea Level (MSL)) to the site over a period of hours and recedes below grade after approximately 20 hours. (FSAR Subsection 2.4S.4)

2. Three completely independent, 100% capacity Emergency Diesel Generators per unit, protected from all design basis external events. (FSAR Subsection 8.3.1)

3. One Condensate Storage Tank (CST) per unit which is a robust tank (FSAR Appendix 1E) of more than 550,000 gallons of water (FSAR Table 9.2-3). For the FLEX analysis, a CST volume of 250,000 gallons is assumed which is at the low end of the normal operating range. The CST water is protected against extreme cold by immersion-type electric heaters (FSAR Subsection 9.2.4.2.2).

4. An Ultimate Heat Sink (UHS) for each unit that is a safety-related forced draft cooling tower. The cooling tower and fans will survive all defined BDBEEs. Likewise the Reactor Service Water and Residual Heat Removal systems (including pumps) which are located below grade are designed to survive all defined BDBEEs. The approximately 16 million gallon UHS is rendered inoperable solely due to the loss of AC power. (FSAR Subsection 9.2.5)

5. Within 60 minutes of the onset of an Extended Loss of A/C Power (ELAP) and loss of access to the Ultimate Heat Sink (LUHS), event command and control is shifted to the Remote Shutdown System panels (FSAR Section 18.5, Subsections 7.4.1.4 and 7.4.2.4).

6. The permanently installed seismically qualified ACIWA system is housed in a robust structure with a minimum of 36 hours fuel supply (FSAR Appendix 1E). There is one ACIWA system and two Fire Water Storage Tanks (FWSTs) shared between both units. Each of the FWSTs are of robust design (FSAR Appendix 1E) and contain a minimum usable volume of 300,000 gallons (FSAR Subsection 9.5.1.3.5).

7. Class 1E 125V DC power (FSAR Subsection 8.3.2.1.3) is available for remote shutdown instrumentation for over 72 hours following a deep load shedding and division cross-connection strategy. It is expected that battery chargers will be re-energized and operating at about 36 hours into the event so sufficient battery margin is available. (Reference 1)

The baseline ABWR design allows STP 3&4 to cope for beyond 36 hours with installed plant equipment (i.e. without the need for portable FLEX equipment) (Phase 1). Spent Fuel Pool cooling makeup is not needed for more than 36 hours.

References:

1. Extended Station Blackout Scenario, DP Engineering, August 2012

Extent to which the guidance, JLD-ISG-2012-01 and NEI 12-06, are being followed. Identify any deviations to JLD-ISG-2012-01 and NEI 12-06. **Ref: JLD-ISG-2012-01** **NEI 12-06 13.1**
Include a description of any alternatives to the guidance, and provide a milestone schedule of planned action. There are no deviations to the guidance in JLD-ISG-2012-01 and NEI 12-06.

Provide a sequence of events and identify any time constraint required for success including the technical basis for the time constraint.

Ref: NEI 12-06 section 3.2.1.7
JLD-ISG-2012-01 section 2.1

Strategies that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walk-through of deployment).

Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline

See attached sequence of events timeline.

Technical Basis Support information, see attached NSSS Significant Reference Analysis Deviation Table

OVERALL STRATEGY

The certified ABWR design includes a Reactor Core Isolation Cooling (RCIC) system that is steam driven and will be available to provide makeup water to the Reactor Pressure Vessel (RPV) in the event of an extended loss of all AC Power (ELAP). (FSAR Subsection 5.4.6)

A reactor scram occurs upon initiation of the ELAP. The Main Steam Isolation Valves (MSIVs) close and the Reactor Internal Pumps (RIPs) coast down. Feedwater pumps will also coast down and the RPV water level begins to fall. When the water level reaches Level 2, the RCIC system initiates taking suction from the Condensate Storage Tank (CST). The steam generated in the core is discharged to the suppression pool through the Safety Relief Valves (SRVs) and RCIC turbine exhaust.

The operations staff will determine that an ELAP event has occurred within 30 minutes. The Operations staff will then conduct a deep load shed of the ESF DC batteries to extend battery life. The Class 1E batteries are discussed in FSAR Subsection 8.3.2.1.3. This deep load shed in conjunction with a cross-tie of the batteries will provide more than 72 hours of power (Reference 1). This load shed will include the digital I&C system and as a result, command and control will be shifted from the Main Control Room to the Remote Shutdown System room. An operator will be dispatched to operate the RCIC system manually.

When the suppression pool level reaches the high level alarm set point, the RCIC suction will be automatically shifted to the Suppression Pool. As the suppression pool temperature approaches 250°F, RCIC suction will be shifted back to the CST. This is expected to occur at approximately 10 hours. A cooldown of the RPV to 350 psig will be initiated.

Since there is no containment cooling at this point, the suppression pool temperature and pressure will continue to increase until the Containment Overpressure Protection System (COPS) rupture disk opens at a nominal pressure of approximately 90 psig (FSAR Subsection 6.2.5.2.6.3). This will occur at approximately 20 hours (Reference 1). COPS will then vent the containment from the suppression pool to the environment via the plant stack and provide containment cooling (FSAR Subsection 6.2.5.2.6.2).

RCIC suction will remain aligned to the CST until CST water level approaches the end of its usable volume. Based on an assumed CST volume of 250,000 gallons, this is expected to occur at about 36 hours. It is very possible that the CST would have substantially more water and this transition could be delayed further. RCIC injection will not be stopped until the usable volume in the CST has been depleted. When the CST volume is nearly depleted, the RPV will be depressurized by opening at least one Safety Relief Valve (SRV) to discharge steam to the suppression pool and reducing RPV pressure below the shutoff head (284 psig) (FSAR Subsection 19E.2.2.3) of the ACIWA system. Once the ACIWA is injecting into the RPV, the RCIC pump will be secured.

After 36 hours, Phase 3 has started and once the water in the FWSTs is depleted, operator action would be necessary to shift ACIWA suction to the volume of water in the UHS basin (FSAR Appendix 1E). Operators would also need to transfer diesel fuel from one of the three underground Emergency Diesel Generator fuel oil storage tanks to the ACIWA fuel storage tank using a staged portable pump and small portable diesel generator.

Longer term actions will require installation of portable 480V FLEX diesel generators to provide longer term DC power via the installed Class 1E battery chargers. Other than these actions small portable 120 V diesel generators will be used to charge satellite phone batteries and hand held radio batteries.

Attachment 1 provides the detailed sequence of events.

The information in this document is conceptual because a walk-through or simulator validation is not possible at this stage of the design process. A walk-through validation, simulator runs, and as built design calculations will be used to update this scenario at the appropriate stage of the design process.

Discussion of Time Constraints

There are three time critical steps that are required.

1. **Determine that an ELAP has occurred**
   This should occur prior to 30 minutes after the event. There will be a procedure step for Operations to determine if the loss of all AC will not be recovered for an indefinite time period.

2. **Transfer command and control to the Remote Shutdown System Room**
   This action is necessary since the next action will strip loads from the Class 1E batteries and result in a loss of the digital I&C systems. The action is necessary because the Plant Computer System is one of the more significant loads on the station batteries (Reference 1). This should be completed within 60 minutes after the event occurs and is done in conjunction with the bus stripping action below.

3. **Conduct DC bus stripping to lengthen battery life**
   This action should be completed 60 minutes after the event occurs to preserve battery capacity. STP 3&4 will have a site-specific requirement to perform stripping of DC loads once an ELAP

has been determined.

References:

1. Extended Station Blackout Scenario, DP Engineering, August 2012

Identify how strategies will be deployed in all modes.

Ref: NEI 12-06 section 13.1.6

Describe how the strategies will be deployed in all modes.

The responses/strategies discussed in this document primarily reflect an initial condition of operating modes 1-3; however, the FLEX equipment can be deployed in all modes of operation.

For operating modes 1-3 the strategy is basically the same as described previously, except that the timing of events may be slightly different. For operating modes 4 and 5, the strategy will start with RPV injection using ACIWA rather than using the RCIC pump, since there will not be sufficient steam available to power RCIC. The ACIWA valves are readily accessible in the Reactor Building and they can be aligned in a relatively short time frame.

For Phase 3, transportation strategies will be developed from the equipment staging area to where the equipment is needed. An administrative program will be developed to monitor transportation route availability or developed compensatory actions will be implemented. These details will be included in the plant specific "FLEX Playbook". The "FLEX Playbook" is an agreement between the site and the RRC defining the specific equipment required for the site, the priority of delivery of the equipment, and the delivery logistics for the equipment.

Provide a milestone schedule. This schedule should include:
• **Modifications timeline**
  ○ **Phase 1 Modifications**
  ○ **Phase 2 Modifications**
  ○ **Phase 3 Modifications**
• **Procedure guidance development complete**
  ○ **Strategies**
  ○ **Maintenance**
• **Storage plan (reasonable protection)**
• **Staffing analysis completion**
• **FLEX equipment acquisition timeline**
• **Training completion for the strategies**
• **Regional Response Centers operational**
 	
Ref: NEI 12-06 section 13.1

The dates specifically required by the NRC order are obligated or committed dates. Other dates are planned dates subject to change. Updates will be provided in the periodic (six month) status reports. See attached the milestone schedule in Attachment 2. Note that because STP 3&4 is pre-construction plant, development of a detailed schedule is not yet realistic. All actions required by this document will be implemented prior to fuel load on the respective unit.

Identify how the programmatic controls will be met.
Ref: NEI 12-06 section 11 **JLD-ISG-2012-01 section 6.0**
Provide a description of the programmatic controls equipment protection, storage and deployment and equipment quality. See section 11 in NEI 12-06. Storage of equipment, 11.3, will be documented in later sections of this template and need not be included in this section. *See section 6.0 of JLD-ISG-2012-01.* STP 3&4 will implement an administrative program whereby the equipment used in these strategies will be controlled with respect to configuration control, maintenance and testing. Preventative Maintenance (PM) activities and inventories will be established for required components and testing procedures will be developed and frequencies established based on type of equipment and considerations made within EPRI guidelines. These programs, maintenance requirements, and procedures, which are part of the STP 3&4 operational programs, will be in place 180 days prior to initial fuel load on Unit 3. It is expected that an NRC inspection of STP 3&4 operational programs will occur prior to fuel load.

Describe training plan	*List training plans for affected organizations or describe the plan for training development* The Systematic Approach to Training (SAT) will be used to evaluate required training for station personnel based upon plant equipment and procedures that result from implementation of the strategies described in this report. This training will be developed and completed 180 days prior to the initial fuel load of Unit 3.
Describe Regional Response Center plan	The industry will establish two Regional Response Centers (RRCs) to support utilities during beyond design basis events. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. The RRC that will support STP 3&4 is expected to be located in Memphis, Tennessee. Equipment will be moved from the RRC to a local Assembly Area, established by the Strategic Alliance for FLEX Emergency Response (SAFER) team and the utility. Communications will be established between the affected nuclear site and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the nuclear site's FLEX Playbook will be delivered to the site staging area within 24 hours from the initial request.

Discussion of Maintaining Core Cooling

Maintain Core Cooling Phase 1

Determine Baseline coping capability with installed coping modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06:

- **RCIC**
- **Depressurize RPV**
  for Makeup with Installed ACIWA Injection Source
- **Sustained Source of Water**

Ref: JLD-ISG-2012-01 section 2 and 3

ABWR Installed Equipment Phase 1

Provide a general description of the coping strategies using installed equipment including station modifications that are proposed to maintain core cooling. Identify methods (RCIC/ACIWA) and strategies utilized to achieve this coping time.

The ABWR has design features to mitigate a simultaneous ELAP and LUHS. The RCIC and ACIWA are the primary systems used to provide core cooling during Phase 1. The overall strategy was previously described in the Sequence of Events/Time Constraints section of this document and is not repeated here. The detailed sequence of events is provided in Attachment 1.

RCIC

The STP 3&4 RCIC turbine-pump is a single shaft unit which requires no external services (electrical, pneumatic, lube oil) to operate. Only steam is needed for the RCIC to function. The governor controls are self-contained on the unit. The bearings are water lubricated from the pump discharge. The bearings are designed to operate with pumped fluid lubricating water up to a temperature of 250°F (Reference 1).

The design basis operating temperature of the RCIC room is 150.8°F. (FSAR Table 19E.2-2). The RCIC room is designed not to exceed this temperature for up to 8 hours of RCIC operation during SBO conditions (FSAR 5.4.15.2.1). For extended RCIC operation, the door to the RCIC room will be propped open, and the overhead hatch will be removed to provide a natural circulation path to provide additional cooling.

At the initiation of the event, RCIC takes suction from the Condensate Storage Tank (CST). After the high suppression pool level is reached in the first few minutes of the event, suction is automatically switched to the suppression pool. As suppression pool temperature approaches the design limit of 250°F (Reference 1), operators will shift suction back to the CST. This transition to the CST is expected to occur at approximately 10 hours. The RCIC will operate using suction from the CST until the usable volume is depleted. Although it could occur later, this is assumed to occur at 36 hours. Prior to the CST volume being depleted, the operators will shift to ACIWA injection and secure RCIC.

COPS

No heat is removed from containment until the COPS rupture disk opens at approximately 20 hours into the event. The COPS is a hardened vent system that relieves pressure from the top of the suppression pool air space to the atmosphere via the plant stack. Once the COPS rupture disk relieves, containment pressure and temperature will decrease. (FSAR Subsection 6.2.5.2.6.2)

ACIWA

There is one ACIWA system that is designed to support both units. ACIWA provides a means for introducing water directly into the reactor pressure vessel when AC power is not available from either onsite or offsite sources. The RHR System provides the piping and valves which connect the ACIWA piping with the RHR Loop C pump discharge piping. The ACIWA valves that are used to introduce flow into RHR Loop C are located in the Reactor Building and are readily accessible. The primary means for supplying water through this connection is by use of the diesel-driven pump in the ACIWA system. ACIWA is operated only manually; there is no automatic operation other than the start of the ACIWA pump on loss of offsite power. (FSAR Subsection 5.4.7.1.1.10).

When the decision is made to inject via ACIWA based on CST level, the ACIWA system will first be aligned to RHR Loop C in the low pressure core flooder mode with the ACIWA pump already in operation. The operators will then depressurize the RPV to begin injecting with the ACIWA system. One SRV is opened to reduce RPV pressure to below the shutoff head of ACIWA, which is 284 psig (FSAR 19E.2.2.3). Once the RPV pressure decreases below the shutoff head and the ACIWA system starts injecting, RCIC can be secured and core cooling provided by ACIWA. ACIWA injection rate is manually controlled to maintain RPV level as required. This transition is expected to be performed at approximately 36 hours. As discussed in FSAR Subsection 5.4.7.1.1.10.3, the ACIWA design flow capacity is 634 gpm at a backpressure of 90 psig and increases to 951 gpm at a back pressure of 0 psig. After 36 hours, RPV pressure has reduced below 90 psig due to the open COPS rupture disk and the injection flow capacity would be greater than 634 gpm. At 36 hours the required flow rate to remove decay heat is less than approximately 165 gpm (Reference 2) for each unit, and therefore the single ACIWA pump can provide enough flow to maintain vessel level for both units.

RCIC, COPS, and ACIWA are seismically qualified and are contained within robust structures such that they are adequately protected against the applicable site extreme hazards.

The instrumentation used in this scenario is available on the Remote Shutdown System panels as hardwired instruments that are powered from Class 1E DC power. These instruments will not be affected by the shutdown of the plant computer systems and as such will be available for use.

CORE COOLING STRATEGY IN OTHER MODES

Power Operation, Startup, and Hot Shutdown (Modes 1-3)

The core cooling strategy described above assumes 100% power initial conditions. The strategy is similar in Modes 2 and 3 except that the timing of events would be different.

Cold Shutdown and Refueling (Modes 4 and 5)

The overall strategy for core cooling during Cold Shutdown and Refueling are, in general, similar to those for Power Operation, Startup, and Hot Shutdown.

If an ELAP occurs during Cold Shutdown (Mode 4), water in the vessel will heat up, an SRV will be opened and the ACIWA system will be used to maintain RPV level and as such provide water for core cooling.

During Refueling, the most limiting condition for providing cooling is the case in which the reactor head is de-tensioned and water level in the vessel is at or below the reactor vessel flange. If an ELAP/LUHS occurs during this condition, ACIWA would be used to restore and maintain water level in the reactor cavity above the vessel flange.

References:

1. Clyde Union Pump Technical Data Sheet, Integral Steam Turbine Water Lubricated Pump, April 2012.
2. NEDC-33771P Revision 1.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* STP 3&4 will use procedures developed based on industry guidance from the Owners Groups, EPRI, and NEI as part of the Procedure Development Plan described in FSAR Section 13.5. The procedures, training, and any walk-through validation will be in place and completed 180 days prior to the initial fuel load of Unit 3.
Identify modifications	*List modifications and describe how they support coping time.* No modifications will be necessary to cope for the specified times.
Key Reactor Parameters	*List instrumentation credited for this coping evaluation phase.* RPV Level RPV pressure Suppression Pool Level Drywell Pressure Suppression Pool Temperature Condensate Storage Tank Level

Maintain Core Cooling Phase 2	
ABWR Portable Equipment Phase 2	
Provide a general description of the coping strategies using on-site portable equipment including station modifications that are proposed to maintain core cooling. Identify methods and strategies utilized to achieve this coping time. Due to the ability of the STP 3&4 ABWR to cope for 36 hours with an Extended Loss of All AC Power using installed equipment, there is no Phase 2 and at the end of Phase 1 at 36 hours there is a direct transition into Phase 3. The equipment and resources needed for Phase 3 will begin arriving onsite within at least 32 hours from the start of the event.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Not Applicable
Identify modifications	*List modifications necessary for phase 2* Not Applicable
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* Not Applicable
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List Protection or schedule to protect* Not Applicable
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List Protection or schedule to protect* Not Applicable
Severe Storms with High Winds	*List Protection or schedule to protect* Not Applicable
Snow, Ice, and Extreme Cold	*List Protection or schedule to protect* Not Applicable
High Temperatures	*List Protection or schedule to protect* Not Applicable
Deployment Conceptual Design	

Maintain Core Cooling Phase 2		
ABWR Portable Equipment Phase 2		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
	None	

Maintain Core Cooling Phase 3

ABWR Portable Equipment Phase 3

Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain core cooling. Identify methods and strategies utilized to achieve this coping time.

Phase 3 will be an extension of Phase 1. The following actions would be performed in Phase 3:

- Continue running ACIWA pump
- Continue dumping heat to the suppression pool using SRV(s)
- Continue venting the containment via COPS
- Switch ACIWA suction to the UHS (FSAR Appendix 1E)
- Add diesel fuel to the ACIWA fuel tank as necessary
- Power up select battery chargers and safety-related loads from the 480V FLEX AC DG so that command and control can be re-established in the Main Control Room
- Re-establish ventilation in the Reactor Building and Control Room

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* STP 3&4 will use procedures developed based on industry guidance from the Owners Groups, EPRI, and NEI as part of the Procedure Development Plan described in FSAR Section 13.5. The procedures, training, and any walk-through validation will be in place and completed 180 days prior to the initial fuel load of Unit 3.
Identify modifications	*List modifications necessary for phase 3* None
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* RPV Level RPV Pressure Suppression Pool Level Drywell Pressure Suppression Pool Temperature UHS Level

Deployment Conceptual Design		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
	None	

Discussion of Maintaining Containment

Maintain Containment Phase 1

Determine Baseline coping capability with installed coping modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06:

- Containment Spray
- Hydrogen igniters (ice condenser containments only)

ABWR Installed Equipment Phase 1:

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain containment. Identify methods (containment spray/Hydrogen igniter) and strategies utilized to achieve this coping time.

The ABWR has design features to mitigate a simultaneous ELAP and LUHS. The RCIC system and ACIWA are the primary systems used to provide core cooling. The Containment Overpressure Protection System (COPS) is the primary means for providing containment cooling. The overall strategy was previously described in the Sequence of Events/Time Constraints section of this document and is not repeated here. The detailed sequence of events is provided in Attachment 1.

The containment design pressure is 45 psig (FSAR Subsection 6.2.1.1.2.1), the ultimate strength of the containment is 133.7 psig (FSAR Subsection 6.2.1.1.10), and the drywell head allowable pressure is 96.7 psig (FSAR Subsection 6.2.1.1.10). Containment structural integrity is maintained during the event because the COPS rupture disk actuates at a nominal pressure of approximately 90 psig (FSAR Subsection 6.2.5.2.6.3) prior to exceeding the drywell head and the ultimate containment pressure limits.

During Phase 1, containment integrity is maintained by the normal design features of the containment, such as the containment overpressure protection system (COPS) and the containment isolation valves. The COPS is described in FSAR Subsection 6.2.5.2.6.2. As the suppression pool heats up, the containment will begin to heat up and pressurize. Additionally, the suppression pool level rises due to the transfer of inventory from the CST and the FWST to the suppression pool (via RCIC and then ACIWA and the SRVs). The containment will continue to pressurize to approximately 90 psig at which point the COPS rupture disk will actuate, containment venting will commence, and heat will be removed from containment approximately 20 hours into the event. The COPS is a hardened vent system that relieves pressure from the top of the suppression pool air space to the atmosphere via the plant stack. Once the COPS rupture disk relieves, containment pressure and temperature decrease.

Monitoring of containment parameters will be available at the Remote Shutdown System panels (FSAR Figure 7.4-2). As discussed in FSAR Subsection 6.2.5.2.6.5, the COPS rupture disk can remove the energy equivalent to 2.4% of rated power. At 20 hours, the decay heat being produced is less than 0.7% of rated power and therefore COPS has sufficient capability to remove the decay heat and keep the containment cooled. The COPS includes provisions to isolate the venting path if required after the plant is stable (FSAR Subsection 6.2.5.2.1).

Maintain Containment Phase 1
Containment structural integrity is maintained throughout the duration of Phase 1. The instrumentation used in this scenario is available on the Remote Shutdown System panels as hardwired instruments that are powered from Class 1E DC power. These instruments will not be affected by the shutdown of the plant computer systems and as such will be available for use. Power Operation, Startup, and Hot Shutdown (Modes 1, 2, and 3) The containment cooling strategy described above assumes 100% power initial conditions. The strategy is similar in Modes 2 and 3 except that the timing of events would be different. Cold Shutdown and Refueling (Modes 4 and 5) The overall strategy for containment cooling during Cold Shutdown is, in general, similar to those for Power Operation, Startup, and Hot Shutdown. Core cooling would be provided by ACIWA injection, discharge of steam to the suppression pool via the SRVs, and relief of pressure and heat from the containment using COPS. As with Modes 2 and 3, the timing for events in an ELAP in Mode 4 or 5 would be different but the basic strategy is the same. In Mode 5, the reactor vessel would be open to the Secondary Containment Building. Heat would be rejected by the boiling water in the refueling cavity. Water level will be maintained using ACIWA injection and exterior doors in the Reactor Building will be opened to release the heat to the atmosphere.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* STP 3&4 will use procedures developed based on industry guidance from the Owners Groups, EPRI, and NEI as part of the Procedure Development Plan described in FSAR Section 13.5. The procedures, training, and any walk-through validation will be in place and completed 180 days prior to the initial fuel load of Unit 3.
Identify modifications	*List modifications and describe how they support coping time.* N/A
Key Containment Parameters	*List instrumentation credited for this coping evaluation phase.* RPV Level RPV pressure Suppression Pool Level Drywell Pressure Suppression Pool Temperature

Maintain Containment Phase 2	
ABWR Portable Equipment Phase 2:	
Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain containment. Identify methods (containment spray/hydrogen igniters) and strategies utilized to achieve this coping time. Containment structural integrity is maintained by permanently installed equipment. No portable equipment is required. As a result, there is no Phase 2 required, and at 36 hours there is a direct transition to Phase 3.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* Not Applicable
Identify modifications	*List modifications* None Required
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* Not Applicable
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Not Applicable
Flooding	*List how equipment is protected or schedule to protect* Not Applicable
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Not Applicable
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Not Applicable
High Temperatures	*List how equipment is protected or schedule to protect* Not Applicable

Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
	Not Applicable	

Maintain Containment Phase 3	
ABWR Portable Equipment Phase 3:	
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain containment. Identify methods (containment spray/hydrogen igniters) and strategies utilized to achieve this coping time. Containment structural integrity is maintained by permanently installed equipment. No portable equipment is required. The methods used in Phase 1 can continue to be used in Phase 3.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* STP 3&4 will use procedures developed based on industry guidance from the Owners Groups, EPRI, and NEI as part of the Procedure Development Plan described in FSAR Section 13.5. The procedures, training, and any walk-through validation will be in place and completed 180 days prior to the initial fuel load of Unit 3.
Identify modifications	*List modifications* None Required
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* RPV Level RPV pressure Suppression Pool Level Drywell Pressure Suppression Pool Temperature

Deployment Conceptual Modification		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
	None Required	

Discussion of Maintaining Spent Fuel Cooling

Maintain Spent Fuel Pool Cooling Phase 1
Determine Baseline coping capability with installed coping modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06: • **Makeup with Portable Injection Source**
ABWR Installed Equipment Phase 1:
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategies utilized to achieve this coping time. The ABWR has design features to mitigate a simultaneous ELAP and LUHS. The ACIWA system is the primary means for providing makeup water to ensure cooling of the spent fuel. The overall strategy was previously described in the Sequence of Events/Time Constraints section of this document and is not repeated here. The detailed sequence of events is provided in Attachment 1. There are no required actions during Phase 1 other than monitoring of spent fuel pool (SFP) level. Fuel in the SFP is cooled by maintaining an adequate water level above the top of fuel. The worst case for SFP heatup assumes that the SFP is completely full including a recently discharged full core (21 days after shutdown). The normal SFP water level at the event initiation is approximately 23 feet over the top of the stored spent fuel (Technical Specification 3.7.8). Engineering analysis indicates that with pool gates closed and no pool cooling taking place, the pool will start boiling in about 12 hours. Maintaining the SFP full of water at all times during the ELAP event is not required; instead the requirement is to maintain adequate level to protect the stored spent fuel and limit exposure to personnel onsite and offsite. Once boiling starts at 12 hours, it would take another 64 hours (76 hours total from event start) for the level to drop to 10 feet above the top of the fuel. Makeup to the SFP will be provided by permanently installed equipment. These methods can be maintained for the duration of the event and are described below. Makeup to the SFP is not needed during the 36 hour Phase 1 since the level will remain above 10 feet above the top of the fuel for 76 hours assuming no makeup. If makeup is desired , the strategy in both Phase 1 or Phase 3 is to use the installed ACIWA pump providing flow to the "C" RHR system piping and then to the SFP as described in FSAR Subsection 9.1.3. As discussed in FSAR Subsection 5.4.7.1.1.10.3, the ACIWA design flow capacity is 634 gpm at a backpressure of 90 psig and increases to 951 gpm at a back pressure of 0 psig. At 36 hours, COPS has actuated and Containment and RPV pressures are less than 90 psig and the ACIWA flow capacity would be greater than 634 gpm. The required flow rate to remove core decay heat is approximately 165 gpm (Reference 1) for each unit, and therefore the single ACIWA pump can provide enough flow to maintain vessel level for both units and still have more than 150 gpm (300 gpm total) available for SFP makeup to each pool. Therefore, the flow and pressure provided by the ACIWA pump are sufficient to meet these requirements for both Spent Fuel Pools (Reference 2).

References: 1. NEDC-33771P Revision 1 2. ACIWA Capability Evaluation, NINA, April 11, 2013.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* STP 3&4 will use procedures developed based on industry guidance from the Owners Groups, EPRI, and NEI as part of the Procedure Development Plan described in FSAR Section 13.5. The procedures, training, and any walk-through validation will be in place and completed 180 days prior to the initial fuel load of Unit 3.
Identify modifications	*List modifications* None
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.* SFP level indication with a remote readout available.

<table>
<tr><th colspan="2">Maintain Spent Fuel Pool Cooling Phase 2</th></tr>
<tr><th colspan="2">ABWR Portable Equipment Phase 2:</th></tr>
<tr><td colspan="2">Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategies utilized to achieve this coping time.

There is no need for a Phase 2 since installed equipment can provide necessary makeup to the spent fuel pool well beyond the 36 hours when off-site resources have arrived and Phase 3 is initiated.</td></tr>
<tr><th colspan="2">Details:</th></tr>
<tr><td>Provide a brief description of Procedures / Strategies / Guidelines</td><td>Confirm that procedure/guidance exists or will be developed to support implementation

N/A</td></tr>
<tr><td>Identify modifications</td><td>List modifications

N/A</td></tr>
<tr><td>Key SFP Parameter</td><td>List instrumentation credited or recovered for this coping evaluation.

N/A</td></tr>
</table>

Maintain Spent Fuel Pool Cooling Phase 3
ABWR Portable Equipment Phase 3:
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategies utilized to achieve this coping time. Makeup is provided with the installed ACIWA pump providing flow to the "C" RHR system piping and then to the Spent Fuel Pool as described in FSAR Subsection 9.1.3. As discussed previously in Spent Fuel Cooling Phase 1, at 36 hours ACIWA has sufficient flow capacity to provide core cooling and spent fuel cooling for both units. Therefore, the flow and pressure provided by the ACIWA pump are sufficient to meet these requirements for both SFPs for Phase 3. During Phase 3 the ACIWA suction will be transferred to the UHS and diesel fuel will be transferred to the ACIWA Fuel Tank as discussed previously.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* STP 3&4 will use procedures developed based on industry guidance from the Owners Groups, EPRI, and NEI as part of the Procedure Development Plan described in FSAR Section 13.5. The procedures, training, and any walk-through validation will be in place and completed 180 days prior to the initial fuel load of Unit 3.
Identify modifications	*List modifications* None Required
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.* SFP level indication and a remote readout available.

Deployment Conceptual Design		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
•	None Required	

Discussion of Maintaining Safety Function Support

Safety Functions Support Phase 1
Determine Baseline coping capability with installed coping modifications not including FLEX modifications.
ABWR Installed Equipment Phase 1
Provide a general description of the coping strategies using installed equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategies utilized to achieve coping times. The overall strategy is to use RCIC and then ACIWA and COPS to provide the necessary core, containment, and spent fuel pool cooling. The overall strategy was previously described in the Sequence of Events/Time Constraints section of this document and is not repeated here. The detailed sequence of events is provided in Attachment 1. The following actions are needed to support the coping strategies for maintaining core cooling, containment, and spent fuel cooling: <u>Main Control Room Habitability</u> Under ELAP conditions, the Main Control Room command and control will be transferred to the Remote Shutdown System (RSS) room in the Reactor Building. <u>Remote Shutdown System Habitability</u> Under ELAP conditions, the RSS Room will begin to heat up. The Phase 1 FLEX strategy is to block open the RSS room door and the stairwell doors in the Reactor Building to limit the temperature rise in the room until normal ventilation is restored in Phase 3. <u>RCIC Room Access</u> As described in the FSAR (Table 19E.2-2) the RCIC room is designed to not exceed 150.8 °F for at least 8 hours of continuous RCIC pump operation. During the first 11 hours of the strategy using RCIC, operators may make periodic RCIC room entries to verify proper pump operation, but for the purposes of NEI 12-06, continuous habitability will not be required. The door to the hallway from the room and stairwell doors will be blocked open. In addition the roof access hatch directly above the RCIC pump will be removed using the installed monorail and chain hoist. This will provide additional natural circulation cooling for the room.

<u>Communications</u> Each unit will have 4 portable satellite phones and additional batteries. Also each unit will have additional batteries and a charger for radio communications. The radio communication system will have a backup supply from the 250V DC non-Class 1E battery located in the Control Building (FSAR Appendix 1E). This will be sufficient to keep the radio communication system operable for more than 36 hours. <u>Lighting</u> Each operator has emergency lighting on his person. DC lighting necessary for ELAP operation will last at least 72 hours based on a deep load shed of the battery systems (Reference 1). Procedures will require lights to be turned off when not in service to conserve battery power. Lighting (e.g. battle-lanterns) located inside the power block will provide additional lighting. References: 1. Extended Station Blackout Scenario, DP Engineering

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* STP 3&4 will use procedures developed based on industry guidance from the Owners Groups, EPRI, and NEI as part of the Procedure Development Plan described in FSAR Section 13.5. The procedures, training, and any walk-through validation will be in place and completed 180 days prior to the initial fuel load of Unit 3.
Identify modifications	*List modifications and describe how they support coping time.* None Required
Key Parameters	*List instrumentation credited for this coping evaluation phase.* None Required

Safety Functions Support Phase 2	
ABWR Portable Equipment Phase 2	
Provide a general description of the coping strategies using on-site portable equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategies utilized to achieve coping times. There is no Phase 2, once Phase 1 is complete at 36 hours; Phase 3 will be entered since offsite equipment is available on site.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Not applicable
Identify modifications	*List modifications necessary for phase 2* None Required
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* None Required

Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Not applicable
Flooding	*List how equipment is protected or schedule to protect* Not applicable
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Not applicable
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Not applicable

Safety Functions Support Phase 2		
ABWR Portable Equipment Phase 2		
High Temperatures	*List how equipment is protected or schedule to protect* Not applicable	
Deployment Conceptual Design		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
	None Required	

Safety Functions Support Phase 3
ABWR Portable Equipment Phase 3
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain and/or support safety functions. Identify methods and strategies utilized to achieve coping times.
Details:
Provide a brief description of Procedures / Strategies / Guidelines
Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline. The following actions are needed to support the coping strategies for maintaining core cooling, containment, and spent fuel cooling: <u>Remote Shutdown System Room Habitability</u> The strategy for maintaining the environment of the Remote Shutdown System (RSS) during the initial portion of Phase 3 will be a continuation of the natural circulation process described in Phase 1. Temperature rise is expected to be slow and additional measures could be implemented in Phase 3, for example placement of portable fans. Once power is restored to the Plant Computer, command and control will be restored to the Main Control Room and the RSS room will no longer need to be occupied. No additional strategy is required. <u>RCIC Room Access</u> The RCIC will not be used in Phase 3. No additional actions are required. <u>Communications</u> Phase 1 communication actions will be continued in Phase 3. <u>Lighting</u> In the event that areas are discovered where additional lighting is desired, lighting strings will be located in areas inside the power block. <u>Spent Fuel Pool Gate Seals</u> Removable gates are provided at the transfer canal of the SFP to facilitate movement of fuel during refueling operations. The gates have passive seals that prevent water from leaking out of the SFP when water on the reactor cavity side of the gate is lower than that of the SFP. The seals do not require any sealing devices other than the seals themselves (no air is required).

Safety Functions Support Phase 3
ABWR Portable Equipment Phase 3
Diesel Fuel Oil A 120V portable AC generator will be stored in two of the Emergency Diesel Generator Fuel Oil Storage Vaults along with a pump that will pump fuel oil from the ESF DG Fuel Oil Storage Tanks to the ACIWA DG fuel oil tank in the fire pump house. It will also be capable of filling the portable ACIWA pump tank as well as other diesel fueled equipment. Approximately 300 feet of 1" hose will be staged to support this strategy. Five-gallon fill cans will be used to fuel the 120V portable AC generators. They will be filled at either the chemical sampling line of one of the ESF DGs or using the small fuel oil transfer pump, whichever is easiest. (FSAR Appendix 1E) Ventilation Portable ventilation fans will be positioned in the plant as needed. Air Compressors A portable instrument air compressor will be used to provide air for air operated valves and ventilation dampers. 480V FLEX Diesel Generators Two 480V 1500 kW Diesel Generators will be positioned in pre-determined locations outside of each unit. These DGs will be connected to pre-run cabling that connects them to the Class 1E load centers (FSAR Appendix 1E).
Identify modifications
List modifications necessary for phase 3 None Required
Key Parameters
List instrumentation credited or recovered for this coping evaluation. None Required
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**

Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*

Safety Functions Support Phase 3		
ABWR Portable Equipment Phase 3		
	None Required	

Table 2 - ABWR Portable Support Equipment (Phase 1 or 3) Onsite Protected Equipment							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment (per unit)	Core	Containment	SFP	Instrumentation	Accessibility, small battery charging, communications and fuel, etc.		Maintenance / PM requirements
(3) 120 V AC Generators					X	6.5 Kw	Manufacturer recommendations
(3) Light strings					X	100 feet each	Inventoried
(4) Portable satellite phones w/ additional batteries & charger					X		Inventoried
(18) Radio batteries & charger					X		Inventoried
(2) 120V Fuel Oil Transfer pump and hoses	X	X	X		X	300 feet hose each	Manufacturer recommendations
5-gallon fuel cans	X	X	X		X	5-gallon fuel can capacity	Inventoried
(2) Portable DC Power Supplies			X	X		Backup for SFP level and other instrumentation	Inventoried

Table 3 - ABWR Portable Equipment Phase 3 Offsite FLEX Equipment								
Use and (potential / flexibility) diverse uses							*Performance Criteria*	*Notes*
List portable equipment (per unit)	Core	Containment	SFP	Instrumentation	Accessibility			
Two (2) 480V portable diesel generators	X	X	X	X			1500 Kw each	With associated cabling to connect to "A" and "C" Train Battery Chargers.
Six (6) Portable Ventilation fans				X	X			With cabling/extension cords
Portable Instrument Air Compressor				X	X		300 scfm	To provide instrument air availability. Plant equipment is 500 scfm.

<table>
<tr><th colspan="2">Table 4 - Phase 3 Response Equipment/Commodities</th></tr>
<tr><th>Item</th><th>Notes</th></tr>
<tr><td>Radiation Protection Equipment
• Survey instruments
• Dosimetry
• Off-site monitoring/sampling</td><td rowspan="7">Final quantities of the equipment needed for Phase 3 will be determined during the development of site-specific implementing procedures and the FLEX “Playbook” .</td></tr>
<tr><td>Commodities
• Food
• Potable water</td></tr>
<tr><td>Fuel Requirements
• Means of transporting tanker trucks of diesel fuel to the site</td></tr>
<tr><td>Heavy Equipment
• Transportation equipment
• Debris clearing equipment</td></tr>
<tr><td>Additional items
• Portable air tanks for valve manipulations
• Portable air compressors</td></tr>
<tr><td>Portable toilets</td></tr>
<tr><td>Portable Lighting
• Six Portable light towers</td></tr>
</table>

Attachment 1
Sequence of Events Timeline

This scenario starts with a complete loss of all AC power. The EDGs and CTGs do not start and are not recoverable. Off-site power is not recoverable. Concurrent with the loss of all AC power, an instantaneous Main Cooling Reservoir embankment failure occurs resulting in a design basis flood of 38.8 feet above Mean Sea Level (MSL) inundating the site for a period of approximately 20 hours.

Event:	**Time Constraint (Y/N)**	**Explanation**
Reactor trips on loss of all AC power RCIC automatically starts on low RPV level with suction aligned to CST ACIWA pump starts automatically due to loss of power	N	Plant @ 100% when the event is initiated
During first hour:		
• Enter Emergency Operating Procedures and go to Loss of All AC Power guidance	N/A	Operations implementing EOP/AOP guidance for Station Blackout (SBO)
• Operators will attempt starting Emergency Diesel Generators	N	Part of the initial Emergency Operating Procedure (EOP) actions and is a continuous action step to restore AC power.
• Operators will attempt starting the Combustion Turbine Generators	N	Part of the initial Emergency Operating Procedure (EOP) actions and is a continuous action step to restore AC power.
• Declare an Emergency and activate the emergency response organization	N	Enter the Emergency Plan at the level determined by the EALs.

• Determine that an ELAP has occurred	Y	This will occur per procedure within 30 minutes after the event prior to shutdown of plant computer systems. Operations will implement ELAP procedural guidance.
• Transfer command and control to the Remote Shutdown System (RSS) Room • Conduct DC bus stripping to lengthen battery life	Y	These two steps are performed concurrently and both must be completed within 60 minutes. The DC Bus stripping is performed to lengthen battery life. The transfer of command and control is made because the computer in the Main Control Room is a significant load on the batteries. STP 3&4 will have a site-specific requirement to perform stripping of DC loads.
• Dispatch operator to manually operate RCIC	N	
• Operators will:		
o Monitor RCIC operation	N	Monitor running RCIC pump and valve alignment
o Monitor Suppression Pool Level, Suppression Pool Temperature, RPV Pressure and Level, CST level, and SRV operation	N	Continuous action to monitor core cooling operation to verify adequate core cooling. Particular attention will be paid to suppression pool temperature.
o Emergency Communicator begins communications with satellite phone (State and County)	N	
o Communicate with NRC using Satellite phone	N	
• Notify on shift maintenance to support start of the CTG or EDG.	N	This is a support action for maintenance to restore an AC power source

• Within the first few minutes of the event RCIC suction switches to the suppression pool	N	Once the suppression pool high level alarm setpoint is reached, suction is automatically transferred to the suppression pool.
At ≤ 2 hours into event:		
• Monitor RCIC pump and valve operation, RPV Level, Suppression Pool level/temperature, CST level, and SRV operation	N	Continuous action to monitor core cooling operation to verify adequate core cooling. Monitor suppression pool level for approach to the high level setpoint.
• Security protects perimeter & facilitates door access	N	This will be needed to allow operator access and move/stage equipment. Security does have time per the security plans to implement any security protective measures, but does not necessarily have times to support FLEX implementation.
• Contact offsite Regional Response Center for equipment. Request Phase 3 equipment as listed	N	This would support longer term recovery actions.

~ 3 hours into event:		
• Monitor RCIC pump and valve operation, RPV Level, Suppression Pool level/temperature, CST level, and SRV operation • Open doors to RCIC room and stairway doors, and remove RCIC room overhead access hatch • Open doors to the RSS Room and stairway doors	N	Continuous action to monitor core cooling operation to verify adequate core cooling Doors opened to provide natural circulation cooling.
~ 9 hours into event:		
• Monitor RCIC pump and valve operation, RPV Level, Suppression Pool level/temperature, CST level, and SRV operation	N	Continuous action to monitor core cooling operation to verify adequate core cooling. Particular attention will be paid to CST level.
• Monitor suppression pool temperature for the approach to 250°F	N	250°F is the design temperature for the RCIC and suction needs to be shifted to a cooler water source prior to reaching that value
• Shift suction for RCIC back to the CST as the 250°F RCIC design limit is approached	N	This is expected to occur at approximately 10 hours into the event
~ 10 hours into event:		
• Initiate RPV cooldown to 350 psig	N	After RCIC suction is shifted to the CST commence a cooldown of the RPV to approximately 350 psig to reduce pressure in anticipation of the upcoming depressurization to shift to ACIWA injection.

~ 16 hours into event:		
• Monitor RCIC pump and valve operation, RPV Level, Suppression Pool level/temperature, CST level, SFP level, and SRV operation as applicable	N	Continuous action to monitor core cooling operation to verify adequate core cooling. At approximately 36 hours, the CST water will be depleted and the transition to ACIWA must be made.
• Assess site flood conditions	N	Flood is expected to recede below grade in approximately 20 hours from the start of the event.
~ 20 hours into event:		
• Monitor containment pressure to verify COPS actuation	N	The COPS is expected to actuate and vent the containment at approximately 20 hours into the event. Containment pressure and suppression pool temperature should decrease after actuation.
• Confirm that flood has receded below grade	N	Commence activities to remove debris left by flood. Ensure that equipment can be transported and that the Phase 3 FLEX 480V diesels can be connected as planned
• When accessible, verify FWST Level and ACIWA pump operations	N	Prudent action to make sure ACIWA is operating properly.
~ 22 hours into event:		
• Start preparations to connect FLEX 480V DGs		Ready site locations for arrival of FLEX equipment on site, review appropriate maintenance and operating procedures.

~ 32 hours into event:		
• Make preparations to transfer diesel fuel oil to ACIWA storage tank	N	Maintain fuel in ACIWA fuel storage tank
• Make preparations to shift RPV injection to ACIWA. Complete all valve alignments.	N	Prepare to open SRVs to depressurize RPV
• Phase 3 equipment begins arriving on site	N	FLEX diesels are the high priority equipment that will arrive first.
• Begin the process to connect and start FLEX 480 V Diesels	N	
~ 34 hours into event:		
• Monitor CST level. o When level approaches the end of the usable volume, initiate injection transfer to ACIWA. o Open SRV(s) to depressurize RPV for ACIWA injection. o Secure RCIC	N	Initial CST level is assumed to be 250,000 gallons at the start of the event. The usable volume is expected to be depleted at approximately 36 hours into the event. Based on initial CST level this time frame may be longer. RCIC will not be secured until the usable volume in the CST has been depleted. Open SRVs and ACIWA injection starts once RPV is below the shutoff pressure for ACIWA (~284 psig). Secure RCIC once ACIWA is injecting.
• Monitor Suppression Pool level/temperature and SRV operation as applicable	N	Continuous action to monitor core cooling operation to verify adequate core cooling
Evaluate total plant status • Core Cooling • Spent Fuel Pool • Containment • Flood impact on all plant structures and equipment	N	Good practice to periodically review total plant status for overall response/health.

At 36 hours into event:		
• ENTRY INTO PHASE 3 • Make preparations and cross tie ESF batteries as required to maintain DC power available (if necessary) • Connect and start the FLEX 480V diesels to selected ESF load centers, and begin battery charger operation.	N	Maintain A train and C train DC power available
• Transfer fuel to ACIWA storage tank as necessary	N	Maintain fuel in ACIWA fuel storage tank
• If necessary, using 120V portable generators, charge small batteries (satellite phones and radios) and provide supplemental light strings.	N	This will provide for safer travel paths and improved communication.
• Make up to the SFP using ACIWA as needed	N	SFP level is predicted to reach 10 feet above fuel at 76 hours (with no makeup)
• Install and operate FLEX air compressors	N	
~ 38 hours into event:		
• Transfer fuel to ACIWA storage tank as necessary	N	Maintain fuel in ACIWA fuel storage tank
• Install temporary ventilation systems	N	This action supports longer term recovery actions.
• With battery chargers operating, restore DC Power loads	N	This action supports longer term recovery actions.
• Start selected ventilation systems in smoke purge mode to support control room habitability	N	
• Once DC power loads are restored, shift command and control back to Main Control Room	N	This action supports longer term recovery actions.
• If necessary, using 120V portable generators, charge small batteries (satellite phones and radios) and provide supplemental light strings.	N	This will provide for safer travel paths and improved communication.

Expected Long Term Plant Conditions:		
• Shift ACIWA suction to the UHS basin as necessary based on FWST level and usage.	N	This action supports longer term recovery actions.
• Maintain RPV between Level 3 and Level 8	N	This action supports longer term recovery actions.
• Maintain RPV pressure ~ 30 psia	N	This action supports longer term recovery actions.
• Containment vented through COPS	N	This action supports longer term recovery actions.
• Suppression Pool level below the wet-well vent	N	This action supports longer term recovery actions.
• Periodically make up to SFP as necessary using ACIWA pump	N	This action supports longer term recovery actions.
• Periodically make up to RPV as necessary using ACIWA pump	N	This action supports longer term recovery actions.
• Restore RSW and ESF DGs or CTG to operation	N	This action supports longer term recovery actions.
○ Place RHR in service when a more normal power source is restored	N	This action supports longer term recovery actions.
○ Fill UHS as necessary via restored well water system or tanker truck	N	This action supports longer term recovery actions.

Attachment 1C
NSSS Significant Reference Analysis Deviation Table

Item	Parameter of interest	FSAR value	FSAR page	Plant applied value	Gap and discussion
	NONE				

Attachment 2
Milestone Schedule

Since the STP Units 3&4 detailed design is not complete and the units are not yet constructed, a detailed milestone schedule development is not realistic at this time. All actions will be complete 180 days prior to fuel load for the respective unit.

Attachment 3
Valves and Pumps Required for Phase 1 and Phase 3

RCIC

- Pump (C002) – Steam driven (FSAR Figure 5.4-8, Sh. 1)
- F004: (RPV Injection valve from RCIC pump)–Division 1 DC MOV (FSAR Figure 5.4-8, Sh. 1)
- F037: (Steam admission valve) – Division 1 DC MOV (FSAR Figure 5.4-9, Sh. 1)
- F001: (Supply from CST) – Division 1 DC MOV (FSAR Figure 5.4-8, Sh. 1)
- F006: (Supply from Suppression Pool) – Division 1 DC MOV (FSAR Figure 5.4-8, Sh. 1)
- F011: (RCIC bypass isolation) - Division 1 DC MOV (FSAR Figure 5.4-8, Sh. 1)

ACIWA

- F101 (Manual Isolation between RHR and FPS) (FSAR Figure 5.4-10, Sh. 7)
- F102 (Manual Isolation between RHR and FPS) (FSAR Figure 5.4-10, Sh. 7)
- F005C (RHR RPV Isolation) AC MOV (FSAR Figure 5.4-10, Sh. 7
- SRV solenoid valves Division 1 DC
- Fire Pump - Diesel driven

COPS

- COPS is a passive system and requires no operator actions or valve manipulations. It vents containment when its rupture disc actuates.

Manual operations of valves and pumps during Phase 1

- Operator will be dispatched to operate RCIC manually by throttling the RCIC injection valve (F004) after DC load stripping. [handswitch at or near valve]
- RCIC suction will shift automatically from CST to suppression pool upon receipt of suppression pool high level alarm (Before Load Shed)
- Shift RCIC suction back to CST when Suppression pool temperature approaches 250 degrees F by manually opening F001 and closing F006. [handwheel]
- Align ACIWA to RPV by manually opening F005C, F101, and F102. [handwheel]
- When CST level approaches the end of usable volume, an SRV will be opened from the Remote shutdown panel to initiate RPV depressurization to ACIWA injection pressure
- When ACIWA begins to inject to the RPV, RCIC will be secured by manually closing F001, F004, F006, F011, and F037. [handswitch at or near valves]

Phase 3

After 36 hours, Phase 3 begins with core cooling being provided by ACIWA. As Phase 3 proceeds, operator action would be necessary to shift ACIWA suction to the volume of water in the approximately 16 million gallon UHS basin. Operators would also need to transfer diesel fuel from one of the three Emergency Diesel Generator fuel oil storage tanks to the ACIWA fuel storage tank using a staged portable pump and small portable diesel generator. Two FLEX 480V 1500 KW diesel generators from offsite would be connected and started to provide AC power for battery charger operation, limited ventilation system operation, and other limited uses. Command and control is expected to be shifted back to the Main Control Room early in Phase 3.

SFP

- F14C, F15C (Loop C double Isolation between RHR Loop C and fuel pool cooling) – AC MOVs (FSAR Figure 5.4-10, Sh.7)

ACIWA

- Valves (yet unnamed) to transfer ACIWA suction to UHS
- Portable pump and small portable diesel generator to transfer fuel to ACIWA fuel storage tank.

Manual operations of pumps and valves during Phase 3

- Make up to SFP as necessary by manually opening F14C and F15C. [handwheel]
- Add fuel to ACIWA fuel storage tank as necessary
- Transfer ACIWA suction to UHS
- Install and operate FLEX air compressors
- Install and operate temporary ventilation systems
- Install and operate FLEX 480 VAC diesel generators