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CENG
a joint venture of Constellation Energy eDF

February 28, 2013

U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

ATTENTION: Document Control Desk

SUBJECT: **Calvert Cliffs Nuclear Power Plant, Units 1 and 2**
Renewed Facility Operating License Nos. DPR-53 and DPR-69
Docket Nos. 50-317 and 50-318
Nine Mile Point Nuclear Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-63 and NPF-69
Docket Nos. 50-220 and 50-410
R.E. Ginna Nuclear Power Plant
Renewed Facility Operating License No. DPR-18
Docket No. 50-244

Overall Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events

REFERENCES:

(a) NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012

(b) NRC Interim Staff Guidance JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," Revision 0, dated August 29, 2012

(c) NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, " Revision 0, dated August, 2012

(d) Letter from M. G. Korsnick (CENG) to Document Control Desk (NRC), Initial Status Report with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated October 26, 2012

Nuclear Regulatory Commission (NRC) Order EA-12-049, (Reference a) requires 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)

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cooling capabilities. The transition phase requires providing sufficient, portable, on-site equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from off-site. The final phase requires obtaining sufficient off-site resources to sustain those functions indefinitely.

These strategies must be capable of mitigating a simultaneous loss of all alternating current power and loss of normal access to the ultimate heat sink and have adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. Reasonable protection must be provided for the associated equipment from external events. Such protection must demonstrate that there is adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities. The strategies must be implementable in all modes.

NRC Interim Staff Guidance (ISG) JLD-ISG-2012-01, (Reference b) provides guidance to assist nuclear power reactor applicants and licensees with the identification of measures needed to comply with the requirements to mitigate challenges to key safety functions contained in Order EA-12-049. This ISG endorses, with clarifications, the methodologies described in Reference (c).

Nuclear Energy Institute 12-06 outlines the process to be used by individual licensees to define and implement site-specific diverse and flexible mitigation strategies that reduce the risks associated with beyond-design-basis conditions. It also requires that each plant establish the ability to cope with the baseline conditions for a simultaneous extended loss of alternating current power and loss of normal access to the ultimate heat sink event and then evaluate the mitigation strategies protection and deployment strategies in consideration of the challenges of the external hazards applicable to the site.

Reference (d) provided the initial status report regarding mitigation strategies, as required by Reference (a).

The purpose of this letter is to provide the Overall Integrated Plan pursuant to Section IV, Condition C.1, of Reference (a). This letter confirms that R.E. Ginna Nuclear Power Plant, Calvert Cliffs Nuclear Power Plant, and Nine Mile Point Nuclear Station have received Reference (b) and have developed the Overall Integrated Plans presented in Attachments 1 - 4.

The Integrated Plans are based on conceptual design information. Final design details and associated procedure guidance, as well as any revisions to the information contained in the attachments, will be provided in the six-month Integrated Plan updates required by Reference (a).

This letter contains a regulatory commitment as listed in Attachment (5).

If there are any questions regarding this submittal, please contact Everett (Chip) Perkins everett.perkins@cengllc.com at 410-470-3928.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 28, 2013.

Sincerely,

Mary G. Korsnick

Mary G. Korsnick

MGK/EMT/bjd

Attachments:

(1) R.E. Ginna Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events
(2) Nine Mile Point Unit 1 Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events
(3) Nine Mile Point Unit 2 Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events
(4) Calvert Cliffs Integrated Plan for Mitigation Strategies for Beyond-Design-Basis External Events
(5) Regulatory Commitments Contained in this Correspondence.

cc:

B. K. Vaidya, NRC
M. C. Thadani, NRC
W. M. Dean, NRC
Resident Inspector, Calvert Cliffs
Resident Inspector, Ginna
Resident Inspector, Nine Mile Point
S. Gray, DNR

ATTACHMENT (1)

R.E. GINNA INTEGRATED PLAN FOR MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS

Constellation Energy Nuclear Group, LLC
February 28, 2013

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Introduction

This integrated plan provides the R.E. Ginna Nuclear Power Plant (Ginna) approach for complying with Order EA-12-049 (Reference 1) using the methods described in NRC JLD-ISG-2012-01 (Reference 3). The current revision of the Ginna Integrated Plan is based on our conceptual design information and will be revised as we proceed with detailed design engineering. Consistent with the requirements of Order EA-12-049 and the guidance in NEI 12-06, our six-month reports will delineate progress made, including an update of milestones accomplished since the last report, any proposed changes in our compliance methods, updates to the schedule, and if needed, requests for relief and the basis.

Implementation Capability Requirements Overview

The primary FLEX objective is to develop the capability for coping with a simultaneous extended loss of alternating current (AC) power (ELAP) and loss of normal access to the UHS (LUHS) event for an indefinite period through a combination of installed plant equipment, portable on-site equipment, and off-site resources. The baseline assumptions have been established on the presumption that other than the loss of normal and alternate AC power sources, and normal access to the UHS, installed equipment that is designed to be robust with respect to design basis external events is assumed to be fully available. Installed equipment that is not robust is assumed to be unavailable. Permanent plant equipment, cooling and makeup water inventories, and fuel for FLEX equipment contained in systems or structures with designs that are robust with respect to seismic events, floods, high winds and associated missiles are available. Other equipment, such as portable ac power sources, portable back up direct current (DC) power supplies, spare batteries, and equipment for 10 CFR 50.54(hh)(2), may be used provided it is reasonably protected from the applicable external hazards, has predetermined hookup strategies with appropriate procedures/guidance, and the equipment is stored in a relative close vicinity of the site. Installed electrical distribution system, including inverters and battery chargers, remain available provided they are protected consistent with current station design.

The FLEX strategy relies upon the following principles:

1. Initially cope by relying on installed plant equipment (Phase 1)
2. Transition from installed plant equipment to on-site FLEX equipment (Phase 2)
3. Obtain additional capability and redundancy from off-site resources until power, water, and coolant injection systems are restored or commissioned. (Phase 3)
4. Response actions will be prioritized based on available equipment, resources, and time constraints. The initial coping response actions can be performed by available site personnel post-event.
5. Transition from installed plant equipment to on-site FLEX equipment may involve on-site, off-site, or recalled personnel as justified by evaluation.
6. Strategies that have a time constraint to be successful are identified and a basis provided that the time can reasonably be met.

While initial approaches to FLEX strategies take no credit for alternate ac sources, credit is being taken for a to-be-installed diesel generator(D/G), which will not be connect to, and will not be connectable, to the offsite or onsite emergency ac power systems. Also, 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.

An element of a set of strategies to maintain or restore core and SFP cooling and containment functions includes knowledge of the time that Ginna can withstand challenges to these key safety functions using installed equipment during a beyond-design-basis external event (BDBEE). This knowledge provides an input to the choice of storage locations and conditions of readiness of the equipment required for the follow-on phases. This duration is related to, but distinct from the specified duration for the requirements of 10 CFR 50.63, *Loss of all alternating current power*, (Reference 6) paragraph (a), because it represents our current capabilities rather than a required capability. As such Ginna will 1) account for the SFP cooling function, which is not addressed by 10 CFR 50.63(a); and 2) assume the non-availability of alternate ac sources, which may be included in meeting the specified durations of 10 CFR 50.63(a). This is implicit in the FLEX principles described in Section 3.2.1.7, Paragraph (6) and Section 3.2.2, Paragraph (1) of NEI 12-06. Maintenance of the guidance and strategies addressing estimate of capability will be kept current to reflect plant conditions following facility changes such as modifications or equipment outages. Ginna recognizes that changes in the facility can impact the duration for which the initial response phase can be accomplished, the required initiation times for the transition phase, and the required delivery and initiating times for the final phase.

Implementation Plan

Capabilities for responding to ELAP and LUHS scenarios caused by BDBEEs are described in the following sections.

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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.*

The applicable extreme external hazards for Ginna are seismic, external flooding, ice, snow, high winds (including tornadoes), low temperature and high temperature as detailed below:

Assess Seismic Impact:

Ginna has two license basis earthquake spectra. These spectra are Regulatory Guide (RG) 1.60 shapes with the Operating Basis Earthquake (OBE) having a peak horizontal ground acceleration of 0.08g and the Safe Shutdown Earthquake (SSE) having a peak horizontal ground acceleration of 0.20g (Reference 25). Per NEI 12-06 Section 5.2 (Reference 4), all sites will consider the seismic hazard.

The Ginna UFSAR (Reference 25) Section 2.5.3 was reviewed to perform a limited evaluation of the liquefaction potential outside the power block area for a SSE event. Two onsite slopes, whose failures may be of safety concern, were identified by Rochester Gas & Electric (RG&E). The first slope is located about 200 feet (ft) northwest of the turbine building while the second slope is located east of the screen house. Both slopes were excavated from the original ground elevation of about 270 ft down to elevation 255 ft in silty clay soil and were graded at approximately 7.5 horizontal to 1 vertical. In order to assess the stability of those slopes, assumptions have been made about the subsurface conditions and the soil parameters. Stability analyses, both static and pseudostatic with earthquake load, were performed by the NRC staff using a commercially available computer program, MCAUTO's "Slope" program. The results of the slope analyses performed by the NRC staff during the Systematic Evaluation Program show that the factors of safety against slope failure under both static and earthquake loading conditions are less than unity, indicating that these slopes are not stable and that failure would take place along an arc of radius about 175 ft. Since the slopes were not determined to be stable, the impact of their failures was further evaluated by the NRC staff. The most critical failure arc, as calculated, would intercept the slope at elevation 276 ft, adjacent to the crest and at elevation 257 ft, adjacent to the toe. The lateral spread of the slope failure adjacent to the toe is estimated by the staff to be somewhere around 8 ft, based on post-failure equilibrium. At the first slope, northwest of the turbine building, there is no structure nor equipment located within or adjacent to the slope except a roadway. Therefore, the failure of that slope would not pose any safety concern but might close the road. The second slope, east of the screen house, is sufficiently removed from any required safety-related equipment. Thus, its failure would not be of safety concern.

Thus, Ginna screens in for assessing seismic impact.

Assess External Flooding Impact:

Ginna is a "wet" site which means that portions of the plant are below the design basis flood level. The source of the event that leads to the design basis flood level of elevation 273.8' is regional precipitation resulting in a Probable Maximum Flood (PMF) (Reference 25). Per Table 6-1 of NEI 12-06, the warning time would be days and the persistence of the event could be many hours to days.

Thus, Ginna screens in for assessing external flooding impact.

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Assess Impact of Snow, Ice, and Extreme Cold:

The guidelines provided in NEI 12-06 (Section 8.2.1) generally include the need to consider extreme snowfall at plant sites above the 35th parallel. Ginna is located at latitude 43°16.7'N and longitude 77°18.7'W. Ginna is located above the 35th parallel (Reference 25, Section 2.1.1); thus, the capability to address hindrances caused by extreme snowfall with snow removal equipment will be provided. Per Section 8.2.1 of NEI 12-06, "It will be assumed that this same basic trend applies to extremely low temperatures." The lowest recorded temperature for the site region is -16°F (Reference 63).

Ginna is located within the region characterized by the Electric Power Research Institute (EPRI) as ice severity level 5 (Reference 4, Figure 8-2).

Thus, Ginna screens in for assessing snow, ice, and extreme cold.

Assess Impact of Severe Storms with High Winds:

Per Figure 7-1 of NEI 12-06, Ginna has a 1 in 1 million chance per year of a hurricane induced peak-gust wind speed of < 120 miles per hour (mph). Thus, the site does not need to assess the impact of extreme straight winds.

Per Figure 7-2 of NEI 12-06, Ginna has a 1 in 1 million chance of tornado wind speeds of 169 mph. As this is greater than the threshold of 130 mph, the site will assess tornadoes and tornado missiles impact.

Assess Impact of High Temperatures:

Per NEI 12-06 Section 9.2, all sites will address high temperatures for impact on deployment of FLEX equipment. The maximum temperature observed for the site region has been 100°F (Reference 63). Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.

Thus, Ginna screens in for assessing High Temperatures.

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:* • *Exceptions for the site security plan or other (license/site specific) requirements of 10CFR may be required.* • *Certain Technical Specifications cannot be complied with during FLEX implementation.*

Key assumptions associated with implementation of FLEX Strategies for Ginna are described below:

- Staffing re-evaluations pursuant to NRC 50.54(f) letter dated March 12, 2012, have not been completed and will be performed under the NTTF recommendation for staffing.
- Following conditions exist for the baseline case:
  - Seismically designed Direct Current (DC) battery banks are available.
  - Seismically designed Alternating Current (AC) and DC distribution available.
  - Entry into Extended Loss of AC Power (ELAP) will occur by the one hour point.
  - Best estimate decay heat load analysis and decay heat is used to establish operator time and action.
  - All installed emergency and Station Blackout (SBO) AC sources are not available.

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- No additional failure of Structures, Systems, or Components (SSCs) is assumed.

- Portable FLEX components will be procured commercially.
- The design hardened connections will be protected against external events. **(Open Item: Implement a design change to install permanent protected FLEX equipment connection points.)**
- Deployment strategies and deployment routes will be assessed for hazards impact. **(Open Item: Evaluate deployment strategies and deployment routes for hazards impact.)**
- Phase 2 FLEX components are stored at the site and will be protected against external events either by design or location. **(Open Item: Provide for onsite storage of Phase 2 FLEX components that is protected against external events by design or location.)**
- The event impedes site access as follows: (NEI 12-01, Reference 5).
  - Post event time: 6 hours – No site access. This duration reflects the time necessary to clear roadway obstructions, use different travel routes, mobilize alternate transportation capabilities (e.g., private resource providers or public sector support), etc.
  - Post event time: 6 to 24 hours – Limited site access. Individuals may access the site by walking, personal vehicle or via alternate transportation capabilities (e.g., private resource providers or public sector support).
  - Post event time: 24+ hours – Improved site access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver equipment, supplies and large numbers of personnel.
- Maximum environmental room temperatures for habitability or equipment availability are based on NUMARC 87-00 (Reference 47).
- This plan defines strategies capable of mitigating a simultaneous loss of all alternating current(ac) power and loss of normal access to the ultimate heat sink resulting from a beyond-design-basis event by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at all units on a site. Though specific strategies are being developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety will be incorporated into the unit emergency operating procedures in accordance with established EOP change processes, and their impact to the design basis capabilities of the unit evaluated under 10 CFR 50.59. The plant Technical Specifications contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the beyond-design-basis event may place the plant in a condition where it cannot comply with certain Technical Specifications and/or with its Security Plan, and, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p).
- **Open Item: Exceptions for the site security plan or other (license/site specific – 10 CFR 50.54x) requirements of a nature requiring NRC approval will be communicated in a future 6 month update following identification.**

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- FLEX equipment storage location(s) have not been selected. Once a location or locations are finalized, implementation routes will be defined. **(Open Item: Evaluate requirements and options and develop strategies related to the storage on site of the FLEX portable equipment.)**

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.*

Ginna has one potential deviation to the guidelines in JLD-ISG-2012-01 and NEI 12-06. NEI 12-06 initial condition 3.2.1.3(2) states "All installed sources of emergency on-site ac power and SBO Alternate ac power sources are assumed to be not available and not imminently recoverable" and in Section 2.1 that initial approaches to FLEX strategies will take no credit for ac power supplies. Credit is being taken for a to-be-installed D/G, which will not be connected to, and will not be connectable, to the offsite or onsite emergency ac power systems. This D/G will be able to be connected to a Standby Auxiliary Feedwater (SAFW) pump to provide Phase 1 makeup to a steam generator (S/G). Additional details are provided under safety strategy Maintain Core Cooling and Heat Removal (Steam Generators Available). If additional deviations are identified, then the deviations will be communicated in a future 6 month update following identification.

Provide a sequence of events and identify any time constraint required for success including the basis that the **time constraint can reasonable be met.** **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 walkthrough of deployment).* *Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline.*

See the attached sequence of events timeline for an ELAP/ LUHS with Snow, Ice, or High Temperatures (Attachment 1A, Turbine Driven Auxiliary Feedwater (TDAFW) Available) or for an ELAP/ LUHS with Tornado Missile, Seismic, or Flooding Events (Attachment 1B, TDAFW Not Available).

<u>Discussion of time constraints identified in Attachment 1A (TDAFW Available).</u>

- $\leq$ 1 minutes (min), Operators initiate a manual reactor trip. A scenario related to station blackout, although not technically part of the *Station Blackout Rule*, 10 CFR 50.63 (Reference 6) baseline assumptions as defined by NUMARC 87-00 (Reference 47) (in that non-vital power is available), has been evaluated. The Ginna Operators have been trained on this possible scenario and are procedurally directed to manually trip the reactor when these conditions exist. Plant and engineering personnel met on November 2, 1995 to discuss an apparent vulnerability identified

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during simulator exercises related to meeting the Station Blackout Rule. Based on Ginna's plant-specific arrangement, a loss of voltage to safeguards buses 14 and 16 does not result in a reactor trip or reactor coolant pump trip. If not tripped by the operator, the RCP's would continue to run without any seal cooling. This lack of seal injection and component cooling could cause seal failure Loss of Coolant Accident's (LOCA's) at both reactor coolant pumps after a relatively short period of time. The plant would eventually trip due to temperature related equipment failures and enter into a station blackout after a loss of non-vital power, which is normally supplied from the turbine generator. This scenario is similar to the station blackout considered in our PRA (Probabilistic Risk/Safety Assessment), but was not specifically evaluated, since the station blackout scenario includes a loss of the 115kV offsite system. Qualitatively, however, the risk from this scenario is estimated to be significantly greater than the evaluated station blackout, due to the more severe consequences. SBO-PROGPLAN Paragraph 2.4.3 (Reference 32); A-601.10 (Reference 17). • Prior to S/G overfill, Throttle TDAFW pump discharge using motor operated valve (MOV) - 3996. Timing is based on decay heat levels and the potential to overfill the S/Gs and cause overcooling. ECA-0.0 (Reference 22). • < 12 min, Manually secure A and B Main Feedwater (MFW) pump DC oil pumps if auto shed does not occur. The UFSAR assumes that the MFW pump DC oil pump operates for 12 minutes following loss of all AC power. This is based on a timer in the MFW pump DC oil pump control circuitry which allows the pump to operate for 11 minutes. However, the timer will only actuate if the MFW pump AC oil pump selector switches are selected to OFF. Ginna Updated Final Safety Analysis Report (UFSAR) Table 8.3-4 (Reference 25); ECA-0.0 Background Information (Reference 54). • 15 – 30 min, DC Load Shedding. Following loss of all AC power, the station batteries are the only source of electrical power. The station batteries supply the DC buses and the AC vital instrument buses. Since AC emergency power is not available to charge the station batteries, battery power supply must be conserved to permit monitoring and control of the plant until AC power can be restored. The intent of load shedding is to remove all large non-essential loads as soon as practical, consistent with preventing damage to plant equipment. ATT-8.0 (Reference 46); On-Shift Staffing Analysis Report (Reference 50); ECA-0.0 Background Information (Reference 54). • ≤ 30 min, Operators Open Control Room & All Reactor Protection and Control System Rack Doors in the Control Room. Calculations performed for the control room area (References 59, 60) indicate that the ambient temperature will be up to 116°F after a four hour SBO in this area if the Control Room door is opened. SBO-PROGPLAN Paragraphs 4.1.10 & 4.1.11 (Analysis support 4 hr coping period) (Reference 32); ECA0.0 (Reference 22). • < 30 min, Open selected vital area doors. Calculations performed for the TDAFW pump area (Reference 58) indicate that the ambient temperature will be between 110°F and 115°F after a four hour SBO in this area if doors S37F, S44F, and SD/55 are opened within 30 minutes. Calculations performed for the Atmospheric Relief Valve (ARV) area indicate that the ambient temperature in this area for continued occupancy with an expected maximum temperature between 117°F and 122°F with doors S37F, S44F, and SD/55 opened within 30 minutes after a four hour station blackout. However, no specific manual actions are required in the ARV area for an SBO. This cannot be assumed for an ELAP / LUHS event. (**Open Item: Perform a habitability analysis and address local ARV operation.**) SBO-PROGPLAN Paragraph 7.2.4 (Reference 32) (Analysis supports 4 hr coping period).

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• < 1 hour (hr), Declare ELAP. Declaration of ELAP shall be made by the Shift Manager when it is recognized or determined that restoration of power to mitigate the effects of a SBO cannot be performed. ECA-0.0 directs the Operator to try to restore power to any train of AC emergency buses after a loss of all AC power. One hour is sufficient time for the Operators to recognize or determine that off-site power or on-site emergency power restoration is unlikely and that an ELAP should be declared. • < 1 hr, Commence RCS Cooldown – maintain a cooldown rate in the Reactor Coolant System (RCS) cold legs near 100^{0}F/hr. ECA-0.0 directs the Operators to initiate depressurization of the steam generators as a means of minimizing primary system inventory loss through the reactor coolant pump (RCP) seals. Based on experience with the Ginna simulator, RCS cooldown is performed within the first hour of SBO initiation. SBO-PROGPLAN Paragraphs 1.4 & 7.2.1.5 (Reference 32); ECA-0.0 (Reference 22). • ≤ 1 hr, Pull stop Turbine DC Oil Pump. Following loss of all AC power, the station batteries are the only source of electrical power. The station batteries supply the DC buses and the AC vital instrument buses. Since AC emergency power is not available to charge the station batteries, battery power supply must be conserved to permit monitoring and control of the plant until AC power can be restored. ECA-0.0 (Reference 22); ECA-0.0 Background Information (Reference 54). • ≤ 2 hr, Align alternate source of water to the Condensate Storage Tank (CST) when level reaches 5 feet. The required CST water volume is ≥ 24,350 gallons, which is based on the need to provide at least 2 hours of decay heat removal, including cooldown, via the turbine-driven AFW pump following loss of all AC electrical power (TS Basis 3.7.6, Reference 27). An alternate source of water to the CST is needed when level reaches 5 feet, prior to losing suction (~12 minutes after reaching 5 ft in CST at 400 gpm). At 400 gpm with CST at Minimum Technical Specification (TS) level, 5 ft will be reached in about 44 minutes (A-601.10, Reference 17). However, the ELAP coping strategy will be to commence feeding the S/Gs from SAFW powered by the new SAFW D/G and taking suction from the new 160,000 gallon CST. (**Open Item: Develop and implement procedures to commence feeding the S/Gs from SAFW powered by the new SAFW D/G and taking suction from the new CST prior to reaching 5 ft in the existing CST.**) SBO-PROGPLAN Paragraph 4.1.5 (Reference 32) • ≤ 2 hr, Align cooling to TDAFW Pump. The TDAFWP is designed to use service water for bearing and lubricating oil cooling; service water is not available under station blackout conditions. The TDAFWP has demonstrated during tests that it will operate for at least two hours without cooling water. However, rather than aligning FLEX cooling to the TDAFWP lube oil cooler, the ELAP coping strategy will be to commence feeding the S/Gs from SAFW powered by the new SAFW D/G taking suction from the new 160,000 gallon CST. (**Open Item: Develop and implement procedures to commence feeding the S/Gs from SAFW powered by the new SAFW D/G and taking suction from the new CST prior to reaching 5 ft in the existing CST.**) SBO-PROGPLAN Paragraphs 1.5.5 and 4.1.2 (Reference 32); A-601.10 (Reference 17) • ≤ 4 hr, Degas Main Generator. Generator degassing should be started to ensure that DC seal oil backup pump can be stopped in four hours to decrease DC loading on the Technical Support Center Battery. ECA-0.0 (Reference 22); ECA-0.0 Background Information (Reference 54) • ≤ 4 hr, Provide Charging to Batteries A and/or B (Load shedding provides additional time). Design analysis DA-EE-97-069, *Sizing of Vital Batteries A and B*, (Reference 53) shows that the Ginna station batteries are adequate to sustain power to the current load profiles for the duration of a four hour station blackout, using a temperature of 55^{0}F. In addition, ECA-0.0 (Reference 22)

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provides load shedding guidance to the Operators for preserving battery capacity and maintaining required voltage levels. DA-EE-2001-028, *Vital Battery 8 Hour Capacity*, (Reference 55) was subsequently performed and documents an 8 hour capacity given the load shedding directed by procedure ECA-0.0 ATT-8.0, *Attachment DC Loads* (Reference 46). SBO-PROGPLAN Paragraph 7.2.2 (Reference 32).

- < 8 hr, Initiate boration. See the Phase 1 discussion for mitigating strategy Maintain RCS Inventory Control / Long Term Subcriticality for a discussion of this time constraint. PA-PSC-0965, *PWROG Core Cooling Position Paper* (Reference 41); WCAP-17601-P (Reference 19); CALC-2011-0009 (Reference 20).
- 8 hr, Vital Battery Capacity given load shedding in ECA-0.0. DA-EE-2001-028 (Reference 55) documents that the vital batteries have an adequate capacity for an 8-hour station blackout event assuming the load shedding listed in procedure ECA-0.0 (ATT-8.0) is implemented. This analysis is conservative because it applies 50% of the calculated load reduction to Battery A, and only during the period from 12 min to 245.5 min. 50% of the calculated load shedding is conservatively small in that the load shedding is assumed to take place anytime from 12 min to 245.5 min. This analysis does not consider the effects of load shedding for Battery B. Battery B is shown to be adequately sized for an 8-hour SBO without procedural load shedding. SBO-PROGPLAN Paragraph 7.2.2 (Reference 32).
- ≤ 72 hr, Provide Battery Room ventilation for hydrogen control. DA-EE-99-068, *Vital Battery Room Hydrogen Analysis*, (Reference 62) documents that under worse case conditions, without ventilation, the 0.8% normal hydrogen concentration limit would not be exceeded until 28.9 hours and that the unacceptable hydrogen concentration limit of 2% would not be exceeded until 73.3 hours, with all batteries being equalized.

<u>Discussion of unique time constraints identified in Attachment 1B (TDAFW Not Available).</u>

- ≤ 14.5 min, Restore AFW loss due to an external event (Tornado, Seismic Event, or Flood). Time critical action for loss of AFW due to an external event is to use AFW or SAFW. Transfer is assumed within 14.5 minutes of S/G Low Level Auto Start setpoint for AFW or from the time of the loss of the pumps, whichever is longer. TS Basis 3.7.5 (Reference 27); DA-NS-2002-008 (Reference 56); A-601.10 (Reference 17).
- ≤ 35 min, Establish AFW or SAFW to maintain heat sink. DBCOR-2006-0057, *Appendix R Time Critical Tasks Validation for EPU*, (Reference 57) documents that the time required for restoration of feed to a S/G was reduced from 50 minutes to 35 minutes due to the increased core decay heat from the Extended Power Uprate (EPU). Simulated walkthroughs were performed to validate that the time critical action could be accomplished as required. Restoration of feed to a S/G was completed at 24 minutes.
- < 24 hr, Refill new SAFW CST. New equipment in process. (**Open Item: Develop and implement a FLEX method / procedure to refill the new SAFW CST prior to losing suction.**)

<u>Technical Basis Support information</u>

The mitigating strategies in this Integrated Plan rely upon existing Ginna specific technical basis support information or will rely upon Ginna specific technical basis support information that will be developed. Relevant information from design documents is summarized in this Integrated Plan with the design document reference provided. 'Open Items' identify analyses that are needed to develop

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or support mitigating strategies.

WCAP-17601-P, *Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs*, (Reference 19) and PA-PSC-0965, *PWROG Core Cooling Position Paper*, (Reference 41) were reviewed and their guidance utilized to assist with development of the Ginna Integrated Plan:

WCAP-17601-P was prepared to address the Pressurized Water Reactor Owners Group (PWROG) member's Nuclear Steam Supply Systems (NSSS) response to an extended loss of AC power (ELAP) event. The report documents studies that embraced a range of conditions and sensitivities associated with the ELAP event. This report includes information intended to assist the PWROG in understanding how each of their plant types will be able to cope with an ELAP. Analysis cases were developed to produce results that would be useful toward other industry initiatives and regulations that affect emergency preparedness including NEI 12-06 (Reference 4) and NRC Order EA-12-049, *Order to Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, (Reference 1).

PA-PSC-0965, *PWROG Core Cooling Position Paper*, is structured to provide an overview of each NSSS generic approach followed by discussions associated with Secondary Cooling, Subcriticality, and Primary Inventory. Gaps identified between the NSSS generic approach / generic analyses provided in WCAP-17601-P, and plant specific characteristics / considerations / parameters are identified in the applicable sections. Recommendations are also provided in the applicable sections in an effort to provide consistency of method, to the extent possible, for maintaining core cooling across all PWR NSSS vendors. The purpose of PA-PSC-0965, *PWROG Core Cooling Position Paper*, is to assist utilities with development of site specific FLEX strategies which are aligned with the requirements contained in NEI 12-06.

Responding to a Beyond-Design-Basis External Event (BDBEE)

Responding to BDBEEs presents new challenges and new requirements for personnel actions to mitigate the BDBEE.

In the Letter from J.A. Spina (Constellation Energy Nuclear Group, LLC (CENG)) to Document Control Desk (NRC), dated May 11, 2012, *Sixty-Day Response to 10 CFR 50.54(f) Request for Information* (Reference 8), CENG committed to provide an assessment of the onsite and augmented staff needed by Ginna to respond to a large scale natural event meeting the conditions described in Enclosure 5 to the NRC's March 12, 2012 Request for Information (Reference 7). This assessment should include a discussion of the onsite and augmented staff available to implement the strategies as discussed in the emergency plan and/or described in plant operating procedures. The following functions are requested to be assessed:

- How onsite staff will move back-up equipment (e.g., pumps, generators) from alternate onsite storage facilities to repair locations at each reactor as described in the order regarding the NRC Near-Term Task Force (NTTF) Recommendation 4.2. It is requested that consideration be given to the major functional areas of NUREG-0654, Table B-1, (Reference 11) such as plant operations and assessment of operational aspects, emergency direction and control, notification/communication, radiological accident assessment, and support of operational accident assessment, as appropriate.

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• New staff or functions identified as a result of the assessment. • Collateral duties (personnel not being prevented from timely performance of their assigned functions). In Reference 8 and the Letter from M.G. Korsnick (CENG) to Document Control Desk (NRC), dated June 6, 2012, *Supplemental Information for the Sixty-Day Response to 10 CFR 50.54(f) Request for Information* (Reference 9), CENG committed to provide the onsite and augmented staffing assessment for Ginna considering functions related to NTTF Recommendation 4.2 (Reference 12) to the NRC 4 months prior to the beginning of the second refueling outage scheduled for October 2015.

Identify how strategies will be deployed in all modes. **Ref: NEI 12-06**	*Describe how the strategies will be deployed in all modes.*

Deployment routes will be established once the storage locations for FLEX equipment are defined and connection points established. (**Open item: Establish deployment routes from FLEX equipment storage locations to connection points.**). The identified paths and deployment areas will be accessible during all modes of operation, i.e. operating or refueling. (**Open Item: Develop and implement a program and/or procedure to keep FLEX equipment deployment pathways clear or with identified actions to clear the pathways.**)

Provide a milestone schedule. This schedule should include:
• **Modifications timeline**
  o **Phase 1 Modifications**
  o **Phase 2 Modifications**
  o **Phase 3 Modifications**
• **Procedure guidance development complete**
  o **Strategies**
  o **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 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 milestone schedule in Attachment 2.

The schedule for when Regional Response Centers will be fully operational is still to be determined. **(Open Item: Determine schedule for when Regional Response Centers will be fully operational.)**

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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.*

Ginna has established a system designation for emergency portable equipment and will manage this system in a manner consistent with CENG procedure CNG-OP-4.01-1000, *Integrated Risk Management* (Reference 40). All elements of the program described in Section 11 of NEI 12-06, including recommended "should" items will be included in the station program. A system engineer will be assigned the responsibility for configuration control, maintenance and testing. The equipment for FLEX will have unique identification numbers. Installed structures, systems and components pursuant to 10 CFR 50.63(a) (Reference 6) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, *Station Blackout* (Reference 13). Preventive Maintenance procedures (PMs) will be established for all components and testing procedures will be developed with frequencies established based on type of equipment, original equipment manufacturer (OEM) recommendations and considerations made within EPRI guidelines.

Describe training plan	*List training plans for affected organizations or describe the plan for training development*

New training of general station staff and Emergency Planning personnel will be performed no later than 2015, prior to the Ginna unit design implementation. These programs and controls will be implemented in accordance with the Systematic Approach to Training (Reference 71).

Synchronization with Off-Site Resources **Ref: NEI 12-06 Section 12** **JLD-ISG-2012-01 Section 2.3**	*Discussion in this section may include the following information and will be further developed as the Regional Response Center development is completed.* • *Site-specific RRC plan* • *Identification of the primary and secondary RRC sites* • *Identification of any alternate equipment sites (i.e. another nearby site with compatible equipment that can be deployed)* • *Describe how delivery to the site is acceptable* • *Describe how all requirements in NEI 12-06 are identified*

CENG has signed contracts and issued purchase orders to Pooled Inventory Management (PIM) for all five CENG units for participation in the establishment and support of two (2) Regional Response Centers (RRCs) through the Strategic Alliance for FLEX Emergency Response (SAFER). 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 two RRCs are located in Phoenix Arizona and Memphis Tennessee. There are no designated alternate equipment sites; however, each site has agreed to enter portable FLEX equipment inventory into the Rapid Parts Mart which is an internet based search capability currently used for other spare part needs. This capability provides a diverse network of potential alternate equipment sites for portable FLEX equipment.

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SAFER will provide requested portable FLEX equipment to a local staging area where the equipment will be serviced (e.g., fuel and lubricating oil) and made ready for transport to the site. The criteria for the local staging area will be defined by June 2013. The staging area must be outside the 25 mile radius of the site, because the FLEX strategy evaluations assume that there will be significant damage and no power or communications within the 25 mile radius. If an individual site provides qualified power and communications to a staging area within the 25 mile radius, then that staging area will be considered acceptable. The RRC will support initial portable FLEX equipment delivery to the site within 24 hours of a request for deployment. **(Open Item: Define criteria for the local staging area by June 2013.) (Open Item: Establish a suitable local staging area for portable FLEX equipment to be delivered from the RRC to the site.)** Each site will develop a playbook which will provide the detail necessary to ensure the successful delivery of the portable FLEX equipment from the RRC to the local staging area and from the local staging area to the site. Pilot playbooks are to be developed and ready for use by each site as a template by June 2013. **(Open Item: Develop site specific playbook for delivery of portable FLEX equipment from the RRC to the site.)**

Maintain Core Cooling & Heat Removal (S/Gs Available; Modes 1 – 4 and Mode 5 with Loops Filled)

STRATEGIES

A graphic representation of the Phase 1 to Phase 3 FLEX strategies for maintaining Core Cooling and Heat Removal safety functions, with Steam Generators (S/Gs), available is shown below.

Under a loss of all AC power, the Operators will initiate a controlled plant cooldown and depressurization as per current procedure ECA-0.0, *Loss of All AC Power*, (Reference 22) and consistent with recommendations in PA-PSC-0965, *PWROG Core Cooling Position Paper* (Reference 41). Natural circulation will transfer heat from the Reactor Coolant System (RCS) to the S/Gs. S/G pressure and steam releases will be controlled by means of the steam ARVs. By maintaining appropriate S/G water inventory, the successful implementation of the FLEX strategy Phase 1 to 3 will prevent core damage.

Under Phase 1 (using installed equipment), the Operators will rely on the TDAFW taking suction from one of the CSTs as the primary strategy to maintain S/G water inventory. An alternate Phase 1 strategy is being developed, where the Operators will rely on one of two installed D/G powered SAFW pumps, taking suction from a new protected CST. This strategy will provide the unit with a 24 hour coping time.

Under Phase 2 (using portable on-site FLEX equipment), the Operators will ensure that the new protected CST is being replenished from several water supplies; Lake Ontario providing the ultimate and indefinite water source, with the SAFW pump providing the S/G make-up capability. An alternate strategy is being developed, where a low-pressure portable injection pump and connection points will be used to provide make-up water to one of the two S/Gs. Portable equipment will be deployed early during the Phase 1 sequence, so as to ensure continuity of the strategy.

Under Phase 3 (using off-site RRC supplied equipment), portable equipment and consumables will be used to reinforce and secure for an indefinite coping time the measures implemented during Phase 2, mainly the make-up to the new protected CST and the long-term operation of a low pressure portable injection pump.

Maintain Core Cooling & Heat Removal (S/Gs Available)

___ Phase 1 (TDAFW – time 0 up to 2 hrs)

__________________________ Phase 1 (SAFW D/G – 30 minutes to 24 hours; must refill CST)

____ Phase 2

____ Phase 3

0 6 12 18 24 30 36 42 48 54 60 66 72 + Hrs

OBJECTIVES

Reactor core cooling and heat removal requires S/G makeup sufficient to maintain or restore S/G level to provide core cooling. Baseline capabilities include the use of installed equipment and FLEX equipment for Phase 1 and Phase 2 coping strategies. Performance attributes include depressurizing the S/Gs for makeup with portable injection sources utilizing primary and alternate injection points to inject through separate divisions/ trains, i.e., should not have both connections in one division/ train. Analysis should demonstrate that the guidance and equipment for combined S/G depressurization and makeup capability supports continued core cooling. Sustained sources of water are available and sufficient to supply water indefinitely including consideration of concurrent makeup or spray of SFP. (Reference 4)

Feeding a Single S/G with a Low-Pressure Portable Pump

A low-pressure portable pump is required to supply 215 gpm to a single S/G to provide adequate heat removal (Reference 64). PA-PSC-0965, *PWROG Core Cooling Position Paper*, (Reference 41) provides a conservative approach for determining the target S/G pressure with regard to preventing nitrogen injection from the Safety Injection (SI) Accumulators when RCS pressure and temperature is being reduced by depressurizing intact S/Gs. EOP Setpoint H.8, "Minimum pressure that prevents nitrogen injection plus margin," (Reference 42) follows the methodology in Reference 41 and determined the minimum S/G pressure for which accumulator nitrogen injection will not occur is 260 psig. The margin discussed in Reference 41 and EOP Setpoint H.8 is 100 psig. **(Open Item: Perform an analysis to determine the diesel driven portable high pressure pump upper and lower head requirements to provide for a minimum of 215 gpm to a S/G without causing RCS pressure to decrease to the point where nitrogen will be injected from the SI Accumulators, assuming suction is directly from the UHS.). (Open Item: Develop and implement procedures to close SI Accumulator injection valves or vent the SI Accumulators prior to nitrogen injection into the RCS.)**

Feedwater Flow Interruptions

DBCOR-2006-0057, *Appendix R Time Critical Tasks Validation for EPU*, (Reference 57) documents that the time required to restore feed to a S/G is 35 minutes. This time is from a full power reactor trip with S/G shrinkage. If the event allows restoring S/G level in both S/Gs, and as decay heat decreases over time, there will be additional margin to restore feed to a S/G. **(Open Item: Perform an analysis to determine the time to restore feed to a S/G if only one S/G was able to be supplied with feedwater after a trip and then feed is lost to that one S/G. This is to account for the reduction in water available for heat removal.)**

ACCEPTANCE CRITERIA

No core damage will occur. Coping times will be calculated such that they preclude core damage. The codes used will ensure no core damage occurs including maintaining saturation conditions in the core region, keeping peak clad temperature below core melt limits, preventing clad rupture and maintaining two-phase water level above the top of the active fuel.

Maintain Core Cooling & Heat Removal (Steam Generators Available)
(Modes 1 – 4 and Mode 5 with Loops Filled)

PWR Installed Equipment Phase 1

Determine Baseline coping capability with installed coping[1] modifications not including FLEX modifications, utilizing methods described in Tables 3-2, D-1, D-2, & D-3 of NEI 12-06:

- **AFW**
- **Depressurize S/G for Makeup with Portable Injection Source**
- **Sustained Source of Water**

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

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

At the initiation of the ELAP/LUHS event in Modes 1, 2 and 3, Operators will enter the existing emergency operating procedure ECA-0.0, *Loss of All AC Power*, (Reference 22) either directly or from E-0, *Reactor Trip or Safety Injection*, (Reference 23) on the indication that both Bus 14 and Bus 16 are deenergized. In Modes 4, 5, and 6 Operators enter AP-ELEC.3, *Loss of 12A and/or 12B Transformer (Below 350°F)*, (Reference 24) which refers the Operators to ECA-0.0.

Per ECA-0.0, steps are taken to verify reactor trip, maintain Steam Generator (S/G) inventory, minimize Reactor Coolant System (RCS) leakage, and reduce DC loads on the unit's batteries. Heat removal from the RCS is accomplished by supplying feed water from the CST to the S/Gs using the Turbine Driven Auxiliary Feedwater (TDAFW) Pump or a Standby Auxiliary Feedwater (SAFW) Pump, powered by a new 1 MW D/G, taking suction on the new 160,000 gallon CST. **(Open Item: Implement the design change to install the 1 MW SAFW D/G, 160,000 gallon CST, and enclosure meeting the reasonable protection requirements of NEI 12-06.) (Open Item: Develop and implement procedures to feed S/Gs using a SAFW Pump powered by the new SAFW D/G and taking suction on the new 160,000 CST.)** S/G dryout conditions will be reached within 35 minutes with no feedwater supplied. (Reference 57) The feed rate can be controlled by use of either manual operation of Auxiliary Feedwater (AFW) pump discharge valves, flow control valves, or by starting and stopping the AFW pump. Steam is released from the S/Gs to the atmosphere through the ARVs. Natural circulation transfers the heat from the RCS to the S/Gs. This method is used to maintain RCS temperature at approximately 547°F.

AUXILIARY FEEDWATER

For other than the Tornado Missile, Seismic, and Flooding ELAP/LUHS events, the TDAFW Pump will automatically start and valves automatically align to supply water to the S/Gs from the CSTs. AFW flow is controlled by throttling the TDAFW Pump discharge MOV, which is powered from a DC bus. Throttling of feedwater flow will prevent overfilling of the S/Gs and overcooling of the RCS.

The TDAFW pump initially takes suction from a CST. CST level can be replenished from various sources. Although the TDAFW pump can operate long term and supply adequate AFW flow to the S/Gs for core cooling and decay heat removal, the Phase 1 strategy will be to commence feeding the S/Gs from a SAFW pump powered from the new SAFW D/G and taking suction from the new CST.

[1] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain Core Cooling & Heat Removal (Steam Generators Available)
(Modes 1 – 4 and Mode 5 with Loops Filled)

PWR Installed Equipment Phase 1

The TDAFW Pump is not protected from Tornado Missile, Seismic, and Flooding ELAP/LUHS events. **(Open Item: Implement a plant modification to allow S/G makeup to be provided by a SAFW Pump powered by the new SAFW D/G and taking suction on the new 160,000 gallon CST. Attachment 3, Figure 1. This modification will provide for 24 hrs of decay heat removal, including cooldown per ECA-0.0.) (Open Item: Revise procedures to direct Operators to manually establish makeup to the S/Gs via this flow path if the TDAFW Pump fails to deliver water to the S/Gs.)**

<u>DEPRESSURIZE S/G FOR MAKEUP WITH PORTABLE INJECTION SOURCE</u>
For other than Tornado Missile ELAP/LUHS events, S/G ARVs are currently available to control S/G pressure / T_{ave}. The Tornado Missile safe shutdown approach in UFSAR Section 3.3.3.2.2.D documents that "The standby AFW system would provide cooling to the steam generator(s) by using one of the main steam safety valves for venting to the atmosphere." **(Open Item: Implement a design change to protect the S/G ARVs from Tornado Missiles to address reactor core cooling and heat removal using high capacity portable diesel driven pumps.)** Protecting the S/G ARVs from Tornado Missiles will allow reducing S/G pressure for RCS Natural Circulation Cooldown and r connecting and feeding the S/Gs with portable FLEX pumps in Phase 2, if necessary. Another benefit to protecting the S/G ARVs from Tornado Missiles is to provide for a method of reactor core cooling and heat removal in Mode 4 and Mode 5, Loops Filled (Reference 27, Section B3.4.7).

The S/Gs will be depressurized by opening the ARVs as directed in ECA-0.0 to maintain an RCS cooldown rate of < 100°F/hr until S/G pressure reaches 260 psig. This will reduce RCS cold leg temperatures for maintaining the integrity of the RCP seals and to inject the SI Accumulators for RCS inventory control and long term subcriticality.

PA-PSC-0965, *PWROG Core Cooling Position Paper*, (Reference 41) states: "If local control of S/G feed and/or steam relief is required, this approach should demonstrate adequate manpower and communication. This needs to include habitability requirements. Otherwise, capability to maintain control of S/G feed and steam relief from the control room will be required." Local control of S/G ARV is credited to maintain core cooling and heat removal. **(Open Item: Perform an analysis to demonstrate adequate manpower, communications capability, and habitability for local operation of the S/G ARVs. If this cannot be demonstrated, implement a design change to provide for ARV control from the Control Room for seismic and tornado missile events.)**

PA-PSC-0965, *PWROG Core Cooling Position Paper*, (Reference 41) provides a conservative approach for determining the target S/G pressure with regard to preventing nitrogen injection from the SI Accumulators when RCS pressure and temperature is being reduced by depressurizing intact S/Gs. EOP Setpoint H.8, "Minimum pressure that prevents nitrogen injection plus margin," (Reference 42) follows the methodology in Reference 41 and determined the minimum S/G pressure for which accumulator nitrogen injection will not occur is 260 psig. The margin discussed in Reference 41 and EOP Setpoint H.8 is 100 psig. **(Open Item: Develop and implement procedures to close SI Accumulator injection valves or vent the SI Accumulators prior to nitrogen injection into the RCS.)**

Maintain Core Cooling & Heat Removal (Steam Generators Available)
(Modes 1 – 4 and Mode 5 with Loops Filled)

PWR Installed Equipment Phase 1

SUSTAINED SOURCE OF WATER

The existing CSTs and/or the new 160,000 gallon CST will be the initial water source(s) for feeding the S/Gs, providing 24 hours of core cooling and heat removal during Phase 1. (**Open Item: Develop and implement procedures/administrative controls to ensure that the new CST maintains a minimum usable volume at all times.**)

MODE 5, LOOPS FILLED

Technical Specification Basis for the R.E. Ginna Nuclear Power Plant B3.4.7, RCS Loops – MODE 5, Loops Filled, (Reference 27) states that loops filled is based on the ability to use a S/G as a backup to RHR cooling. To be able to take credit for the use of one S/G, the ability to pressurize the RCS to 50 psig and control pressure must be available. This is to prevent flashing and void formation at the top of the S/G tubes which may degrade or interrupt the natural circulation flow path. In this mode, the secondary side of at least one S/G is required to be ≥ 16%.

An ELAP / LUHS event during Mode 4 and Mode 5, Loops Filled, will result in RCS temperature increasing until S/G heat removal capability matches reactor decay heat. RCS temperature will be allowed to increase to 260°F before attempting to stabilize temperature to ensure an RCS pressure of 50 psig is maintained. Since the RCS is normally water solid with the Pressurizer filled during this mode of operation, the Pressurizer Power Operated Relief Valves (PORVs) will be cycling to limit RCS pressure. On loss of power and Instrument Air, nitrogen backup to the PORVs enables normal operation. However, there are a limited number of cycles with the exiting Nitrogen backup. (See Phase 2 for the strategy to address this issue.)

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

- ECA-0.0, *Loss of All AC Power*, provides actions to respond to a loss of all AC power.
- E-0, *Reactor Trip or Safety Injection*, provides actions to verify proper response of the automatic protection systems following manual or automatic actuation of a reactor trip or safety injection and to assess plant conditions, and identify the appropriate recovery procedure.
- AP-ELEC.3, *Loss of 12A and/or 12B Transformer (Below 350°F)*, provides actions to respond to a loss of 12A or 12B SS Transformer when RCS temperature is less than 350°F.

ECA-0.0, E-0, and AP-ELEC.3 will remain the entry points for ELAP/LUHS events. FLEX Support Guidelines (FSGs) are being developed and will be entered from ECA-0.0 and, if appropriate, other procedures.

Identify modifications	*List modifications*

- Implement a design change to protect the S/G ARVs from Tornado Missiles.
- Implement a design change to install a protected D/G capable of powering SAFW, new charging pump(s), and a Battery Charger. (In process, ECP-11-000104, *Diesel Driven AFW Pump Modification Scope*, (Reference 43)
- Implement a design change to install a protected 160,000 gallon CST. (In process, ECP-11-000104)
- Perform an analysis or implement a design change to qualify S/G Pressure instrumentation for a Tornado Missile event.

Maintain Core Cooling & Heat Removal (Steam Generators Available) (Modes 1 – 4 and Mode 5 with Loops Filled)	
PWR Installed Equipment Phase 1	
Key Reactor Parameters	*List instrumentation credited for this coping evaluation.*

Control Room and Field Instruments that can be relied upon for a Snow, Ice, or High Temperature event, including control room and field instruments.

Parameter	ID	Description	CR	Field	Power
BATT Volts	EI/PG	DC BUS A VOLTMETER 125V	Y		Y
BATT Volts	EI/PA	DC BUS B VOLTMETER 125V	Y		Y
AFW Flow	FT-2015	TDAFW PUMP DISCH FLOW FI-2031	Y		Y
CST Level	LI-2022A	CST A LVL	Y		Y
CST Level	LI-2022B	CST B LVL	Y		Y
S/G Level	LI-505	S/G A WIDE RANGE LEVEL	Y		Y
S/G Level	LI-507	S/G B WIDE RANGE LEVEL	Y		Y
S/G Press	PI-468	S/G A PRESS	Y		Y
S/G Press	PI-478	S/G B PRESS	Y		Y
RCS Press	PI-420	RCS LO RANGE PRESS	Y		Y
RCS Press	PI-429	PRZR PRESS	Y		Y
RCS Press	PI-431	PRZR PRESS	Y		Y
PZR Level	LI-426	PRZR LVL	Y		Y
PZR Level	LI-428	PRZR LVL	Y		Y
PZR Level	LI-433A	PRZR LVL COLD CAL (SS)	Y		Y
RCS Temp	TI-410A-1	WIDE RANGE THOT	Y		Y
RCS Temp	TI-410B-1	WIDE RANGE TCOLD	Y		Y
RCS Temp	CETA	CORE EXIT THERMOCOUPLE	Y		Y
RCS Temp	CETB	CORE EXIT THERMOCOUPLE	Y		Y

Identify instruments to be relied upon for a Flooding event, including control room and field instruments.

Parameter	ID	Description	CR	Field	Power
BATT Volts	EI/PG	DC BUS A VOLTMETER 125V	Y		Y
BATT Volts	EI/PA	DC BUS B VOLTMETER 125V	Y		Y
S/G Level	LI-505	S/G A WIDE RANGE LEVEL	Y		Y
S/G Level	LI-507	S/G B WIDE RANGE LEVEL	Y		Y
S/G Press	PI-468	S/G A PRESS	Y		Y
S/G Press	PI-478	S/G B PRESS	Y		Y
RCS Press	PI-420	RCS LO RANGE PRESS	Y		Y
RCS Press	PI-429	PRZR PRESS	Y		Y
RCS Press	PI-431	PRZR PRESS	Y		Y
PZR Level	LI-426	PRZR LVL	Y		Y
PZR Level	LI-428	PRZR LVL	Y		Y
PZR Level	LI-433A	PRZR LVL COLD CAL (SS)	Y		Y
RCS Temp	TI-410A-1	WIDE RANGE THOT	Y		Y

Maintain Core Cooling & Heat Removal (Steam Generators Available)
(Modes 1 – 4 and Mode 5 with Loops Filled)

PWR Installed Equipment Phase 1

RCS Temp	TI-410B-1	WIDE RANGE TCOLD	Y		Y
RCS Temp	CETA	CORE EXIT THERMOCOUPLE	Y		Y
RCS Temp	CETB	CORE EXIT THERMOCOUPLE	Y		Y

Identify instruments to be relied upon for a Seismic event, including control room and field instruments.

Parameter	ID	Description	CR	Field	Power
BATT Volts	EI/PG	DC BUS A VOLTMETER 125V	Y		Y
BATT Volts	EI/PA	DC BUS B VOLTMETER 125V	Y		Y
S/G Level	LI-505	S/G A WIDE RANGE LEVEL	Y		Y
S/G Level	LI-507	S/G B WIDE RANGE LEVEL	Y		Y
S/G Press	PI-468	S/G A PRESS	Y		Y
S/G Press	PI-478	S/G B PRESS	Y		Y
RCS Press	PI-420	RCS LO RANGE PRESS	Y		Y
RCS Press	PI-429	PRZR PRESS	Y		Y
RCS Press	PI-431	PRZR PRESS	Y		Y
PZR Level	LI-426	PRZR LVL	Y		Y
PZR Level	LI-428	PRZR LVL	Y		Y
RCS Temp	TI-410A-1	WIDE RANGE THOT	Y		Y
RCS Temp	TI-410B-1	WIDE RANGE TCOLD	Y		Y

In the *Plant-Specific Safety Evaluation Report For USI A-46 Program Implementation At The R.E. Ginna Nuclear Power Plant* (Reference 72) the NRC staff concluded that the Ginna's approach to demonstrate that it can achieve and maintain hot shutdown for 72 hours following a seismic event, including instrumentation, is acceptable for use in the Unresolved Safety Issue (USI) A-46 program at Ginna.

Identify instruments to be relied upon for a Tornado Missile event, including control room and field instruments.

Parameter	ID	Description	CR	Field	Power
BATT Volts	EI/PG	DC BUS A VOLTMETER 125V	Y		Y
BATT Volts	EI/PA	DC BUS B VOLTMETER 125V	Y		Y
S/G Level	LI-505	S/G A WIDE RANGE LEVEL	Y		Y
S/G Level	LI-507	S/G B WIDE RANGE LEVEL	Y		Y
RCS Press	PI-420	RCS LO RANGE PRESS	Y		Y
RCS Press	PI-429	PRZR PRESS	Y		Y
RCS Press	PI-430	PRZR PRESS	Y	Open Item	N
PZR Level	LI-426	PRZR LVL	Y		Y
PZR Level	LI-427	PRZR LVL	Y	Open Item	N
RCS Temp	TI-410A-1	WIDE RANGE THOT	Y		Y
RCS Temp	TI-410B-1	WIDE RANGE TCOLD	Y		Y

Maintain Core Cooling & Heat Removal (Steam Generators Available)
(Modes 1 – 4 and Mode 5 with Loops Filled)

PWR Installed Equipment Phase 1

In the *Supplemental Safety Evaluation – Systematic Evaluation Program (SEP)/Structural Upgrade Program (SUP) at R.E. Ginna* (Reference 69) the NRC stated that the Safety Evaluation provided on March 24, 1987 concluded that, subject to the plant modifications which RG&E had committed to install, the implementation of the SUP would provide reasonable assurance that Ginna Station could be safely shut down following specified environmental effects. The Safety Evaluation provided on March 24, 1987 (Reference 70) required RG&E to "assure sufficient instrumentation to monitor safe shutdown conditions." Based on the NRC review, audit, and plant inspection, the NRC concluded that the evaluation and resolution of R.E. Ginna Nuclear Power Plant SEP Topics III-2 Wind and Tornado Loading, III-4.A Tornado Missiles, III-6 Seismic Design Considerations, and III-7.B Load Combinations are acceptable. The NRC also concluded that the RG&E analysis and implementation of the SUP are acceptable, that all structural issues related to Ginna Station SUP are resolved, and that this evaluation also provides closure to the Ginna Station SEP.

Open Items:

- **Identify instrumentation and develop procedures to take field readings of necessary parameters, including PI-430 and LI-427.**

Notes:

Identify analyses or actions:

- Perform an analysis to determine the time to restore feed to a S/G if only one S/G was able to be supplied with feedwater after a trip and then feed is lost to that one S/G. This is to account for the reduction in water available for heat removal.
- Perform an analysis to demonstrate adequate manpower, communications capability, and habitability for local operation of the S/G ARVs. If this cannot be demonstrated, implement a design change to provide for ARV control from the Control Room for seismic and tornado missile events.
- Develop and implement procedures/administrative controls to ensure that the new CST maintains a minimum usable volume at all times.
- Develop and implement procedures to close SI Accumulator injection valves or vent the SI Accumulators prior to nitrogen injection into the RCS.
- Develop and implement procedures to feed S/Gs using a SAFW Pump powered by the new SAFW D/G and taking suction on the new 160,000 CST.
- Identify instrumentation and develop procedures to take field readings of necessary parameters, including PI-430 and LI-427.
- Perform an analysis to determine the diesel driven portable high pressure pump upper and lower head requirements to provide for a minimum of 215 gpm to a S/G without causing RCS pressure to decrease to the point where nitrogen will be injected from the SI Accumulators, assuming suction is directly from the UHS.

Maintain Core Cooling & Heat Removal (Steam Generators Available)
(Modes 1-4 and Mode 5 with Loops Filled)

PWR 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 strategy(ies) utilized to achieve this coping time.

DEPRESSURIZE S/G FOR MAKEUP WITH PORTABLE INJECTION SOURCE
Operators will continue to use S/G ARVs to reduce and/or maintain S/G pressures by manual or local operation depending on the BDBEE. The S/G ARVs have nitrogen bottles to provide initial control and may be supplemented by the instrument air system, which can be supplied by a FLEX air compressor, already purchased and onsite. (**Open Item: Implement a design change to install connections for a portable air compressor to be connected to the instrument air system at a location/configuration to support ARV operation.**)

Primary Strategy

SUSTAINED SOURCE OF WATER
The Operations Staff will monitor the new CST level. (**Open Item: Develop and implement procedures to refill the new CST from an alternate water source prior depleting the usable volume (approximately 24 hours after the event.) (Attachment 3, Figure 1).** (**Open Item: Implement a design change as part of the installation of the new CST to install a mechanical connection that will allow the tank to be refilled from a portable diesel driven pump.**) This will allow the new CST to be refilled from a variety of sources including the UHS (Lake Ontario) and fire water systems.

The primary Phase 2 coping strategy is resupply the new CST from the UHS using a portable diesel driven pump and hoses. (See the Safety Functions Support section for a discussion on a protected source of water from the UHS.) Core cooling and heat removal will be sustained indefinitely, or until long term recovery actions are determined, using a SAFW pump powered from the SAFW Diesel Generator (D/G), with provision for refilling the new CST and SAFW D/G fuel tank. (See the Safety Functions Support section for a discussion on the protected means of refilling the SAFW D/G fuel tank.)

Alternate Strategy

AUXILIARY FEEDWATER
The alternate Phase 2 strategy is to utilize a diesel driven high capacity portable pump to supply the S/Gs with water from the new CST should the SAFW Pump become unavailable. The diesel driven high capacity portable pump will be sized to supply adequate feedwater flow to restore and maintain S/G level at the target S/G pressure to prevent nitrogen injection from the SI Accumulators. (**Open Item: Perform an analysis to establish plant conditions in Phase 1 that will allow this pump to be utilized as soon as plant resources are available to provide defense in depth for maintaining an adequate heat sink should SAFW fail.**) (Reference 41)

The new CST will be resupplied from the UHS using an additional portable diesel driven pump and hoses. (See the Safety Functions Support section for a discussion on a protected source of water from the UHS.) Core cooling and heat removal will be sustained indefinitely, or until long term recovery actions are determined, using the portable diesel driven pump, with provision for refilling the new CST and portable

Maintain Core Cooling & Heat Removal (Steam Generators Available)
(Modes 1-4 and Mode 5 with Loops Filled)

PWR Portable Equipment Phase 2

diesel driven pump fuel tank. (See the Safety Functions Support section for a discussion on the protected means of refilling the portable diesel driven pump fuel tank.)

The diesel driven high capacity portable pump will provide a minimum of 215 gpm to a steam generator at a pressure sufficient to prevent nitrogen injection into the RCS from the SI Accumulators. A diesel driven high capacity portable pump can currently be connected to the AFW system at two protected connection points in the Auxiliary Building intermediate level. The location of these connections is provided in a diagram in Attachment 3 Figure 1. (**Open Item: Implement a design change to install a new isolation valve upstream of the FLEX connection to S/G B in case a tornado missile impacts a section of unprotected piping between the SAFW Building and the connection point.**)

PA-PSC-0965, *PWROG Core Cooling Position Paper*, (Reference 41) provides a conservative approach for determining the target S/G pressure with regard to preventing nitrogen injection from the SI Accumulators when RCS pressure and temperature is being reduced by depressurizing intact S/Gs. EOP Setpoint H.8, "Minimum pressure that prevents nitrogen injection plus margin," (Reference 42) follows the methodology in Reference 41 and determined the minimum S/G pressure for which accumulator nitrogen injection will not occur is 260 psig. The margin discussed in Reference 41 and EOP Setpoint H.8 is 100 psig. (**Open Item: Perform an analysis to determine the diesel driven portable high pressure pump upper and lower head requirements to provide for a minimum of 215 gpm to a S/G without causing RCS pressure to decrease to the point where nitrogen will be injected from the SI Accumulators, assuming suction is directly from the UHS.**) (**Open Item: Develop and implement procedures to close SI Accumulator injection valves or vent the SI Accumulators prior to nitrogen injection into the RCS.**)

<u>MODE 5, LOOPS FILLED</u>

An ELAP / LUHS event during Mode 4 and Mode 5, Loops Filled, will result in RCS temperature increasing until S/G heat removal capability matches reactor decay heat. RCS temperature will be allowed to increase to 260°F before attempting to stabilize temperature to ensure an RCS pressure of 50 psig is maintained. Since the RCS is normally water solid with the Pressurizer filled during this mode of operation, the Pressurizer Power Operated Relief Valves (PORVs) will be cycling to limit RCS pressure. On loss of power and Instrument Air, nitrogen backup to the PORVs enables normal operation. However, there are a limited number of cycles with the exiting Nitrogen backup. (**Open Item: Implement a design change to provide a sustainable source of nitrogen and/or air to the PORVs to protect RCS Integrity during a BDBEE while in Mode 4 or Mode 5, loops filled.**)

<u>COOLDOWN TO MODE 5</u>

If cooldown to Mode 5, or remaining in Mode 5, Loops Filled, is desired, procedure ER-FIRE.3, Alternate Shutdown for Aux Building Basement/Mezzanine Fire, Section 6.7, Water Solid S/G Cooldown, (Reference 35) provides guidance that can be modified for use. Water solid cooldown requires both SAFW pumps and S/Gs to be available for cooldown. A high flow portable diesel driven pump can also be used in place of the SAFW pumps. (**Open Item: Develop and implement procedures to provide guidance for water solid S/G cooldown using FLEX equipment.**)

R.E. Ginna Nuclear Power Plant Fire Protection Program (Reference 39) Section 5.1.6.1, Water-Solid Steam Generator Operation, documents that water solid S/G operation can cool the RCS to less than 200°F in less than 72 hours.

Details:

Maintain Core Cooling & Heat Removal (Steam Generators Available) (Modes 1-4 and Mode 5 with Loops Filled)	
PWR Portable Equipment Phase 2	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
• Implement a design change as part of the installation of the new CST to install a mechanical connection that will allow the tank to be refilled from a portable diesel driven pump. • Implement a design change to install connections for a portable air compressor to be connected to the instrument air system at a location/configuration to support ARV operation • Implement a design change to install a new isolation valve upstream of the FLEX connection to S/G B in case a tornado missile impacts a section of unprotected piping between the SAFW Building and the connection point. • Implement a design change to provide a sustainable source of nitrogen and/or air to the PORVs to protect RCS Integrity during a BDBEE while in Mode 4 or Mode 5, loops filled.	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same as instruments listed in above section, Core Cooling Phase 1	
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	

Severe Storms with High Winds - *List Protection or*	*List how equipment is protected or schedule to protect*

schedule to protect	
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Snow, Ice, and Extreme Cold - *List Protection or schedule to protect*	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
High Temperatures - *List Protection or schedule to protect*	*List how equipment is protected or schedule to protect*
Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required as normal room ventilation will be utilized per Reference 4. The schedule to construct structures is still to be determined. • Ginna procedures and programs are being developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	

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*
The storage structure and its location have not been determined. Portable equipment will be towed to designated locations. Connections will be made to yet-to-be-determined connections points.	• Implement a design change as part of the installation of the new CST to install a mechanical connection that will allow the tank to be refilled from a portable diesel driven pump. • Implement a design change to install connections for a portable air compressor to be connected to the instrument air system at a location/configuration to support ARV operation. • Implement a design change to provide a sustainable source of nitrogen and/or air to the PORVs to protect RCS Integrity during a BDBEE while in Mode 4 or Mode 5,	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles, and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

	loops filled.	

Notes:

Identify analyses or actions:

- Develop and implement procedures to refill the new CST from an alternate water source prior depleting the usable volume (approximately 24 hours after the event).
- Perform an analysis to determine the diesel driven portable high pressure pump upper and lower head requirements to provide for a minimum of 215 gpm to a S/G without causing RCS pressure to decrease to the point where nitrogen will be injected from the SI Accumulators, assuming suction is directly from the UHS.
- Develop and implement procedures that will allow a portable diesel driven pump to be utilized as soon as plant resources are available to provide defense in depth for maintaining an adequate heat sink should SAFW fail.
- Develop and implement procedures to close SI Accumulator injection valves or vent the SI Accumulators prior to nitrogen injection into the RCS.
- Develop and implement procedures to provide guidance for water solid S/G cooldown using FLEX equipment.

Maintain Core Cooling & Heat Removal (Steam Generators Available)
(Modes 1-4 and Mode 5 with Loops Filled)

PWR 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 strategy(ies) utilized to achieve this coping time.

The Phase 3 strategy is basically the Phase 2 strategy supplemented by equipment available from the RRC.

During Phase 3, core cooling could be provided by a SAFW Pump, portable diesel driven high capacity pump, or an offsite supplied pump consistent with core cooling activities in Phase 2. With the initiation of access to off-site equipment, CENG would obtain D/Gs capable of supplying 480 Volt Vital Busses. (**Open Items: The RRC needs to be able to provide D/Gs capable of providing 480 Volts to onsite equipment. Ginna needs the capability to power the vital busses from the RRC supplied portable D/Gs.**) Repowering the 480 Vital Busses would allow both SAFW Pumps to be powered to feed S/Gs. If the onsite water processing unit cannot be repowered, water processing units capable of providing demineralized water would also be provided by the regional center. (**Open Item: RRC needs to provide water processing unit.**) Supply to the portable water processing trailer would come from the Town of Ontario or the UHS.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/G.	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same as Phase 1 not including instrumentation to support portable equipment.	

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*
RRC equipment will be transported to a staging area near or on site. Site equipment (possibly with assistance from local/state authorities) will	Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/Gs.	Connection points for RRC equipment will be located in a structure protected against flooding, tornado missiles, and seismic events. RRC connections

Maintain Core Cooling & Heat Removal (Steam Generators Available) (Modes 1-4 and Mode 5 with Loops Filled)		
PWR Portable Equipment Phase 3		
transport equipment to designated locations in the protected area. Connections will be made to yet-to-be-determined connections points.		will be installed to meet station and protection requirements.
Notes: **RRC Requirements:** • Ensure RRC can supply D/Gs capable of powering vital bus loads. • Ensure RRC can supply a water processing unit.		

Maintain RCS Inventory Control/Long Term Subcriticality (Modes 1 – 4 and Mode 5 with Loops Filled)

STRATEGIES

A graphical representation of the Phase 1 to Phase 3 strategies for maintaining RCS Inventory Control and Long Term Subcriticality (Modes 1 – 4 and Mode 5 with Loops Filled) is shown below.

The general RCS makeup strategy is to deliver the necessary amount of borated water to maintain adequate Shutdown Margin to maintain the core subcritical in Phases 1 and 2. The need to borate to maintain subcriticality bounds the need for RCS inventory control early in the ELAP / LUHS event. Once an adequate shutdown margin is obtained, the focus will be to maintain RCS inventory.

Under a loss of all AC power, the Operators will initiate a controlled plant cooldown and depressurization as per current procedure ECA-0.0, *Loss of All AC Power* (Reference 22), and consistent with recommendations in PA-PSC-0965, *PWROG Core Cooling Position Paper* (Reference 41). This will result in injecting borated water from the SI Accumulators. However, at the end of the Operating cycle, this cooldown will cause a significant addition of positive reactivity to the reactor core. By delivering the necessary amount of borated water to the RCS during the cooldown, the successful implementation of the FLEX strategy Phase 1 to 3 will prevent core re-criticality and core damage.

Under Phase 1 (using installed equipment) the Operators initially rely on increasing negative core reactivity due to the buildup of Xenon to maintain the reactor subcritical. However, cooling down per current procedure ECA-0.0, *Loss of All AC Power*, (Reference 22) at end-of-life (EOL) will add a significant amount of positive reactivity. While this will cause the SI Accumulators to inject borated water into the RCS, the cooldown will reduce the subcritical margin to a very low value.

Under Phase 2 (using on-site FLEX equipment) the Operators will deliver borated water to the RCS to ensure the reactor remains subcritical during the controlled cooldown directed in ECA-0.0. Additional borated water will be delivered to the RCS as needed to increase the RCS boron concentration or to maintain RCS inventory.

Under Phase 3 (using off-site RRC supplied equipment), portable equipment and consumables will be used to reinforce and secure for an indefinite coping time the measures implemented during Phase 2, mainly additional boric acid and the ability to re-power the Charging Pumps.

Maintain RCS Inventory Control / Long Term Subcriticality (Modes 1 – 4 and Mode 5 with Loops Filled)

Phase 1 (Xenon and SI Accumulators – time 0 up to ~ 18 hrs)

~1 hr ——— Phase 2

——— Phase 3

0 6 12 18 24 30 36 42 48 54 60 66 72 + Hrs

OBJECTIVES

Extended coping without RCS makeup is not possible without minimal RCS leakage. Plants must evaluate use of low leakage RCP seals and / or providing borated high pressure RCS makeup. Analysis is required to determine RCS makeup requirements. Letdown may be required to support required makeup and ensure subcriticality. (Reference 4)

RCP Seals with Regard to Inventory

RCS Inventory will be maintained by relying on low leakage RCP seals. **(Open Item: Implement a design change to install low leakage RCP seals. The new seals need to be able to withstand T_{hot} for an extended period of time.**) The WCAP-17601-P (Reference 19) analysis for the normal RCP Seals documents that the core will remain covered up to 55 hours assuming no RCS makeup, the RCS is cooled down per ECA-0.0, and the SI Accumulators inject to the RCS. WCAP-17601-P documents that with low leakage RCP seals and no cooldown, at the end of seven days there is a minimum of ~2 ft of mixture above the top of the core. Other advantages of low leakage RCP seals include:

- If asymmetric S/G operation is necessary, the temperature consideration for the idle loop is addressed.
- The impact on containment heat-up is reduced.

RCS Makeup with Regard to Subcriticality

Regardless of whether the RCS is cooled down or not, boration capability is necessary to maintain the reactor subcritical once Xenon will have decayed away. A modification to install a protected FLEX Boric Acid Storage Tank (FBAST) and FLEX charging capability will provide the capability to maintain the reactor subcritical. This provides the added benefit of maintaining RCS inventory.

The current Phase 1, 2, and 3 strategies for RCS boration and makeup involve cooling down to inject the SI Accumulators and then maintain stable plant conditions until long term recovery actions can be implemented (See safety function Maintain Core Cooling & Heat Removal (S/Gs Available; Modes 1 – 4 and Mode 5 with Loops Filled)). An alternate strategy being considered is to remain at or near no-load T_{ave} and use the new FLEX charging pump and FBAST to borate the RCS and maintain subcriticality. **(Open Item: Perform an analysis to validate that a FBAST with a boron concentration of at least 2750 ppm and no more than 3050 ppm, and containing a minimum usable volume of 7000 gallons, is sufficient to maintain the reactor subcritical at Beginning of Life (BOL) or End of Life (EOL) conditions while remaining at or near no-load T_{ave}. (Analysis must be bounding for current and future cycles.))**

Preliminary analysis shows that letdown is not required to support borating to the RCS to maintain subcriticality. The Technical Specification minimum Refueling Water Storage Tank boron concentration is 2750 ppm (Reference 26). This will also be the administrative minimum boron concentration for the FBAST. This higher minimum boron concentration required for the RWST as part of the Extended Power Uprate (EPU), along with the large decrease in Pressurizer Level of 56% to 20% from Full Load T_{ave} to No-Load T_{ave}, provides adequate RCS volume for boration to maintain subcriticality. This minimum boron concentration value also means that the RCS water volume shrinkage that occurs during cooldown allows for boration without requiring letdown. If at some point letdown is desired, the Pressurizer PORV will be the designated method. **(Open Item: Perform an analysis to validate that a FBAST with a boron**

concentration of at least 2750 ppm and no more than 3050 ppm, and containing a minimum usable volume of 7000 gallons, is sufficient to maintain the reactor subcritical at EOL conditions with a cooldown to 350°F. (Analysis must be bounding for current and future cycles.))

Accumulator Makeup Capability and Isolation/Venting to Prevent Nitrogen Injection

As discussed in Maintain Core Cooling & Heat Removal (Steam Generators Available) cooldown is initiated to lower RCS cold leg temperatures for maintaining the integrity of the RCP seals and to inject the SI Accumulators for RCS inventory control and long term subcriticality. (**Open Item: Develop and implement procedures to close SI Accumulator injection valves or vent the SI Accumulators prior to nitrogen injection into the RCS.**)

ACCEPTANCE CRITERIA

There will be no return to criticality once the loss of all AC power has occurred. To ensure that the reactor remains subcritical, a limit of Keff less than 0.99 (subcritical) is set. The level of 0.99 for subcriticality was chosen because it will provide some margin to account for the best estimate reactor physics parameters assumed in the analysis.

Maintain RCS Inventory Control / Long Term Subcriticality (Modes 1 – 4 and Mode 5 with Loops Filled)
PWR Installed Equipment Phase 1:
Determine Baseline coping capability with installed coping[2] modifications not including FLEX modifications, utilizing methods described in Table 3-2, D-1, D-2, & D-3 of NEI 12-06: • **Low Leak RCP Seals or RCS makeup required** • **All Plants Provide Means to Provide Borated RCS Makeup**
Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain core cooling. Identify methods (Low Leak RCP Seals and/or borated high pressure RCS makeup) and strategy(ies) utilized to achieve this coping time. <u>SUBCRITICALITY:</u> According to WCAP-17601-P Section 5.8, Re-Criticality with Lowered RCS Temperatures, (Reference 19) Ginna will need to borate to maintain Keff less than 0.99 throughout the entire Cycle 36. The limiting time to start boration is end-of-life when boration must start within 14 hours of Reactor Trip. Because it is necessary to place some constraints on this scenario, WCAP-17601-P recommends that the low end of RCS temperatures be limited to no less than hot shutdown, i.e., 350°F. PA-PSC-0965, *PWROG Core Cooling Position Paper*, states: "If xenon greater than equilibrium is required to maintain reactor subcritical at 350°F, then initiate boration prior to peak xenon of 8 hours post trip. Otherwise, initiate boration prior to xenon decay to level that may cause re-criticality at 350°F." Boration to the RCS will be necessary to prevent re-criticality as Xenon decay will otherwise result in net 220 percent mil (pcm) positive core reactivity at EOL. CALC-2011-0009, *Cycle 36 Reactor Engineering Calculations*, Attachment 3 (Reference 20) shows the maximum equilibrium Xenon concentration as -2885 pcm at EOL. CALC-2011-0009 Section 8.12 calculates the available shutdown margin at EOL as -2665 pcm after the reactor trip and assuming all rods insert consistent with the SBO Program and NEI 12-06 assumptions. To maintain Keff < 0.99 per WCAP-17601-P, RCS boron concentration will need to be increased by 172 parts per million (ppm). (1220 pcm / -7.1 pcm/ppm boron worth at EOL) The rate of boric acid injection must be sufficient to offset the maximum addition of positive reactivity from decay of peak Xenon associated with 100% power history. UFSAR Section 3.1.1.5.4, "Reactivity Hold-Down Capability," (Reference 25) states "Sufficient boric acid from the Refueling Water Storage Tank (RWST) can also be injected to compensate for xenon decay beyond the equilibrium level, with one charging pump operating at its minimum speed, and thereby delivering in excess of the required minimum flow of approximately 9 gpm into the reactor coolant system." This required flow rate is checked on a cycle specific basis. Recent calculation CALC-2011-0009 Section 8.17, Minimum Charging Flow Required from RWST, documents that one charging pump, delivering a minimum of 9 gpm into the RCS, can keep up with xenon decay. Nine gpm is based on a charging pump delivery rate of 17 gpm, minus a maximum seal leakoff of 8 gpm. The basis for this flow rate (from the Technical Requirements Manual for the R. E. Ginna Nuclear Power Plant (Reference 28) and ACB 2009-0005, (Reference 29)) assumes that boration from the RWST does not start until post-trip Xenon equals pre-trip Xenon (19 to 20.5 hours from 100% Pre-Trip RTP from BOL to EOL per CALC-2011-0009).

[2] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain RCS Inventory Control / Long Term Subcriticality
(Modes 1 – 4 and Mode 5 with Loops Filled)

PWR Installed Equipment Phase 1:

Ginna CALC-2011-0009 Section 8.12 evaluates the maintenance-of-subcriticality during ECA-0.0 cooldown at EOL. ECA-0.0 directs the Operator to depressurize the steam generators to 260 psig to decrease RCS temperature and pressure to cause SI Accumulator injection. The "conservative analysis", including taking no credit for xenon addition, shows that a cooldown from 547°F to 410°F commencing 20 minutes after the reactor trip and taking on the order of 20-30 minutes will cause the reactor to go critical with 1130 pcm positive reactivity. More realistic conditions (e.g. accurate rod worth's, trip from all rods out (ARO) condition, ARO xenon distribution, nominal versus limiting temperatures, post-trip xenon build in) would likely reduce the magnitude of the excess reactivity, but a re-criticality is still a distinct possibility. (See Phase 2 for strategy to provide margin to prevent re-criticality.)

As discussed in Maintain Core Cooling & Heat Removal (Steam Generators Available) cooldown is initiated to lower RCS cold leg temperatures for maintaining the integrity of the RCP seals and to inject the SI Accumulators for RCS inventory control and long term subcriticality. **(Open Item: Develop and implement procedures to close SI Accumulator injection valves or vent the SI Accumulators prior to nitrogen injection into the RCS.)**

PA-PSC-0965, *PWROG Core Cooling Position Paper*, provides a conservative approach for determining the target S/G pressure with regard to preventing nitrogen injection from the SI Accumulators when RCS pressure and temperature is being reduced by depressurizing intact S/Gs. EOP Setpoint H.8, "Minimum pressure that prevents nitrogen injection plus margin," follows the methodology in PA-PSC-0965, *PWROG Core Cooling Position Paper*; and determined the minimum S/G pressure for which accumulator nitrogen injection will not occur is 260 psig. The margin discussed in PA-PSC-0965, *PWROG Core Cooling Position Paper*, and EOP Setpoint H.8 (Reference 42) is 100 psig. (**Open Item: Perform an analysis to determine the diesel driven portable high pressure pump upper and lower head requirements to provide for a minimum of 215 gpm to a S/G without causing RCS pressure to decrease to the point where nitrogen will be injected from the SI Accumulators, assuming suction is directly from the UHS.**)

<u>RCS INVENTORY CONTROL:</u>
RCS Inventory will be maintained by relying on low leakage RCP seals, which are to be purchased and installed. (**Open Item: Implement a design change to install low leakage RCP seals. The new seals need to be able to withstand T_{hot} for an extended period of time.**) The current analysis for the normal RCP Seals documents that the core will remain covered up to 55 hours assuming no RCS makeup, the RCS is cooled down per ECA-0.0, and the SI Accumulators inject to the RCS (Reference 19). WCAP-17601-P documents that with low leakage RCP seals and no cooldown, at the end of seven days there is a minimum of ~2 ft of mixture above the top of the core.

Consistent with the current Station Blackout Program that "there is no need to operate a charging pump during a four hour SBO event," there are no related Phase 1 actions required to address subcriticality or RCS inventory control. (Reference 32, Sections 1.5.4 and 1.5.54)

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
• ECA-0.0, *Loss of All AC Power*, provides actions to respond to a loss of all AC power. • E-0, *Reactor Trip or Safety Injection*, provides actions to verify proper response of the automatic protection systems following manual or automatic actuation of a reactor trip or safety injection and to assess plant conditions, and identify the appropriate recovery procedure. • AP-ELEC.3, *Loss of 12A and/or 12B Transformer (Below 350°F)*, provides actions to respond to a loss of 12A or 12B SS Transformer when RCS temperature is less than 350°F. ECA-0.0, E-0, and AP-ELEC.3 will remain the entry points for ELAP/LUHS events. FLEX Support Guidelines (FSGs) are being developed and will be entered from ECA-0.0 and, if appropriate, other procedures.	
Identify modifications	*List modifications*
• Implement a design change to install low leakage RCP seals. The new seals need to be able to withstand T_{hot} for an extended period of time.	
Key Reactor Parameters	*List instrumentation credited for this coping evaluation.*
See Maintain Core Cooling & Heat Removal (Steam Generators Available) (Modes 1-4 and Mode 5 with Loops Filled) for Key Reactor Parameters for Phase 1.	
Notes: **Identify analyses or actions:** • Perform an analysis to determine the diesel driven portable high pressure pump upper and lower head requirements to provide for a minimum of 215 gpm to a S/G without causing RCS pressure to decrease to the point where nitrogen will be injected from the SI Accumulators, assuming suction is directly from the UHS. • Develop and implement procedures to close SI Accumulator injection valves or vent the SI Accumulators prior to nitrogen injection into the RCS.	

Maintain RCS Inventory Control / Long Term Subcriticality
(Modes 1-4 and Mode 5 with Loops Filled)

PWR Portable Equipment Phase 2:

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (Low Leak RCP Seals and/or borated high pressure RCS makeup)and strategy(ies) utilized to achieve this coping time.

SUBCRITICALITY / RCS INVENTORY CONTROL

Borated Water Source

Primary Strategy

To maintain RCS Inventory Control and Long Term Subcriticality, Ginna has established two diverse methods for RCS makeup and boration during Phase 2. For both strategies the borated water source will be a new FLEX Boric Acid Storage Tank (FBAST). The FBAST will be the former 10,000 gallon SAFW Test Tank located in the SAFW Building. The SAFW Test Tank will be modified to hold borated water with the Refueling Water Storage Tank (RWST) boron concentration of at least 2750 ppm and no more than 3050 ppm and containing a minimum usable volume of 7,000 gallons. (**Open Item: Perform an analysis to validate that a FBAST with a boron concentration of at least 2750 ppm and no more than 3050 ppm, and containing a minimum usable volume of 7000 gallons, is sufficient to maintain the reactor subcritical at BOL or EOL conditions with T_{ave} at or near no-load T_{ave}, and at EOL conditions with a cooldown to 350°F. (Analysis must be bounding for current and future cycles.)**) Heating of the FBAST is not required. At the maximum boron concentration of 3050 ppm, the FBAST solubility limit is well below 32°F. The existing SAFW Building heating system will maintain the FBAST temperature well above 32°F. The SAFWP Building is a safety-related structure with administrative controls to ensure temperature remains above 60°F (UFSAR Section 9.4.9.6.1, Reference 25). (**Open Item: Implement a design change to convert the existing SAFW Test Tank to the FLEX Boric Acid Storage Tank with a permanent connection to the new pre-staged high pressure pump and connection(s) for a portable diesel driven pump.)**

Alternate Strategy

A portable boric acid blending device will allow refilling the FBAST and provide for inline use with portable pumps to inject borated water directly into the RCS. The blending capacity of the boric acid blending device needs to be determined. (**Open Item: Design and implement the capability to inject blended borated water into the RCS using an inline blender, at the required flow rate with margin, once an analysis determines the RCS makeup requirement for Mode 5, loops not filled and pressurizer manway not removed.)**

RCS Makeup

Primary Strategy

The primary strategy will be to utilize a new FLEX high pressure pump pre-staged (permanently installed) in the SAFW Building taking suction on the FLEX Boric Acid Storage Tank (FBAST) and injecting into the RCS via the Charging header (Attachment 3, Figure 2). This pump will be capable of pumping 22 gpm

Maintain RCS Inventory Control / Long Term Subcriticality (Modes 1-4 and Mode 5 with Loops Filled)	
PWR Portable Equipment Phase 2:	
at 2235 psig or 70 gpm at 1500 psig. **(Open Item: Implement a design change to install a pump capable of pumping 22 gpm of borated water into the RCS at 2235 psig, or 70 gpm at 1500 psig, from the new FBAST with discharge piping connected to the Charging header.)** **(Open Item: Develop and implement procedures to initiate RCS boration prior to commencing RCS cooldown to provide margin to prevent re-criticality.)** ***Alternate Strategy*** The alternate strategy will be to connect a portable diesel engine powered high pressure injection pump from the FBAST to the Charging line to makeup to the RCS. **(Open Items: Implement a design change to connect a portable diesel engine driven high pressure pump to the FBAST and the Charging line, which is capable of pumping 20 gpm of borated water from the FBAST to the RCS at 2235 psig.)**	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
• Implement a design change to install a pump capable of pumping 22 gpm of borated water into the RCS at 2235 psig, or 70 gpm at 1500 psig, from the new FBAST with discharge piping connected to the Charging header. • Implement a design change to connect a portable diesel engine driven high pressure pump to the FBAST and the Charging line, which is capable of pumping 20 gpm of borated water from the FBAST to the RCS at 2235 psig. • Implement a design change to convert the existing SAFW Test Tank to the FLEX Boric Acid Storage Tank with a permanent connection to the new pre-staged high pressure pump and connection(s) for a portable diesel driven pump.	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same as instruments listed in above section, Core Cooling Phase 1	
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	

Maintain RCS Inventory Control / Long Term Subcriticality (Modes 1-4 and Mode 5 with Loops Filled)	
PWR Portable Equipment Phase 2:	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
High Temperatures	*List how equipment is protected or schedule to protect*
Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required as normal room ventilation will be utilized per Reference 4. The schedule to construct structures is still to be determined. • Ginna procedures and programs are being developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	

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*
Storage location and structure have not been decided yet.The storage structure and its location have not been determined.	• Provide a secondary connection point for the portable diesel driven 'charging pump' to makeup to	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles,

Maintain RCS Inventory Control / Long Term Subcriticality (Modes 1-4 and Mode 5 with Loops Filled)		
PWR Portable Equipment Phase 2:		
Portable equipment will be towed to designated locations. Connections will be made to yet-to-be-determined connections points.	the RCS.	and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

Notes:

Identify analyses or actions:

- Perform an analysis to validate that a FBAST with a boron concentration of at least 2750 ppm and no more than 3050 ppm, and containing a minimum usable volume of 7000 gallons, is sufficient to maintain the reactor subcritical at BOL or EOL conditions with T_{ave} at or near no-load T_{ave}, and at EOL conditions with a cooldown to 350°F. (Analysis must be bounding for current and future cycles.)
- Develop and implement procedures to initiate RCS boration prior to commencing RCS cooldown to provide margin to prevent re-criticality.
- Design and implement the capability to inject blended borated water into the RCS using an inline blender, at the required flow rate with margin, once an analysis determines the RCS makeup requirement for Mode 5, loops not filled and pressurizer manway not removed.

Maintain RCS Inventory Control / Long Term Subcriticality
(Modes 1-4 and Mode 5 with Loops Filled)

PWR 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 (Low Leak RCP Seals and/or borated high pressure RCS makeup) and strategy(ies) utilized to achieve this coping time..

The Phase 3 strategy is basically the Phase 2 strategy supplemented by equipment available from the RRC.

Per Maintain Core Cooling & Heat Removal (Steam Generators Available), connections will be provided to supply the 480 Volt vital buses from an RRC supplied D/Gs and for the RRC to supply a water processing unit. Re-establishing power to the 480 Volt Vital Busses will allow use of the normal charging pumps taking suction from the Refueling Water Storage Tank, containing approximately 300,000 gallons, to makeup to the RCS and maintain RCS inventory control and long term subcriticality.

Open Item: Ensure the RRC will supply boric acid for use with the inline blender.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

Identify modifications	*List modifications*

Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/Gs.

Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Same as Phase 1 not including instrumentation to support portable equipment.

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*
RRC equipment will be transported to a staging area near or on site. Site equipment (possibly with assistance from local/state authorities) will transport equipment to designated locations in the protected area. Connections will be made to yet-to-be-determined connections points.	Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/Gs.	Connection points for RRC equipment will be located in a structure protected against flooding, tornado missiles, and seismic events. RRC connections will be installed to meet station and protection requirements.

Maintain RCS Inventory Control / Long Term Subcriticality (Modes 1-4 and Mode 5 with Loops Filled)		
PWR Portable Equipment Phase 3:		

Notes:

RRC Requirements:

- Ensure RRC can supply D/Gs capable of powering vital bus loads.
- Ensure RRC can supply Boric Acid.
- Ensure RRC can supply water processing unit.

Maintain Core Cooling & Heat Removal (S/Gs Not Available; Modes 5 & 6)

The boundary conditions for core cooling and containment strategies assume all reactors on the site are initially at power because this is more challenging in terms of core protection, and containment integrity. The FLEX strategies have been designed for this condition. However, the FLEX strategies are also "diverse and flexible" such that they can be implemented in many different conditions as it is not possible to predict the exact site conditions following a BDBEE. As such, the strategies can be implemented in all modes by maintaining the portable FLEX equipment available to be deployed during all modes.

Although NEI 12-06 states that the FLEX strategies are not explicitly designed for outage conditions due to the small fraction of the operating cycle that is spent in an outage condition, generally less than 10%, consideration is given in the requirements of this document that support outage conditions as follows:

- Provision of primary and alternate connection points provides higher reliability and helps address equipment being out of service.
- Specific makeup rates and connections will be sized to support outage conditions, i.e., connection points for RCS makeup will be sized to support core cooling.

Ginna addresses outage conditions in this strategy.

STRATEGIES

When operating in Modes 5 and 6, RCS cooling is accomplished using a forced cooling decay heat removal, Residual Heat Removal (RHR), system. The S/G's may not be available for natural circulation cooldown of the RCS. Once the RCS is opened forced feed and spill cooling is relied on. Once the reactor head is removed and the refueling cavity is flooded, a significant amount of time exists before boiling of the coolant would occur following a loss of the operating RHR pump. There is ample time to deploy a portable diesel driven pump for refueling cavity makeup.

Should an ELAP occur in the window between exiting Mode 5, Loops Filled, to cavity flooded, the immediate response will be to gravity feed the Refueling Water Storage Tank (RWST). This will provide some amount of flow to the core and delay or prevent core uncovery. In parallel with initiating gravity feed, actions will also be taken to initiate fill and spill cooling by injecting water into the RCS FLEX connections using FLEX pumps.

OBJECTIVES

Borated RCS makeup using diverse makeup connections to sustain residual heat removal to vented RCS must be provided. Diverse injection points or methods are required to establish capability to inject through separate divisions/ trains, i.e., should not have both connections in one division/ train. Connection to RCS for makeup should be capable of flow rates sufficient for simultaneous core heat removal and boron flushing (combined makeup flow exceeding 300 gpm, subject to generic or plant specific analysis). On-site pump (portable or installed) is available for RCS makeup. In order to address the requirement for diversity, if re-powering of installed charging pumps is used for this function, then either (a) multiple power connection points should be provided to the charging pump, or (b) provide a single power supply connection point for the charging pump and a single connection point for a portable makeup pump. A source of borated water is required to support RCS makeup. This can be an on-site tank, or can be provided by off-site resources. (Reference 4)

ACCEPTANCE CRITERIA

No core damage will occur. Coping times will be calculated such that they preclude core damage. The codes used will ensure no core damage occurs including maintaining saturated conditions in the core region, keeping peak clad temperature below core melt limits, preventing clad rupture, and maintaining two-phase water level above the top of the active fuel.

There will be no return to criticality once the loss of all AC power has occurred. To ensure that the reactor remains subcritical, a limit of Keff less than 0.99 (subcritical) is set. The level of 0.99 for subcriticality was chosen because it will provide some margin to account for the best estimate reactor physics parameters assumed in the analysis.

Maintain Core Cooling & Heat Removal (S/Gs Not Available)
(Modes 5 & 6)

PWR Installed Equipment Phase 1

Determine Baseline coping capability with installed coping[3] modifications not including FLEX modifications, utilizing methods described in Table 3-2, D-1, D-2, & D-3 of NEI 12-06:

- **Diverse makeup connections to RCS for long-term RCS makeup and residual heat removal to vented RCS**
- **Source of borated water required**

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

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

Only borated water should be added to the RCS to maintain adequate shutdown margin (SDM). CN-TA-98-148, *R.E. Ginna (RGE) Cycle 28 Reload Safety Evaluation – Mode 6 Boron Dilution*, (Reference 21) documents that the critical boron concentration is 1330 ppm with all the (Rod Cluster Control Assemblies (RCCAs) in the core during refueling.

Design Analysis DA-NS-2006-019, *Loss of RHR Cooling during Mid-Loop for EPU*, (Reference 33) documents that two charging pumps supplying 72.5 gpm can supply boil off for a shutdown time of 48 hours or greater and that one charging pump supplying 60 gpm can supply boil off for a shutdown time of 80 hours or greater. (Maximum Charging Pump capacity is 60 gpm.)

NUREG/IA-0181, *Assessment of RELAP5/MOD3.2 for Reflux Condensation Experiment*, (Reference 38) states "In case of the LORHR during mid-loop operation in nuclear power plants, the reflux condensation heat transfer in the riser part of the U-tube is an effective heat removal mechanism without the loss of coolant inventory... The heat transfer coefficients near the tube inlet increase as the inlet steam flow rate and the system pressure increase. In the presence of noncondensible gas, the heat transfer capability is dramatically decreased."

A partial strategy to maintain core cooling and heat removal under consideration is to fill available S/Gs to provide a limited heat sink function. This can provide additional time before boiling of the reactor coolant occurs and/or reduce the amount of RCS makeup required by reducing the amount of RCS boil off to Containment. Existing procedural guidance for Water Solid S/G Cooldown provides guidance that can be modified for use with a high flow portable diesel driven pump to maintain the limited heat sink function.

Potential borated water sources and paths are:

- Gravity drain from the RWST to the RCS via the RHR System.
- FBAST using the paths described in strategy Maintain RCS Inventory Control/ Long Term Subcriticality.

[3] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain Core Cooling & Heat Removal (S/Gs Not Available) (Modes 5 & 6)

PWR Installed Equipment Phase 1

MODE 5, LOOPS NOT FILLED AND PRESSURIZER MANWAY NOT REMOVED

Technical Specification Basis for the R.E. Ginna Nuclear Power Plant B3.4.8, RCS Loops – MODE 5, Loops Not Filled states that the S/Gs are not available as a heat sink when the loops are not filled.

See Phase 2 for mitigating strategies.

MODE 5, LOOPS NOT FILLED AND PRESSURIZER MANWAY REMOVED

The Pressurizer Manway vent path provides a vent area of 0.39 ft^2. This vent path alone will prevent RCS pressurization (i.e., less than 2 psig) if RHR cooling is lost later than 90 hours after shutdown (for 140°F initial water temperature) or 85 hours after shutdown (for 100°F initial water temperature. (Reference 34, NSL-0000-005, *Thermal Hydraulic Analysis of the Loss of RHR Cooling While the RCS is Partially Filled*).

DA-NS-2006-019 (Reference 33) documents that gravity feed from the RWST has the capability to provide a large volume of water quickly to restore level in the RCS during mid-loop (Mid-loop is defined as water level below the top of the hot leg (25 inches) operation and that gravity feed is effective if the RCS Pressure is less than 27 psig. Figure 3, Peak Cold Leg Pressure, shows that at 48 hours after shutdown, peak RCS cold leg pressure is less than 8 psig and gravity feed from the RWST is available.

The Phase 1 strategy to maintain core cooling and heat removal is to locally open MOV-856, RHR Pump Suction from RWST. Specific flow requirements will be determined after the analysis is performed. **(Open Item: Perform an analysis to determine minimum RCS makeup flow sufficient for simultaneous core heat removal and boron flushing.)**

MODE 5, LOW LOOP LEVEL

The strategy to maintain core cooling and heat removal with Low Loop Level is similar with the Pressurizer Manway removed except that an Operator in communications with the Control Room is stationed in the Auxiliary Building by MOV-856 during the drain down process or anytime the loop level is less than 64 inches, to refill the RCS.

MODE 6 WITH REFUELING WATER LEVEL < 23 FT WITH THE REACTOR VESSEL HEAD REMOVED

The intent of this strategy to inject available borated water sources into the refueling cavity to obtain refueling water level ≥ 23 ft or until boil off of the refueling water starts. At this time, unborated water can be used to maintain refueling water level.

Inject borated water into the RCS to establish refueling water level ≥ 23 ft. Depending on refueling cavity level, opening MOV-856 and gravity draining from the RWST may be effective. Otherwise utilize the new charging pump taking suction of the FBAST to inject available borated water into the RCS / refueling cavity (See Phase 2). **(Open Item: Perform an analysis to determine the transition point from gravity fill of the refueling cavity to when forced makeup is required.)**

Maintain Core Cooling & Heat Removal (S/Gs Not Available) (Modes 5 & 6)

PWR Installed Equipment Phase 1

MODE 6 WITH REFUELING WATER LEVEL ≥ 23 FT

Technical Specification Basis for the R.E. Ginna Nuclear Power Plant B3.9.4, Residual Heat Removal (RHR) and Coolant Circulation-Water Level ≥ 23 ft, (Reference 27) states that with no forced circulation cooling, decay heat removal from the core occurs by natural convection to the heat sink provided by the water above the core. A minimum refueling water level of 23 ft above the reactor vessel flange provides an adequate available heat sink. Due to the water volume available in the RCS with a water level ≥ 23 ft above the top of the reactor vessel flange, a significant amount of time exists before boiling of the coolant would occur following a loss of the required RHR pump. Design analysis DA-ME-98-115, *Time to Boil Following Loss of RHR During Shutdown (18 Month Cycle)*, (Reference 73) documents that at 100 hours after shutdown the time to boil is 5.15 hours, and the time to core uncovery is 73.52 hours.

See Phase 2 for mitigating strategies.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

- ECA-0.0, *Loss of All AC Power*, provides actions to respond to a loss of all AC power.
- E-0, *Reactor Trip or Safety Injection*, provides actions to verify proper response of the automatic protection systems following manual or automatic actuation of a reactor trip or safety injection and to assess plant conditions, and identify the appropriate recovery procedure.
- AP-ELEC.3, *Loss of 12A and/or 12B Transformer (Below 350°F)*, provides actions to respond to a loss of 12A or 12B SS Transformer when RCS temperature is less than 350°F.

ECA-0.0, E-0, and AP-ELEC.3 will remain the entry points for ELAP/LUHS events. FLEX Support Guidelines (FSGs) are being developed and will be entered from ECA-0.0 and, if appropriate, other procedures.

Identify modifications	*List modifications*

None at this time.

Key Reactor Parameters	*List instrumentation credited for this coping evaluation.*

Control Room and Field Instruments that can be relied upon for a Snow, Ice, High Temperature, or Flooding event, including control room and field instruments.

Parameter	ID	Description	CR	Field	Power
BATT Volts	EI/PG	DC BUS A VOLTMETER 125V	Y		Y
BATT Volts	EI/PA	DC BUS B VOLTMETER 125V	Y		Y
RCS Press	PI-420	RCS LO RANGE PRESS	Y		Y
RCS Press	PI-429	PRZR PRESS	Y		Y
RCS Press	PI-431	PRZR PRESS	Y		Y
PZR Level	LI-426	PRZR LVL	Y		Y
PZR Level	LI-428	PRZR LVL	Y		Y

Maintain Core Cooling & Heat Removal (S/Gs Not Available) (Modes 5 & 6)

PWR Installed Equipment Phase 1

PZR Level	LI-433A	PRZR LVL COLD CAL (SS)	Y		Y
RCS Temp	TI-410A-1	WIDE RANGE THOT	Y		Y
RCS Temp	TI-410B-1	WIDE RANGE TCOLD	Y		Y
RCS Temp	CETA	CORE EXIT THERMOCOUPLE *	Y		Y
RCS Temp	CETB	CORE EXIT THERMOCOUPLE *	Y		Y

* If not disconnected for refueling

Identify instruments to be relied upon for a Seismic event, including control room and field instruments.

Parameter	ID	Description	CR	Field	Power
BATT Volts	EI/PG	DC BUS A VOLTMETER 125V	Y		Y
BATT Volts	EI/PA	DC BUS B VOLTMETER 125V	Y		Y
RCS Press	PI-420	RCS LO RANGE PRESS	Y		Y
RCS Press	PI-429	PRZR PRESS	Y		Y
RCS Press	PI-431	PRZR PRESS	Y		Y
PZR Level	LI-426	PRZR LVL	Y		Y
PZR Level	LI-428	PRZR LVL	Y		Y
RCS Temp	TI-410A-1	WIDE RANGE THOT	Y		Y
RCS Temp	TI-410B-1	WIDE RANGE TCOLD	Y		Y

Identify instruments to be relied upon for a Tornado Missile event, including control room and field instruments.

Parameter	ID	Description	CR	Field	Power
BATT Volts	EI/PG	DC BUS A VOLTMETER 125V	Y		Y
BATT Volts	EI/PA	DC BUS B VOLTMETER 125V	Y		Y
RCS Press	PI-420	RCS LO RANGE PRESS	Y		N
RCS Press	PI-429	PRZR PRESS	Y		N
RCS Press	PI-430	PRZR PRESS	Y	Open Item	N
PZR Level	LI-426	PRZR LVL	Y		Y
PZR Level	LI-427	PRZR LVL	Y	Open Item	N
RCS Temp	TI-410A-1	WIDE RANGE THOT	Y		Y
RCS Temp	TI-410B-1	WIDE RANGE TCOLD	Y		Y

Open Item:

- **Identify instrumentation and develop procedures to take field readings of necessary parameters, including PI-430 and LI-427.**

Maintain Core Cooling & Heat Removal (S/Gs Not Available) (Modes 5 & 6)
PWR Installed Equipment Phase 1
Notes: **Identify analyses or actions:** • Perform an analysis to determine the transition point from gravity fill of the refueling cavity to when forced makeup is required. • Perform an analysis to determine minimum RCS makeup flow sufficient for simultaneous core heat removal and boron flushing. • Identify instrumentation and develop procedures to take field readings of necessary parameters, including PI-430 and LI-427.

Maintain Core Cooling & Heat Removal (S/Gs Not Available)
(Modes 5 & 6)

PWR 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 strategy(ies) utilized to achieve this coping time.

MODE 5, LOOPS NOT FILLED AND PRESSURIZER MANWAY **NOT** REMOVED

RCS Heat Removal will be by RCS Bleed and Feed. **Open Items under consideration are:**

- **Establish RCS feed path using low pressure pump capable of [To Be Determined] gpm at > 50 psig and a maximum discharge pressure of 410 psig to the RCS.**
- **Establish sufficient RCS bleed path (PORVs, Reactor Head Vents)**
- **Implement a design change to install permanent connection point for Instrument Air to Containment (Attachment 3, Figure 3)**
- **Establish feed to available S/Gs Partial strategy for consideration - Fill available S/Gs to provide limited heat sink function and additional time before boiling of the coolant occurs. Existing procedural guidance for Water Solid S/G Cooldown provides guidance that can be modified for use with a high flow portable diesel driven pump to maintain the limited heat sink function.**
- **If Water Solid S/G Cooldown is effective to maintain core cooling and heat removal, secure RCS Bleed and Feed and maintain Pressurizer Level.**

Open Item: Perform analysis to determine minimum RCS makeup flow sufficient for simultaneous core heat removal and boron flushing and to determine RCS vent path requirements for Mode 5 with Power Operated Relief Valve (PORV) vent path.

MODE 5, LOOPS NOT FILLED AND PRESSURIZER MANWAY REMOVED

The Phase 2 strategy to maintain core cooling and heat removal with the Pressurizer Manway removed is similar with the Manway not removed except a sufficient RCS bleed path is already established.

MODE 5, LOW LOOP LEVEL

The Phase 2 strategy to maintain core cooling and heat removal with Low Loop Level is similar with the Pressurizer Manway removed.

MODE 6 WITH REFUELING WATER LEVEL < 23 FT WITH THE REACTOR VESSEL HEAD REMOVED

The intent of this strategy to inject available borated water sources into the refueling cavity to obtain refueling water level ≥ 23 ft or until boil off of the refueling water starts. At this time, unborated water can be used to maintain refueling water level.

Inject borated water into the RCS to establish refueling water level ≥ 23 ft. Depending on refueling cavity level, opening MOV-856 and gravity draining from the RWST may be effective (See Phase 1). Otherwise utilize the new charging pump taking suction of the FBAST to inject available borated water into the RCS /

Maintain Core Cooling & Heat Removal (S/Gs Not Available) (Modes 5 & 6)
PWR Portable Equipment Phase 2

refueling cavity.

At this point, the primary strategy is the same as Mode 6 with Refueling Water Level ≥23 ft.

MODE 6 WITH REFUELING WATER LEVEL ≥ 23 FT

Primary strategy is to makeup to the refueling cavity from the Auxiliary Building. The weir gate from the SFP to the transfer canal will need to be installed and the Fuel Transfer Canal/Tube Isolation Valve (650J) to containment opened. Once refueling water level starts to decrease from boiling, makeup water will be supplied from hoses via gravity drain from the new CST or via a portable diesel driven pump taking suction on the new CST or the UHS. Borated water will be supplied from the FBAST, as necessary to maintain RCS boron concentration. (**Open Item: Develop and implement procedures to makeup to the refueling cavity from the new CST, UHS, or FBAST to maintain refueling cavity level and boron concentration.**) (**Open Item: Perform a boron mixing analysis for the effects on RCS boron concentration by providing unborated water to the refueling cavity via the transfer canal from the Auxiliary Building to Containment.**)

A partial core cooling and heat removal strategy under consideration is to fill available S/Gs to provide a limited heat sink function and additional time before boiling of the coolant occurs. Existing procedural guidance for Water Solid S/G Cooldown provides guidance that can be modified for use with a high flow portable diesel driven pump to maintain the limited heat sink function. (**Open Item: Evaluate the viability of feed and bleed for available S/Gs to provide a limited heat sink function and additional time before boiling of the coolant occurs as a parallel mitigating strategy during Modes 5 & 6. This analysis must address reflux condensation and its potential effects on reactor shutdown margin.**)

If necessary to add borated water to the refueling cavity, the new permanently installed high pressure charging pump taking suction from the FBAST and discharging to the Charging System will be the primary connection point for RCS boration. A portable diesel engine powered high pressure injection pump connectable from the FBAST to the Charging System will be the alternate method (See Maintain RCS Inventory Control/Long Term Subcriticality for open item.)

The permanently installed high pressure makeup pump will be located in the Standby Auxiliary Feedwater Pump (SAFWP) Building. This pump will take suction on the 10,000 gallon FBAST with boron concentration of at least 2750 ppm and no more than 3050 ppm, and containing a minimum usable volume of 7000 gallons. (See Maintain RCS Inventory Control/Long Term Subcriticality for open item.)

Makeup to the FBAST will be provided by gravity drain from the new SAFW CST or a high capacity diesel driven portable pump taking suction on the new SAFW CST or UHS, in line with portable boric acid blending equipment. (**Open Item: Implement a design change to establish provisions for refilling the FBAST with borated water.**) (Attachment 3, Figure 2)

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
• Implement a design change to establish provisions for refilling the FBAST with borated water. • Implement a design change to install permanent connection point for Instrument Air to Containment.	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same as instruments listed in above section, Core Cooling Phase 1	
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	

High Temperatures	*List how equipment is protected or schedule to protect*

Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required as normal room ventilation will be utilized per Reference 4. The schedule to construct structures is still to be determined.

- Ginna procedures and programs are being developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.

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*
The storage structure and its location have not been determined. Portable equipment will be towed to designated locations. Connections will be made to yet-to-be-determined connections points.	• Implement a design change to establish provisions for refilling the FBAST with borated water. • Implement a design change to install permanent connection point for Instrument Air to Containment	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles, and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

Notes:

Identify analyses or actions:

- Perform analysis to determine minimum RCS makeup flow sufficient for simultaneous core heat removal and boron flushing and to determine RCS vent path requirements for Mode 5 with Power Operated Relief Valve (PORV) vent path.
- Evaluate the viability of feed and bleed for available S/Gs to provide a limited heat sink function and additional time before boiling of the coolant occurs as a parallel mitigating strategy during Modes 5 & 6. This analysis must address reflux condensation and its potential effects on reactor shutdown margin.
- Perform a boron mixing analysis for the effects on RCS boron concentration by providing unborated water to the refueling cavity via the transfer canal from the Auxiliary Building to Containment.
- Develop and implement procedures to makeup to the refueling cavity from the new CST, UHS, or FBAST to maintain refueling cavity level and boron concentration.

Maintain Core Cooling & Heat Removal (S/Gs Not Available)
(Modes 5 & 6)

PWR 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 strategy(ies) utilized to achieve this coping time.

Open Item: Perform an evaluation to determine a method for recirculation cooling of the RCS if the Auxiliary Building Sub-basement is flooded by Tornado Missiles damaging non-protected tanks on the Auxiliary Building Operating Floor.

During Phase 3, partial core cooling could be provided by a portable diesel driven pump supplying water to available S/Gs for Feed and Bleed heat removal. With the initiation of access to off-site equipment, CENG will obtain D/Gs from the RRC capable of powering the 480 Volt Busses. (**Open Items: The RRC needs to be able to provide D/Gs capable of powering the 480 Volt Busses.**) Additional D/Gs would allow the Standby AFW Pumps to be powered to feed both S/Gs. If the onsite water processing unit cannot be repowered, a water processing unit capable of providing demineralized water for indefinite makeup will be provided by the RRC. (**Open Item: RRC needs to provide water processing unit**) Supply to the portable water processing trailer would come from the Town of Ontario or the UHS.

Open Item: Ensure the RRC will supply boric acid for use with the inline blender.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/Gs.	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same as Phase 1 not including instrumentation to support portable equipment.	

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*
RRC equipment will be transported to a staging area near or on site. Site equipment	Implement a design change to provide connections to 480 Volt vital busses to be able to connect	Connection points for RRC equipment will be located in a structure protected against

Maintain Core Cooling & Heat Removal (S/Gs Not Available) (Modes 5 & 6)		
PWR Portable Equipment Phase 3		
(possibly with assistance from local/state authorities) will transport equipment to designated locations in the protected area. Connections will be made to yet-to-be-determined connections points.	to RRC supplied D/Gs.	flooding, tornado missiles, and seismic events. RRC connections will be installed to meet station and protection requirements.

Notes:

RRC Requirements:

- Perform an evaluation to determine a method for recirculation cooling of the RCS if the Auxiliary Building Sub-basement is flooded by Tornado Missiles damaging non-protected tanks on the Auxiliary Building Operating Floor.
- Ensure RRC can supply boric acid.
- Ensure RRC can supply D/Gs capable of powering vital bus loads.
- Ensure RRC can supply a water processing unit.

Maintain Containment

STRATEGIES
With an ELAP, containment cooling is lost and over an extended period of time containment temperature and pressure can be expected to slowly increase. An analysis will be performed to determine the containment pressure profile during an ELAP / LUHS event, and to justify that the instrumentation and controls in containment which are relied upon by the Operators are sufficient to perform their intended functions. Acceptance criteria will be defined and justified. The results of this analysis will be used to develop an appropriate mitigating strategy, including any necessary modifications. (**Open Item: Perform an analysis to determine the containment pressure profile during an ELAP / LUHS event, after the low leakage RCP seal technology is chosen, and determine the mitigating strategies necessary to ensure the instrumentation and controls in containment which are relied upon by the Operators are sufficient to perform their intended function.**)

OBJECTIVES
In the long-term, containment pressure may rise due to leakage from RCS adding heat to containment. Containment spray can help manage containment pressure. Provide a connection to containment spray header or alternate capability or Analysis. Due to the long-term nature of this function, the connection does not need to be a permanent modification. However, if a temporary connection, e.g., via valve bonnet, then this should be pre-identified. (Reference 4)

ACCEPTANCE CRITERIA
Open Item: Perform an analysis of the containment function to determine the mitigating strategy acceptance criteria for an ELAP / LUHS event.

Maintain Containment
PWR Installed Equipment Phase 1:
Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications, utilizing methods described in Table 3-2, D-1, D-2, & D-3 of NEI 12-06: • **Containment Spray**
PWR 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 strategy(ies) utilized to achieve this coping time. <u>EVALUATION OF CONTAINMENT ISOLATION FOLLOWING ELAP</u> Containment isolation boundaries are provided with actuation and control equipment appropriate to the valve type. For example, air-operated and diaphragm (Saunders patent) valves are generally equipped with air diaphragm Operators, with fail-safe operation ensured by redundant control devices in the instrument air supply to the valve. Solenoid valves are also designed for fail safe operation. Motor-operated valves are capable of being supplied from reliable onsite emergency power as well as their normal power source. Closed systems, manual valves, and check valves, of course, do not require actuation or control systems. These non-automatic isolation boundaries are used in lines that must remain in service, at least for a time, following an accident. These are closed manually if and when the lines are taken out of service. (Reference 25, Section 6.2.4.3.1) <u>EVALUATION OF CONTAINMENT TEMPERATURE AND PRESSURE RESPONSE</u> The Background Information for Ginna Station Emergency Operating Procedure ECA-0.0, *Loss of All AC Power*, (Reference 54) discusses the containment response during station blackout. Table 2 of this background document identifies a best estimate containment vapor temperature rise of 11°F and a pressure rise of 0.8 psi assuming 50 gpm seal leakage from each RCP for a period of 5 hours. The analysis assumes heat is removed only by passive containment heat sinks. Ultimately, should the leak situation not be terminated, the heat sinks will saturate and containment conditions will increase. This leakage impact maintains containment parameters well below design basis pressure and temperature of 60 psig and 286°F, (UFSAR Section 6.2.1.2.2.6, Reference 25). Installing low leakage seals on the RCPs will reduce the rate of temperature and pressure rise. (**Open Item: Implement a design change to install low leakage RCP seals. The new seals need to be able to withstand T_{hot} for an extended period of time.**) Further evaluation will be needed to calculate containment conditions beyond 5 hours after the event (See Phase 2). Containment integrity will be confirmed by Operations during this period. Containment pressure and containment temperature are not expected to be challenged in Phase 1. Thus, there are no related Phase 1 actions required.

[4] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
None required for Phase 1.	
Identify modifications	*List modifications*

- Implement a design change to install low leakage RCP seals. The new seals need to be able to withstand T_{hot} for an extended period of time.
- Implement a design change to qualify containment pressure instrumentation for a Tornado Missile event.

Key Containment Parameters	*List instrumentation credited for this coping evaluation.*

Identify instruments to be relied upon for a Snow, Ice, High Temperature, Flooding, or Seismic event, including control room and field instruments.

Parameter	ID	Description	CR	Field	SBO
CNMT Press	PI-945	CNMT PRESS (0-60 psig)	Y		Y
CNMT Press	PI-947	CNMT PRESS (0-60 psig)	Y		Y

Identify instruments to be relied upon for a Tornado Missile event, including control room and field instruments.

Parameter	ID	Description	CR	Field	SBO
CNMT Press		NONE QUALIFIED (Transmitters and/or Cables Not Protected)			

Open Item: Implement a design change to qualify containment pressure instrumentation for a Tornado Missile event.

Notes:

Identify analyses or actions:

- Implement a design change to qualify containment pressure instrumentation for a Tornado Missile event.

Maintain Containment	
PWR Portable Equipment Phase 2:	
Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (containment spray/hydrogen igniters) and strategy(ies) utilized to achieve this coping time. **Open Item: Perform an analysis to determine the containment pressure profile during an ELAP / LUHS event, after the low leakage RCP seal technology is chosen, and determine the mitigating strategies necessary to ensure the instrumentation and controls in containment, which are relied upon by the Operators, are sufficient to perform their intended function.** **Open Item: Perform an analysis of the containment function to determine the mitigating strategy acceptance criteria for an ELAP / LUHS event.**	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
None pending results of an analysis.	
Identify modifications	*List modifications*
None pending results of an analysis.	
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*
See instrumentation listed in Phase 1 section	
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Flooding	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	

Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
High Temperatures	*List how equipment is protected or schedule to protect*
Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required as normal room ventilation will be utilized per Reference 4. The schedule to construct structures is still to be determined. • Ginna procedures and programs are being developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	

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*
The storage structure and its location have not been determined. Portable equipment will be towed to designated locations. Connections will be made to yet-to-be-determined connections points.	None pending results of an analysis.	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles, and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

Notes:

Identify analyses or actions:

- Perform an analysis to determine the containment pressure profile during an ELAP / LUHS event, after the low leakage RCP seal technology is chosen, and determine the mitigating strategies necessary to ensure the instrumentation and controls in Containment, which are relied upon by the Operators, are sufficient to perform their intended function.
- Perform an analysis of the Containment function to determine the mitigating strategy acceptance criteria for an ELAP / LUHS event.

Maintain Containment
PWR 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 (containment spray/hydrogen igniters) and strategy(ies) utilized to achieve this coping time. **Open Item: Develop the Phase 3 strategy after the containment pressure analysis is completed as described in Maintain Containment, PWR Portable Equipment Phase 2.** A D/G from the proposed RRC can power a containment spray pump to provide containment spray to lower containment pressure/temperature; or Containment Recirculation Fans / Coolers and cooling system. Install connection points for the 480 Volt busses to connect a RRC supplied D/G to support containment cooling equipment. (**Open Item: Implement a design change to provide connections to 480 Volt vital busses to enable connection to RRC supplied D/Gs.**) Alternatively, additional onsite portable pumps or pumps from the RRC could provide water from various sources to provide containment spray to reduce containment pressure/ temperature. (**Open Item: Ensure the RRC will provide additional portable pumps and equipment to spray water into containment or supply water to the Containment Recirculation Fans / Coolers.**)

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
None pending results of an analysis.	
Identify modifications	*List modifications*
• Implement a design change to provide connections to 480 Volt vital busses to enable connection to RRC supplied D/Gs.	
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same instrumentation as Phase 1.	

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*
RRC equipment will be transported to a staging area near or on site. Site equipment (possibly with assistance from	• Implement a design change to provide connections to 480 Volt vital busses to enable connection to RRC supplied	Connection points for RRC equipment will be located in a structure protected against flooding, tornado missiles, and

Maintain Containment		
PWR Portable Equipment Phase 3:		
local/state authorities) will transport equipment to designated locations in the protected area. Connections will be made to yet-to-be-determined connections points.	D/Gs.	seismic events. RRC connections will be installed to meet station and protection requirements.

Notes:

RRC Requirements:

- Ensure RRC can supply D/Gs capable of powering vital bus loads.
- Ensure RRC can supply pumps for Containment Spray or for Containment Recirculation Fans / Coolers.

Identify analyses or actions:

- Develop the Phase 3 strategy after the containment pressure analysis is completed as described in Maintain Containment, PWR Portable Equipment Phase 2.

Maintain Spent Fuel Pool Cooling

STRATEGIES

A graphic representation of the Phase 1 to Phase 3 strategies for maintaining SFP Cooling is shown below.

During an ELAP / LUHS event, SFP cooling capability is lost which, in the long term, can result in SFP boiling and loss of adequate SFP water level for protection of the spent fuel, as well as for maintenance of sufficient radiation shielding if no operator action is taken. Following a loss of SFP cooling, the SFP will heat up to a bulk temperature of 212°F, at which time heat removal from the SFP will be due to boiling of the water with the steam removing the heat from the SFP. In these circumstances, a minimum water level of 5'-9" feet above the top of the fuel has been determined to provide adequate short term shielding.

The basic FLEX strategy for maintaining SFP cooling is to monitor SFP water level and provide makeup water to the SFP sufficient to maintain the normal SFP water level. With the maximum expected SFP heat load immediately following full core offload, with SFP water level required to be approximately 277', the SFP will reach a bulk boiling temperature of 212°F in approximately 5 hours, and boil off to a level 5'-9" (Level 2 value of 257'-0") above the top of fuel in approximately another 40 hours (for a total of 45 hours) unless additional water is supplied to the SFP. A flow of 53 gpm will replenish the water being boiled. For a partial core offload during a typical refueling outage, and with the minimum allowed SFP water level at 261', the SFP will reach a bulk boiling temperature of 212°F in approximately 5 hours, and boil off to a level 5'-9" above the top of fuel in another approximately 16 hours (for a total of 21 hours) unless additional water is supplied to the SFP. A flow of 27 gpm will replenish the water being boiled.

The FLEX strategy during Phase 1 of an ELAP / LUHS event for SFP cooling is to utilize the SFP level instrumentation installed in response to Order EA-12-051 (Reference 2) to continuously monitor the SFP water level and, within the first 12 hours, stage a portable diesel driven pump for the addition of makeup water to the SFP as it is needed to restore and maintain the normal level in Phase 2. Under Phase 3 (using off-site RRC supplied equipment), portable equipment and consumables will be used to reinforce and secure for an indefinite coping time the measures implemented during Phase 2.

Maintain Spent Fuel Pool Cooling

Phase 1 (21 hrs to 45 hrs)

Phase 2

Phase 3

0 6 12 18 24 30 36 42 48 54 60 66 72 + Hrs

OBJECTIVES

Makeup to the SFP from portable injection sources must be provided. The various baseline capabilities must include: (Reference 4)

- Provide makeup to the SFP via hoses on the refueling floor that exceeds SFP boil-off to support long-term cooling of spent fuel with sufficient makeup.
- Provide makeup via connection to SFP cooling piping or other alternate location that exceeds SFP boil-off and provide a means to supply SFP makeup without accessing the refueling floor.
- Ensure a Vent pathway for steam & condensate from SFP. Steam from boiling pool can condense and cause access and equipment problems in other parts of plant.
- Provide spray capability via portable monitor nozzles from the refueling deck using a portable pump for cooling of spent fuel if leakage from the SFP exceeds makeup capability. A minimum of 200 gpm to the SFP, or 250 gpm if overspray occurs, consistent with 10 CFR 50.54(hh)(2) must be provided.

ACCEPTANCE CRITERIA

No fuel damage will occur. Coping times will be calculated such that they preclude fuel damage, including maintaining two-phase water level above the top of the active fuel.

There will be no return to criticality once the loss of all AC power has occurred. To ensure that the reactor remains subcritical, a limit of Keff less than 0.99 (subcritical) is set. The level of 0.99 for subcriticality was chosen because it will provide some margin to account for the best estimate reactor physics parameters assumed in the analysis.

Maintain Spent Fuel Pool Cooling	
PWR Installed Equipment Phase 1:	
Determine Baseline coping capability with installed coping[5] modifications not including FLEX modifications, utilizing methods described in Table 3-2, D-1, D-2, & D-3 of NEI 12-06: • **Makeup with Portable Injection Source**	
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 strategy(ies) utilized to achieve this coping time. The Phase 1 strategy will be to monitor SFP level to ensure coverage. The modification to install a new level indication with integral backup power supply will allow for remote monitoring. Water addition is not required before the end of Phase 1. There are no Phase 1 actions required that need to be addressed	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
None required for Phase 1.	
Identify modifications	*List modifications*
Install wide range SFP level instrumentation in accordance with NRC Order EA-12-051	
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.*
SFP Level.	
Notes:	

[5] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain Spent Fuel Pool Cooling

PWR Portable Equipment Phase 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 strategy(ies) utilized to achieve this coping time.

SFP level is normally maintained between 276'-1.5" and 277' (Reference 36). For off normal conditions where SFP level is temporarily lowered (such as maintenance, transfer slot filling evolutions or emergency conditions), operation using the lower suction has been evaluated. This configuration has been shown to be acceptable as long as the SFP is maintained at an elevation greater than 261 ft and the pool temperature is less than 150°F (UFSAR Section 9.1.3.2.3, Reference 25).

Technical Requirements Manual (TRM) Section TR 3.7.7 (Reference 28) requires that the SFP temperature be maintained ≥ 50°F and ≤ 150°F, and that two SFP cooling loops shall be FUNCTIONAL, each commensurate with the SFP heat load. TRM Section TR 3.9.4 requires that during the removal of all irradiated fuel assemblies from the reactor to the SFP, SFP water temperature shall be ≥ 50°F and ≤ 150°F and two SFP cooling systems shall be OPERABLE, each commensurate with the SFP heat load and with the use of an associated table, the combination of Screenhouse bay temperature and time after shutdown shall be met.

The Precautions and Limitations in procedure S-9, *SFP Cooling System Operation*, (Reference 37) states that only the A train of SFP cooling has been analyzed for using only the lower SFP cooling suction and that if the use of only the lower suction is required, then the B and Standby Trains of SFP Cooling must be secured. This operational restriction precludes draining the SFP to elevation 261 ft during full core offloads as there would be only one SFP cooling system considered operable.

Full Core Offload

With a full core offload and initial SFP temperature of 150°F, the time to 212°F in the SFP is 4.9 hours with an associated boil-off rate of 53 gpm. The SFP contains approximately 255,000 gallons of water, with a depth of approximately 40 feet and the top of the fuel assemblies stored in the spent fuel storage racks approximately 26 feet below the surface of the water (UFSAR Section 9.1.3.4.3). With a boil-off rate of 53 gpm and approximately 6,352 gallons per foot of SFP water level (Reference 74), it will take approximately 2 hours to boil off 1 foot of SFP water level.

During a full core offload with initial SFP temperature at 150°F and SFP water level in the normal range, it will take approximately 45 hours before makeup is required using the SFP Level 2 value (257'-0") determined for the response to NRC Order EA-12-051, *Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation* (Reference 2).

Maintain Spent Fuel Pool Cooling

PWR Portable Equipment Phase 2:

Partial Core Offload

Analysis 109682-M-021, *Spent Fuel Cooling System EPU Evaluation*, Table 7, Total Heat Load as a function of Time Reference 44), documents that the heat load for a partial core offload at 100 hours after shutdown is 12.91 MBtu/hr, which is 50.3% of the full core offload heat load. For a partial core offload with initial SFP temperature at 150°F and SFP level at elevation 261 ft, it will take approximately 21 hours to reach the SFP Level 2 value (257'-0"). (5 hours to 212°F plus 16 hours to boil-off 4 feet of SFP level)

MAKEUP TO THE SFP

Maintaining the SFP full at all times during the ELAP event is not required; the requirement is to maintain adequate level to protect the stored spent fuel and limit exposure to personnel onsite and offsite. Makeup to the SFP will be provided by one of four baseline capabilities.

Primary Strategy

Open Item: Implement a design change to install a protected makeup connection to the SFP cooling piping to provide makeup to the SFP that exceeds SFP boil-off and provide a means to supply SFP makeup without accessing the SFP walkway. Open Item: Provide the necessary connecting hoses and/or equipment to work with existing pumps and water sources for filling the SFP. (Attachment 3, Figure 5)

Alternate Strategy 1

Procedure ER-SFP.2, *Diverse SFP Makeup and Spray*, (Reference 30) provides multiple strategies for establishing a diverse means of SFP makeup for at least 12 hours without offsite supplies. (**Open Item: Revise ER-SFP.2 to provide multiple strategies for establishing a diverse means of SFP makeup for at least 30 hours without offsite supplies.**) Equipment and strategies are provided for concurrent makeup capability of 500 GPM via internal SFP makeup using two hose reel stations in the vicinity of the SFP and via use of a Diesel Driven Portable Pump taking suction from either the City Water Yard Fire Loop or Lake Ontario from the Drafting Station west of the Screen House. ER-SFP.2 Section *SFP Makeup from Internal Fire Header Water Source* provides for establishing flow from Auxiliary Building Hose Reel #22 Isolation Valve through a 3 inch hose which is tied down in the Auxiliary building to feed the SFP. Section *SFP Makeup from Yard Loop Using Diesel Driven Portable Pump* directs taking suction from Hydrant 12 via a 5 inch hose and discharging via a 5 inch hose to two 3 inch hoses connected to a Gated Wye within 50 ft of the SFP. The two 3 inch hoses are tied down in the Auxiliary building at the edge of SFP. If the Yard Loop is not available, Section *Alternate Makeup from Drafting Station (Yard Loop Unavailable)* directs aligning the Diesel Driven Portable Pump to take suction on the Lake Ontario Drafting Station using a 6 inch non-collapsible suction hose. The discharge arrangement is the same.

Maintain Spent Fuel Pool Cooling

PWR Portable Equipment Phase 2:

Alternate Strategy 2

SFP spray capability of at least 200 GPM is addressed using the Diesel Driven Portable Pump taking suction from either the Fire Yard Loop or the Lake Ontario Drafting Station west of the Screen House. ER-SFP.2 Sections *SFP Spray from Yard Loop Using Diesel Driven Portable Pump* and *Alternate Spray from the Drafting Station (Yard Loop Unavailable)* provide for the same Diesel Driven Portable Pump suction strategies as above. Discharge from the Diesel Driven Portable Pump for both suction options is through a 5 inch hose to two 3 inch hoses with Blitz Fire nozzles located within 75 feet of the SFP (near the RWST).

Alternate Strategy 3

Procedure EPIP-1-18, *Discretionary Actions for Emergency Conditions*, Attachment 6, Emergency Spent Fuel Pool Cooling (Reference 31), provides the following additional SFP Cooling strategies: 1) Fill the SFP via the Skimmer system suction utilizing a fire hose reel; 2) Fill the SFP via the Service Water System using a "Deck Gun;" 3) Fill the SFP via the In House Fire Water System using a "Deck Gun;" 4) Fill the SFP via the City Water Yard Fire Loop using a "Deck Gun;" 5) Fill the SFP utilizing the Standby Heat Exchanger Flexible Piping from Service Water; or 6) Fill the SFP utilizing the Standby Heat Exchanger Flexible Piping from Fire Water.

Open Item: Perform an analysis to determine if a vent pathway from the SFP is needed for steam and condensate to minimize the potential for steam to cause access and equipment problems in the Auxiliary Building.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

- ER-SFP.2, *Diverse SFP Makeup and Spray*, provides internal and external strategies for establishing a diverse means of makeup to the SFP.
- Ginna will utilize the industry developed Functional Support Guidelines from the PWROG to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

Identify modifications	*List modifications*

- Implement a design change to install a protected makeup connection to the SFP cooling piping to provide makeup to the SFP that exceeds SFP boil-off and provide a means to supply SFP makeup without accessing the SFP walkway.
- Implement a design change to install SFP level instrumentation per Order EA-12-051.

Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.*

Wide Range SFP level instrumentation to be installed to satisfy the NRC Order EA-12-051 is not yet identified. **Open Item: SFP Water Level instrument numbers will be provided upon detailed design completion.**

Maintain Spent Fuel Pool Cooling	
PWR Portable Equipment Phase 2:	
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
High Temperatures	*List how equipment is protected or schedule to protect*
Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required as normal room ventilation will be utilized per Reference 4. The schedule to construct structures is still to be determined. • Ginna procedures and programs are being developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	

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*
• The pumps used to provide the SFP cooling and makeup functions are the same style FLEX pumps described in the Core Cooling section. See Phase 2 Core Cooling for discussion of deployment strategy for FLEX pumps. • The spray nozzle and fire hoses needed to provide spray or makeup to the SFP will be kept at an accessible and protected location.	• Implement a design change to install a protected makeup connection to the SFP cooling piping to provide makeup to the SFP that exceeds SFP boil-off and provide a means to supply SFP makeup without accessing the refueling floor.	• Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically 'rugged' structure. • Diverse connection points will be provided with at least one protected from tornado missiles. • New FLEX piping shall be installed to meet necessary seismic requirements. • Connection points for the FLEX pump discharge will be designed to withstand the applicable hazards.

Notes:

Identify analyses or actions:

- Provide the necessary connecting hoses and/or equipment to work with existing pumps and water sources for filling the SFP.
- Revise ER-SFP.2 to provide multiple strategies for establishing a diverse means of SFP makeup for at least 30 hours without offsite supplies.
- Perform an analysis to determine if a vent pathway from the SFP is needed for steam and condensate to minimize the potential for steam to cause access and equipment problems in the Auxiliary Building.
- SFP Water Level instrument numbers will be provided upon detailed design completion.

Maintain Spent Fuel Pool Cooling	
PWR 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 strategy(ies) utilized to achieve this coping time. The same strategies employed in Phase 2 can be employed in Phase 3. Additionally, a D/G supplied from the RRC can power a SFP Cooling Pump. **Open Item: Ensure the RRC will provide additional portable pumps and equipment to:** • **provide water from the UHS to the Standby SFP Heat Exchanger to remove heat from the SFP cooling system with the Standby SFP Recirculation Pump; or** • **provide water to SFP Heat Exchanger A to remove heat from the SFP Cooling System with the Standby SFP Recirculation Pump or SFP Pump A, or** • **provide a heat exchanger and equipment to provide cooling for the SFP.** Install connection points for the 480 Volt busses to connect a RRC supplied D/G to support SFP cooling equipment. (**Open Item: Implement a design change to provide connections to 480 Volt vital busses to enable connection to RRC supplied D/Gs.**)	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.*
Ginna will utilize the industry developed Functional Support Guidelines from the PWROG, to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*

• Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/Gs.
• Ensure the RRC will provide additional portable pumps and equipment to:
  o provide water from the UHS to the Standby SFP Heat Exchanger to remove heat from the SFP cooling system with the Standby SFP Recirculation Pump; or
  o provide water to SFP Heat Exchanger A to remove heat from the SFP Cooling System with the Standby SFP Recirculation Pump or SFP Pump A, or
  o provide a heat exchanger and equipment to provide cooling for the SFP.	

Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.*
SFP Level	

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*
RRC equipment will be transported to a staging area near or on site property. Site personnel (possibly with the assistance from local/state authorities) will transport equipment into to be determined designated protected area locations. Standardized connections for RRC equipment will be developed and implemented.	• Implement a design change to provide connections to 480 Volt vital busses to enable connection to RRC supplied D/Gs. • Ensure the RRC will provide additional portable pumps and equipment to: o provide water from the UHS to the Standby SFP Heat Exchanger to remove heat from the SFP cooling system with the Standby SFP Recirculation Pump; or o provide water to SFP Heat Exchanger A to remove heat from the SFP Cooling System with the Standby SFP Recirculation Pump or SFP Pump A, or o provide a heat exchanger and equipment to provide cooling for the SFP.	• Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically 'rugged' structure. • New FLEX piping shall be installed to meet necessary seismic requirements. • Connection points for the FLEX/RRC pump discharge will be designed to withstand the applicable hazards. • Electrical connection points for the RRC DGs will be designed to withstand the applicable hazards.

Notes:

RRC Requirements:

- Ensure RRC can supply D/Gs and equipment capable of powering 480 Volt Vital Bus loads.
- Ensure the RRC can supply cooling system equipment to remove heat from the Standby SFP Heat Exchanger and/or SFP Heat Exchanger A.
- Ensure the RRC will provide a heat exchanger to provide cooling for the SFP.

Safety Functions Support

OBJECTIVES

The strategies for this section involve support equipment that facilitates, but does not directly implement, the safety function strategies. This includes:

- Vital Batteries
- Lighting,
- HVAC,
- Battery Room Hydrogen Control,
- Debris removal, equipment transport, and fuel transport equipment,
- UHS access
- Diesel Fuel, and
- Consumables

Safety Functions Support
PWR Installed Equipment Phase 1
Determine Baseline coping capability with installed coping[6] modifications not including FLEX modifications.
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 strategy(ies) utilized to achieve coping times. VITAL BATTERIES Design analysis DA-EE-97-069, *Sizing of Vital Batteries A and B*, (Reference 53) shows that the Ginna station batteries are adequate to sustain power to the current load profiles for the duration of a four hour station blackout, using a temperature of 55°F. In addition, ECA-0.0, *Loss of All AC Power*, (Reference 22) provides load shedding guidance to the Operators for preserving battery capacity and maintaining required voltage levels. DA-EE-2001-028, *Vital Battery 8 Hour Capacity*, (Reference 55) was subsequently performed and documents an 8 hour capacity given the load shedding directed by procedure ECA-0.0 ATT-8.0, *Attachment DC Loads* (Reference 46). SBO-PROGPLAN Paragraph 7.2.2 (Reference 32) EMERGENCY LIGHTING Per the provisions of 10CFR50, Appendix R Section III.J, emergency lighting power units with at least an eight-hour battery power supply are located in plant areas requiring access following a fire. These include access/egress routes and stations requiring operator actions. Ginna Station Fire Protection Program Table 13-1 (Reference 39) identifies the locations of Appendix R emergency lights. These areas encompass the areas required to be accessed by Operators to respond to the BDBEEs during Phase 1. Various additional portable hand-held lanterns are also available to the Operators to supplement the battery-powered wall units.

[6] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Safety Functions Support

PWR Installed Equipment Phase 1

HVAC

Control Room, Relay Room, and Battery Rooms Habitability

Plant specific analyses were performed in August 1990 (Reference 59) and December 15, 1993 (Reference 60) to determine the maximum expected station blackout temperatures for the Battery Rooms, Relay Room, and the Control Room with the following results:

Area	Temperature	Required Operator Action
Control Room	115.9°F	a. Open doors to turbine deck
		b. Open cabinet doors
		Note: Flow through ceiling tiles have replaced selected solid tiles to eliminate the need for Operators to remove tiles during a blackout.
Battery Room 1A	108.2°F	None
Battery Room 1B	106.2°F	None
Relay Room	103°F	None

Intermediate Building (IB) Habitability

A GOTHIC calculation has been performed for both the TDAFWP and the ARV areas of the IB for the Ginna SBO Program (Reference 32). The results of these calculations indicate that with doors S37F, S44F, and SD/55 opened within 30 minutes, the ambient temperature of TDAFWP area is between 110°F and 115°F (Reference 58). With this result, equipment operability does not appear to be of concern. Calculations utilizing the NUMARC 87-00 methodology performed for the ARV area have yielded a resultant ambient temperature of between 117°F and 122°F (Reference 58) with doors S37F, S44F, and SD/55 opened within 30 minutes. Operator safety concerns with habitability in the ARV area of the Intermediate building caused a caution statement at the beginning of ECA-0.0 (Reference 22) to be written. The caution states that, "Due To Potentially Extreme Environmental Conditions, Caution Should Be Used When Entering The Intermediate Bldg For Local Actions." Protective clothing (ice vests) may be required by the Operators at the Operators discretion when occupying these areas to perform manual actions, such as TDAFW flow Control Valve throttling, ECA-0.0. The ice vests are not considered to be required station blackout coping equipment and are not proceduralized, but are regularly inspected being treated as ordinary safety equipment. (Reference 32, Section 7.2.4). The calculations for the TDAFWP and ARV areas of the IB show stable temperatures at the 4 hour SBO coping time.

Service Building Habitability

This is a relatively large open area with no significant heat source located in the proximity of the coping equipment (CSTs and associated level transmitters). Therefore, no significant ambient temperature rise is anticipated.

Safety Functions Support	
PWR Installed Equipment Phase 1	
Auxiliary Building (RWST area) Habitability Minimal heat loads would be present in this area during a station blackout. This area was analyzed assuming a LOCA and a simultaneous loss of ventilation. The results demonstrate that the ambient temperature rise in this area is nominal and will not preclude operator habitability or equipment operability. However, with an ELAP event, the loss of SFP cooling will result in SFP boiling and the release of steam into the Auxiliary Building. This impact is being addressed under the SFP Cooling safety function.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
Ginna will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
None	
Key Parameters	*List instrumentation credited for this coping evaluation phase.*
Temperature indication for the Control Room provided by a handheld thermometer.	
Notes:	

Safety Functions Support

PWR 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 strategy(ies) utilized to achieve coping times.

VITAL BATTERIES
Primary Strategy
Provisions will be made to run portable cables from the planned 1 MW Standby Auxiliary Feedwater D/G to be connected to one or more of the protected battery chargers for the 125 VDC batteries to ensure vital instrumentation remains powered. **(Open Item: Implement a design change to install connection points needed to supply the battery chargers from the 1 MW D/G.)** (Attachment 3, Figure 4) There are two battery chargers available to each of the station batteries, both with a capacity of 200 amps at 132 Volts DC and requiring up to 58 amps at 480 Volts AC. (Nameplate data per Reference 65)

Alternate Strategy
A FLEX 100 kW D/G (which has been purchased and is onsite) capable of delivering 150 amps at 480 Volts 3 phase will be connected to one or more of the protected battery chargers for the 125 VDC batteries to ensure vital instrumentation remains powered. **(Open Item: Implement a design change to install connection points needed to supply the battery chargers from a 100 kW D/G.)** (Attachment 3, Figure 4)

HVAC
Control Room, Relay Room, and Battery Rooms Habitability
The analyses for the Battery Rooms, Relay Room, and CR (References 59 & 60) show temperatures continuing to ramp higher at the 4 hour point, where the analyses end.

Intermediate Building (IB) Habitability
The potentially extreme environmental conditions caution in ECA-0.0 (Reference 22) for local actions in the Intermediate Building regarding the high temperatures analyzed for the S/G ARV area for a Station Blackout (Reference 32) will need to be evaluated for the longer term ELAP/LUHS event.

Open Item: Perform GOTHIC calculations consistent with NUMARC 87-00, *Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors*, (Reference 47) to determine the effects of a loss of HVAC during an ELAP for the following areas:

- **Intermediate Building, TDAFW Pump and ARV/SV areas**
- **Auxiliary Building, RWST area**
- **Battery Rooms, Relay Room, and Control Room**
- **Standby Auxiliary Feedwater Building**

Open Item: Perform an analysis to evaluate the Battery Room low temperature for an ELAP event, assuming -16°F air temperature to determine if, and when, Battery Room heating is required.

Safety Functions Support

PWR Portable Equipment Phase 2

UHS ACCESS

Open Item: Implement a design change to install a protected primary and secondary means of accessing the UHS for all BDBEEs, and install necessary modifications to meet required deployment times. This must also address how debris in the UHS or other raw water sources will be filtered / strained and how the resulting debris will effect core cooling.

DEBRIS REMOVAL EQUIPMENT

Open Item: Develop a strategy and purchase equipment to respond to events that may require debris removal such as following a flood, tornado, or snow storm.

TRANSPORTATION EQUIPMENT

Open Item: Develop a strategy to move FLEX equipment, including providing reasonable protection from a BDBEE.

DIESEL FUEL

Storage

Diesel fuel is available onsite from the protected D/G A and D/G B Fuel Oil Storage Tanks (FOSTs). Normally, a minimum of 10,000 gallons will be available after an ELAP/LUHS event, unless one of the diesel FOSTs is removed from service for required maintenance. For that short duration, a minimum of 5,000 gallons will be available. (**Open Item: Implement a design change to provide for transferring diesel fuel from the D/G A and D/G B FOSTs to a fuel transfer vehicle.**)

Offsite D/G FOST A and Offsite D/G Fuel Oil Storage Tank B have 18,000 gallons working capacity in each tank. The minimum storage volume maintained between the two tanks is 19,936 gallons. This volume of offsite diesel fuel oil along with the volume of diesel fuel oil in the D/G A & B FOSTs supports 7 days of operation of 1 Emergency D/G at rated load of 2000 kW. (Reference 66) (**Open Item: Perform an analysis to provide a basis that the Offsite D/G Fuel Oil Storage Tanks are reasonably protected from BDBEEs.**)

Transport and Transfer

Open Item: Develop the strategy to transfer fuel from protected fuel storage locations to FLEX equipment.

EMERGENCY LIGHTING

Open Item: Develop strategies to provide for emergency lighting to support Operator actions after a BDBEE.

CONSUMABLES

Per EPIP-1-17, *Planning for Adverse Weather*, (Reference 61) the following supplies are stored in the Warehouse:

- 90 sleeping bags
- 96 disposable pillows

Safety Functions Support

PWR Portable Equipment Phase 2

- 200 disposable pillow cases
- 90 toiletry kits
- 100 each – knives, forks, spoons
- 1000 paper plates

The TSC Storage Room next to Kitchen:

- 90 3-day MREs
- 30 2.5-gallon jugs of water

Open Item: Develop a strategy to protect onsite consumables for use after a BDBEE.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

Ginna will utilize the industry developed guidance from the PWROG, EPRI, and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

Identify modifications	*List modifications*

- Implement a design change to install connection points needed to supply the battery chargers from the 1 MW D/G.
- Implement a design change to install connection points needed to supply the battery chargers from a 100 kW D/G.
- Implement a design change to provide a protected storage location for transportation (equipment and fuel) and debris removal equipment.
- Implement a design change to install a protected primary and secondary means of accessing the UHS for all BDBEEs, and install necessary modifications to meet required deployment times. This must also address how debris in the UHS or other raw water sources will be filtered / strained and how the resulting debris will effect core cooling.
- Implement a design change to provide for transferring diesel fuel from the D/G A and D/G B FOSTs to a fuel transfer vehicle.

Key Parameters	*List instrumentation credited for this coping evaluation phase.*

Phase 2 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

Storage / Protection of Equipment : Describe storage / protection plan or schedule to determine storage requirements	
Seismic	*List Protection or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
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*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Severe Storms with High Winds	*List Protection or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
Snow, Ice, and Extreme Cold	*List Protection or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • Ginna procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	
High Temperatures	*List Protection or schedule to protect*
Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required as normal room ventilation will be utilized per Reference 4. The schedule to construct structures is still to be determined. • Ginna procedures and programs are being developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to Ginna.	

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*
The storage structure and its location have not been determined. Portable equipment will be towed to designated	• Implement a design change to install connection points needed to supply the battery chargers from the 1 MW D/G.	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles,

locations. Connections will be made to yet-to-be-determined connections points.	• Implement a design change to install connection points needed to supply the battery chargers from a 100 kW D/G. • Implement a design change to provide a protected storage location for transportation (equipment and fuel) and debris removal equipment. • Implement a design change to install a protected primary and secondary means of accessing the UHS for all BDBEEs, and install necessary modifications to meet required deployment times. This must also address how debris in the UHS or other raw water sources will be filtered / strained and how the resulting debris will effect core cooling. • Implement a design change to provide for transferring diesel fuel from the D/G A and D/G B Fuel Oil Storage Tanks (FOSTs) to a fuel transfer vehicle.	and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

Notes:

Identify analyses or actions:

- Perform GOTHIC calculations consistent with NUMARC 87-00, *Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors*, (Reference 47) to determine the effects of a loss of HVAC during an ELAP for the following areas:
    - Intermediate Building, TDAFW Pump and ARV/SV areas
    - Auxiliary Building, RWST area
    - Battery Rooms, Relay Room, and Control Room
    - Standby Auxiliary Feedwater Building
- Perform an analysis to evaluate the Battery Room low temperature for an ELAP event, assuming -16^{0}F air temperature to determine if, and when, Battery Room heating is required.
- Develop a strategy to protect onsite consumables for use after a BDBEE.
- Develop a strategy and purchase equipment to respond to events that may require debris removal such as following a flood, tornado, or snow storm.
- Develop the strategy to transfer fuel from protected fuel storage locations to FLEX equipment.
- Develop strategies to provide for emergency lighting to support Operator actions after a BDBEE.
- Perform an analysis to provide a basis that the Offsite D/G Fuel Oil Storage Tanks are reasonably protected from BDBEEs.

Safety Functions Support

PWR 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 strategy(ies) utilized to achieve coping times.

VITAL BATTERIES

A D/G from the RRC can power can be used to repower buses and/or equipment. **(Open Item: Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/Gs.**

HVAC

A D/G from the RRC can be used to repower buses and/or equipment. **(Open Item: Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/Gs.**

See Phase 2 discussion for open item to determine strategies.

BATTERY ROOM HYDROGEN CONTROL

DA-EE-99-068, *Vital Battery Room Hydrogen Analysis*, (Reference 62) documents that under worse case conditions, without ventilation, the 0.8% normal hydrogen concentration limit would not be exceeded until 28.9 hours and that the unacceptable hydrogen concentration limit of 2% would not be exceeded until 73.3 hours, with all batteries being equalized. Ventilation to both Battery Rooms is available from a single DC fan that must be manually started. (**Open Item: Develop and implement procedures to establish battery room ventilation within 72 hours of the event to prevent exceeding the unacceptable hydrogen concentration limit of 2%, once the GOTHIC analysis has been completed as discussed in Phase 2.**

Table 3 lists Phase 3 Response Equipment/Commodities that are being considered for pre-staging at an offsite location. (Open Item) These include:

- **Radiation Protection Equipment**
- **Commodities – Food, Potable Water**
- **Diesel Fuel**
- **Heavy Equipment – Transportation, Debris Removal**
- **Boric Acid**
- **Portable Lighting**
- **Portable Toilets**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

Ginna will utilize the industry developed guidance from the PWROG, EPRI, and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

Identify modifications	*List modifications*
• Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/Gs.	
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Phase 3 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.	

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*
RRC equipment will be transported to a staging area near or on site. Site equipment (possibly with assistance from local/state authorities) will transport equipment to designated locations in the protected area. Connections will be made to yet-to-be-determined connections points.	• Implement a design change to provide connections to 480 Volt vital busses to be able to connect to RRC supplied D/Gs.	Connection points for RRC equipment will be located in a structure protected against flooding, tornado missiles, and seismic events. RRC connections will be installed to meet station and protection requirements.

Notes:

Identify analyses or actions:

- Develop and implement procedures to establish battery room ventilation within 72 hours of the event to prevent exceeding the unacceptable hydrogen concentration limit of 2%, once the GOTHIC analysis has been completed as discussed in Phase 2.
- Establish list of equipment/commodities that will be pre-stage offsite and available for Phase 3.

RRC Requirements:

- Ensure RRC can supply D/Gs capable of powering vital bus loads.

Aggregation of FLEX Strategies

An aggregation of FLEX strategies will be performed. This involves the consideration of the aggregate set of on-site and off-site resource considerations for the applicable hazards. That is, all of the considerations related to protection of FLEX equipment, deployment of FLEX equipment, procedural interfaces, and utilization of off-site resources. This will establish the best overall strategy for the storage and deployment of FLEX capabilities over a broad set of beyond-design-basis conditions for the applicable hazards.

Provision of at least N+1 sets of portable on-site equipment stored in diverse locations or in structures designed to reasonably protect from applicable BDBEEs will provide reasonable assurance that N sets of FLEX equipment will remain deployable to assure success of the FLEX strategies. Procedures and guidance to support deployment and implementation including interfaces to EOPs, special event procedures, abnormal event procedures, and system operating procedures, will be coordinated within the site procedural framework.

References

References used in this integrated plan and listed here are available for audit.

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2) NRC Order EA-12-051, *Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation*, March 12, 2012
3) NRC Interim Staff Guidance (ISG) JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, August 29, 2012
4) NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, Revision 0
5) NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, Revision 0
6) 10 CFR Section 50.63, *Loss of all alternating current power*,
7) Letter from E. J. Leeds (NRC) and M. R. Johnson, (NRC) to All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status, dated March 12, 2012, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident,
8) Letter from J.A. Spina (CENG) to Document Control Desk (NRC), dated May 11, 2012, *Sixty-Day Response to 10 CFR 50.54(f) Request for Information* (ML12136A231)
9) Letter from M.G. Korsnick (CENG) to Document Control Desk (NRC), dated June 6, 2012, *Supplemental Information for the Sixty-Day Response to 10 CFR 50.54(f) Request for Information* (Withheld from Public Disclosure Under 10 CFR 2.390)
10) Letter from M.G. Korsnick (CENG) to Document Control Desk (NRC), dated October 26, 2012, *Initial Status Report in Response to Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)* (ML12311A017)
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12) SECY-11-0093, *Near-Term Report and Recommendations for Agency Actions Following the Events in Japan*, July 12, 2011
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16) Not Used
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18) Not Used
19) WCAP-17601-P, *Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs*, Revision 0
20) CALC-2011-0009, *Cycle 36 Reactor Engineering Calculations*, Revision 0
21) CN-TA-98-148, *R.E. Ginna (RGE) Cycle 28 Reload Safety Evaluation – Mode 6 Boron Dilution*,, Revision 1
22) ECA-0.0, *Loss of All AC Power*, Revision 03800

23) E-0, *Reactor Trip or Safety Injection*, Revision 04500
24) AP-ELEC.3, *Loss of 12A and/or 12B Transformer (Below 350°F)*, Revision 01703
25) UFSAR, *Updated Final Safety Analysis Report*, Revision 23
26) TECHSPEC, *Technical Specifications Amendment for R.E. Ginna Nuclear Power Plant*, Revision 112
27) TSB, *Technical Specification Bases for R.E. Ginna Nuclear Power Plant*, Revision 64
28) TRM, *Technical Requirements Manual for the R. E. Ginna Nuclear Power Plant*, Revision 50
29) Acceptance Criteria Basis Form ACB 2009-0005, *Minimum Charging Flow ≥ 17 gpm*, February 2, 2009
30) ER-SFP.2, *Diverse SFP Makeup and Spray*, Revision 00203
31) EPIP-1-18, *Discretionary Actions for Emergency Conditions*, Revision 01900
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33) DA-NS-2006-019, *Loss of RHR Cooling During Mid-Loop for EPU*, Revision 0
34) NSL-0000-005, *Thermal Hydraulic Analysis of the Loss of RHR Cooling While the RCS is Partially Filled*, Revision 3
35) ER-FIRE.3, *Alternate Shutdown for Aux Building Basement/Mezzanine Fire*, Revision 03301
36) O-6.1, *Auxiliary Operator Rounds and Log Sheets*, Revision 04700
37) S-9, *SFP Cooling System Operation*, Revision 00404
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40) CNG-OP-4.01-1000, *Integrated Risk Management*, Revision 01101
41) PA-PSC-0965, *PWROG Core Cooling Position Paper*, Revision 0, November 2012
42) EOP-SETPOINT-ALL, Revision 00003
43) ECP-11-000104, *Diesel Driven AFW Pump Modification Scope*, Revision 001
44) Analysis 109682-M-021, *Spent Fuel Cooling System EPU Evaluation*, Revision 0
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47) NUMARC 87-00, *Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors*
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51) Not Used
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54) ECA-0.0, *Background Information Loss of All AC Power*, Revision 019
55) DA-EE-2001-028, *Vital Battery 8 Hour Capacity*, Revision 001
56) DA-NS-2002-008, *Operator Action Time Requirement Evaluation*, Revision 005
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58) ECP-10-000301, Rev. 0, *Evaluate the Heat Up of the Intermediate Building under a Station Blackout Scenario*, May 7, 2010
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65) DA-NS-99-023, *Battery Room Low Temperature Evaluation*, Revision 0
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70) Letter from C. Stahle, NRC, to R. W. Kober, RG&E, *Subject: Safety Evaluation Report on the Structural Upgrade Program*, March 24, 1987
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72) Letter from G. S. Vissing, NRC, to R. C. Mecredy, RG&E, *Plant-Specific Safety Evaluation Report For USI A-46 Program Implementation At The R.E. Ginna Nuclear Power Plant (TAC NO. M69449)*, June 17, 1999
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Acronyms

AC	Alternating Current
AFW	Auxiliary Feedwater
ARV	Atmospheric Relief Valve
BDBEE	Beyond-Design-Basis External Event
BOL	Beginning of Life
CENG	Constellation Energy Nuclear Group, LLC
CST	Condensate Storage Tank
DC	Direct Current
D/G	Diesel Generator
ELAP	Extended Loss of AC Power
EOL	End of Life
EPRI	Electric Power Research Institute
EPU	Extended Power Uprate
FOST	Fuel Oil Storage Tank
FSG	FLEX Support Guideline
ft	feet
gpm	gallons per minute
LOCA	Loss of Coolant Accident
LUHS	Loss of UHS
MBtu	Million British thermal units
MFP	Main Feedwater Pump
MOV	Motor Operated Valve
mph	miles per hour
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
NUMARC	Nuclear Management and Resources Council
OBE	Operating Basis Earthquake
OEM	Original Equipment Manufacturer
pcm	percent mil
PIM	Pooled Inventory Management
PM	Planned Maintenance
PMF	Probable Maximum Flood
PORV	Power Operated Relief Valve
ppm	parts per million
PWROG	Pressurized Water Reactor Owner's Group
RCCA	Rod Cluster Control Assembly
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RG	Regulatory Guide
RG&E	Rochester Gas and Electric Corporation
RRC	Regional Response Center
RWST	Refueling Water Storage Tank
SAFER	Strategic Alliance for FLEX Emergency Response
SAFW	Standby Auxiliary Feedwater
SBO	Station Blackout

SDM	Shutdown Margin
SEP	Systematic Evaluation Program
SFP	Spent Fuel Pool
S/G	Steam Generator
SI	Safety Injection
SS	Safety Significant
SSE	Safe Shutdown Earthquake
SUP	Structural Upgrade Program
TBD	to be determined
TDAFW	Turbine Driven AFW
TS	Technical Specifications
TSC	Technical Support Center
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
USI	Unresolved Safety Issue

Table 1 – PWR FLEX Equipment Phase 2

Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List FLEX equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
One (1) Portable 480 Volt Diesel Generator				X		480 Volt/ 150 Amp/ 100 kW/ 125 KVA	Will follow EPRI Template Requirements
One (1) Portable Diesel Self-Priming Pump			X			380 gpm @ 450 ft with diesel fuel and required hoses/connectors	Will follow EPRI Template Requirements
Three (3) Portable Diesel Self-Priming Pumps	X		X			770 gpm @ 620 ft with diesel fuel and required hoses/connectors	Will follow EPRI Template Requirements
One (1) Portable Diesel Air Compressor	X					375 cfm @ 100 – 150 psi with diesel fuel and hose/connectors	Will follow EPRI Template Requirements
Two (2) Gasoline Engine Diesel Fuel Transfer Pumps	X		X			Self-priming – 82 gpm capacity with 25' suction lift @ 10.4 psi	Will follow EPRI Template Requirements
One (1) High Pressure Motor Driven RCS Makeup Pump	X					22 gpm at 2235 psig or 70 gpm at 1500 psig. 480 Volt	Will follow EPRI Template Requirements
One (1) Portable High Pressure Diesel RCS Makeup Pump	X		X			20 gpm at 2235 psig with diesel fuel and required hose/connectors	Will follow EPRI Template Requirements
One (1) FLEX Boric Acid Storage Tank	X		X			10,000 gallon capacity with 7,000 gallon usable volume containing 2750 to 3050 ppm Boric Acid	Will follow EPRI Template Requirements
One (1) Pickup Truck					X	Capable of towing portable equipment. Pintle hitch equipped	Will follow EPRI Template Requirements

Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List FLEX equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
One (1) Diesel Fuel Truck with Pumping Unit	X		X			2000 gallon diesel fuel capacity with connecting capability to onsite tanks.	Will follow EPRI Template Requirements
One (1) Debris Removal Equipment					X	Capable of removing debris following a Flood, Tornado, Seismic, or Snow/Ice event	Will follow EPRI Template Requirements
Pump suction hose, discharge hose, suction strainers, fittings	X		X			Length and fittings as needed per pump	Will follow EPRI Template Requirements
Cables for connecting AC Generators to designated equipment	X			X		Length and gauge for designated use	Will follow EPRI Template Requirements
Lighting					X	Sufficient visibility to implement FLEX strategies	Will follow EPRI Template Requirements

Table 2 – PWR Portable Equipment Phase 3

Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Diesel Generators	X	X	X	X		Capable of powering the 480 Volt Vital Bus loads	To be determined
Water Processing Unit	X		X			Primary or Secondary System Grade Water at to be determined gpm	To be determined
Pumps capable of providing borated water makeup to the RCS	X					Capability of TBD capacity.	To be determined
Pumps capable of providing Containment Spray and/or Containment Recirculation Fan Coolers		X				Sufficient capability to maintain the Containment Function	Pending analysis
Pumps			X			Remove heat from the Standby SFP Heat Exchanger and/or SFP Heat Exchanger A.	To be determined
Cooling System Equipment			X			Remove heat from the Standby SFP Heat Exchanger and/or SFP Heat Exchanger A.	To be determined
SFP Cooling Heat Exchanger			X			Remove heat from the SFP	To be determined

Table 3 – Phase 3 Response Equipment/Commodities

Item	Notes
Radiation Protection Equipment • Survey instruments • Dosimetry • Off-site monitoring/sampling	To be determined
Commodities • Food • Potable water	To be determined
Fuel Requirements • Diesel Fuel	To be determined
Heavy Equipment • Transportation equipment • Debris clearing equipment	To be determined
Boric Acid	To be determined
Portable Lighting	To be determined
Portable Toilets	To be determined

Attachment 1A – Sequence of Events Timeline (TDAFW Available)
(ELAP/LUHS with Snow, Ice or High Temperatures)

Action Item	Elapsed Time	Action	Time Constraint Y/N	Remarks / Applicability
	0	**Event Starts**	**NA**	Plant @100% power
1	≤ 1 min	Operators initiate a manual reactor trip	Y	Time critical action is to ensure a reactor trip is initiated within 1 minute of blackout initiation. SBO-PROGPLAN Paragraph 2.4.3 (Ref. 32); A-601.10 (Ref. 17)
2	Prior to S/G overfill	Throttle TDAFW Pump discharge using MOV-3996	Y	Time critical action is to throttle TDAFW pump discharge using MOV-3996 prior to S/G overfill. Timing is based on decay heat levels and the potential to overfill the S/Gs and cause overcooling. ECA-0.0 (Ref. 22); A-601.10 (Ref. 17)
3	< 12 min	Manually secure A and B MFP DC oil pumps if auto shed does not occur.	Y	The UFSAR assumes that the MFW pump DC oil pump operates for 12 minutes following loss of all AC power. This is based on a timer in the MFW pump DC oil pump control circuitry which allows the pump to operate for 11 minutes. However, the timer will only actuate if the MFW pump AC oil pump selector switches are selected to OFF. UFSAR Table 8.3-4 (Ref. 25); (Ref. 54)
4	15 – 30 min	DC Load Shedding	Y	Following loss of all AC power, the station batteries are the only source of electrical power. The station batteries supply the DC buses and the AC vital instrument buses. Since AC emergency power is not available to charge the station batteries, battery power supply must be conserved to permit monitoring and control of the plant until AC power can be restored. The intent of load shedding is to remove all large non-essential loads as soon as practical, consistent with preventing damage to plant equipment. ATT-8.0 (Ref. 46); On-Shift Staffing Analysis Report (Ref. 50); (Ref. 54)
5	≤ 30 min	Open Control Room & All Reactor Protection and Control System Rack	Y	Time critical action is to open Control Room and all Reactor Protection and

Action Item	Elapsed Time	Action	Time Constraint Y/N	Remarks / Applicability
		Doors in the Control Room		Control System Rack Doors in the Control Room within 30 minutes of blackout initiation. SBO-PROGPLAN Paragraph 4.1.10 & 4.1.11 (Ref. 32) (Analysis supports 4 hr coping period); A-601.10 (Ref. 17)
6	< 30 min	Open selected vital area doors	Y	Time critical action is to open select vital area doors within 30 minutes to limit max temperatures for a 4 hour coping period in the following areas: (SBO-PROGPLAN Paragraph 7.2.4 (Ref. 32); A-601.10 (Ref. 17)) ARV Area = 117-122°F TDAFW Area = 110-115°F Control Room = 116°F Battery Rooms = 108.2°F Relay Room = 103°F
7	< 1 hr	Declare ELAP	N	Declaration of ELAP shall be made when it is recognized or determined that restoration of power to mitigate the effects of a SBO cannot not be performed. ECA-0.0 directs the Operator to try and restore power to any train of AC emergency buses very quickly after a loss of all AC power. Thirty minutes is sufficient time for the Operators to recognize or determine that off-site power or on-site emergency power restoration is unlikely and that an ELAP should be declared.
8	< 1 hr	Commence RCS Cooldown – maintain a cooldown rate in the RCS cold legs near 100°F/hr.	Y	ECA-0.0 directs the Operators to initiate depressurization of the steam generators as a means of minimizing primary system inventory loss through the reactor coolant pump (RCP) seals. Based on experience with the Ginna simulator, RCS cooldown is performed within the first hour of SBO initiation. SBO-PROGPLAN Paragraphs 1.4 & 7.2.1.5 (Ref. 32); ECA-0.0 (Ref. 22)
9	≤ 1 hr	Pull stop Turbine DC Oil Pump	Y	Following loss of all AC power, the station batteries are the only source of electrical power. The station batteries supply the DC buses and the AC vital instrument buses. Since AC emergency

Action Item	Elapsed Time	Action	Time Constraint Y/N	Remarks / Applicability
				power is not available to charge the station batteries, battery power supply must be conserved to permit monitoring and control of the plant until AC power can be restored. ECA-0.0 (Ref. 22); ECA-0.0 Background Information (Ref. 54);
10	≤ 2 hr	Align alternate source of water to the CST when level reaches 5 feet.	Y	Time critical action for a Station Blackout is to align alternate source of water to the CST when level reaches 5 feet, prior to losing suction (~12 minutes after reaching 5 ft in CST at 400 gpm). At 400 gpm with CST at Minimum TS level, 5 ft will be reached in about 44 minutes. However, the ELAP coping strategy will be to commence feeding the S/Gs from SAFW powered by the new SAFW D/G and taking suction from the new CST. SBO-PROGPLAN Paragraph 4.1.5 (Ref. 32); TS Basis 3.7.6 (Ref. 27); A-601.10 (Ref. 17) **(Open Item: Develop and implement procedures to commence feeding the S/Gs from SAFW powered by the new SAFW D/G prior to reaching 5 ft in the CST.)**
11	≤ 2 hr	Align cooling to TDAFW Pump.	Y	Time critical action for a Station Blackout is to align Diesel Driven Fire Pump output to TDAFW Pump lube oil cooler within 2 hours. It has been demonstrated that the TDAFW Pump can operate for up to 2 hours without any cooling. However, the ELAP coping strategy will be to commence feeding the S/Gs from SAFW powered by the new SAFW D/G and taking suction from the new CST. SBO-PROGPLAN Paragraph 1.5.5 & 4.1.2 (Ref. 32); A-601.10 (Ref. 17) **(Open Item: Develop and implement procedures to commence feeding the S/Gs from SAFW powered by the new SAFW D/G prior to reaching 5 ft in the CST.)**
12	≤ 4 hr	Degas Main Generator	Y	Generator degassing should be started to ensure that DC seal oil backup pump can be stopped in four hours to decrease DC

Action Item	Elapsed Time	Action	Time Constraint Y/N	Remarks / Applicability
				loading on the TSC Battery. ECA-0.0 (Ref. 22); ECA-0.0 Background Information (Ref. 54)
13	≤ 4 hr	Provide Charging to Batteries A and/or B (Load shedding provides additional time)	N	Design analysis DA-EE-97-069, *Sizing of Vital Batteries A and B* (Ref. 53) shows that the Ginna station batteries are adequate to sustain power to the current load profiles for the duration of a four hour station blackout, using a temperature of 55°F. In addition, ECA-0.0 (Ref. 22) provides load shedding guidance to the Operators for preserving battery capacity and maintaining required voltage levels. DA-EE-2001-028, *Vital Battery 8 Hour Capacity*, was subsequently performed to verify 8 hour capacity given the load shedding directed by procedure ECA-0.0 ATT-8.0, *Attachment DC Loads* (Ref. 46). SBO-PROGPLAN Paragraph 7.2.2 (Rev. 32)
14	< 8 hr	Initiate boration	Y	See the Phase 1 discussion for mitigating strategy Maintain RCS Inventory Control / Long Term Subcriticality for a discussion of this time constraint. PA-PSC-0965, *PWROG Core Cooling Position Paper* (Ref. 41); WCAP-17601-P (Ref. 19); CALC-2011-0009 (Ref. 20)
15	8 hr	Vital Battery Capacity given load shedding in ECA-0.0	Y	DA-EE-2001-028 (Ref. 55) documents that the vital batteries have an adequate capacity for an 8-hour station blackout event assuming the load reductions listed in procedure ECA-0.0 (ATT-8.0) are implemented. This analysis is conservative because it applies 50% of the calculated load reduction to Battery A, and only during the period from 12 min to 245.5 min. 50% of the calculated load shedding is conservatively small in that the load shedding is assumed to take place anytime from 12 min to 245.5 min. This analysis does not consider the effects of load shedding for Battery B. Battery B is shown to be adequately sized for an 8-hour SBO without procedural load shedding. SBO-

Action Item	Elapsed Time	Action	Time Constraint Y/N	Remarks / Applicability
				PROGPLAN Paragraph 7.2.2 (Ref. 32)
16	≤ 72 hr	Provide Battery Room ventilation for hydrogen control	Y	DA-EE-99-068 (Ref. 62) documents that under worse case conditions, without ventilation, the 0.8% normal hydrogen concentration limit would not be exceeded until 28.9 hours and that the unacceptable hydrogen concentration limit of 2% would not be exceeded until 73.3 hours, with all batteries being equalized.

Attachment 1B – Sequence of Events Timeline (TDAFW Not Available)
(ELAP/LUHS with Tornado Missile, Seismic, or Flooding Events)

Action item	Elapsed Time	Action	Time Constraint Y/N [7]	Remarks / Applicability
	0	**Event Starts**	**NA**	Plant @100% power
1	≤ 1 min	Operators initiate a manual reactor trip	Y	See Attachment 1A
2	< 12 min	Manually secure A and B MFP DC oil pumps if auto shed does not occur.	Y	See Attachment 1A
3	≤ 14.5 min	Restore AFW loss due to an external event (Tornado, Seismic, or Flood)	Y	Time critical action for loss of AFW due to an external event is to use AFW or SAFW. Transfer is assumed within 14.5 minutes of S/G Low Level Auto Start setpoint for AFW or from the time of the loss of the pumps, whichever is longer. TS Basis 3.7.5 (Ref. 27); DA-NS-2002-008 (Ref. 56); A-601.10 (Ref. 17)
4	15 – 30 min	DC Load Shedding	Y	See Attachment 1A
5	≤ 30 min	Open Control Room & All Reactor Protection and Control System Rack Doors in the Control Room	Y	See Attachment 1A
6	< 30 min	Open selected vital area doors	Y	See Attachment 1A
7	≤ 35 min	Establish AFW or SAFW to maintain heat sink	Y	DBCOR-2006-0057 (Ref. 57) documents that the time required for restoration of feed to a S/G was reduced from 50 minutes to 35 minutes due to the increased core decay heat from the Extended Power Uprate (EPU).
8	< 1 hr	Declare ELAP	N	See Attachment 1A
9	≤ 1 hr	Pull stop Turbine DC Oil Pump	Y	See Attachment 1A
10	< 1 hr	Commence RCS Cooldown – maintain a cooldown rate in the RCS cold legs near 100°F/hr.	Y	See Attachment 1A
11	≤ 4 hr	Degas Main Generator	Y	See Attachment 1A
12	≤ 4 hr	Provide Charging to Batteries A and/or B (Additional load shedding may provide additional time)	N	See Attachment 1A
13	< 8 hr	Initiate boration	Y	See Attachment 1A

[7] Instructions: Provide justification if No or NA is selected in the remark column
If yes include technical basis discussion as requires by NEI 12-06 section 3.2.1.7

Action item	Elapsed Time	Action	Time Constraint Y/N [7]	Remarks / Applicability
14	8 hr	Vital Battery Capacity given load shedding in ECA-0.0	Y	See Attachment 1A
15	< 24 hr	Refill new SAFW CST	Y	New equipment in process. **Open Item: Develop and implement a FLEX method / procedure to refill the new SAFW CST prior to losing suction.**
16	≤ 72 hr	Provide Battery Room ventilation for hydrogen control	Y	See Attachment 1A

Attachment 2 – Milestone Schedule

The following milestone schedule is provided. The dates are planning dates subject to change as design and implementation details are developed. Any changes to the following target dates will be reflected in the subsequent 6 month status reports.

Original Target Date	Activity	Status *{Include date changes in this column}*
Started	Commence Engineering and Design	In Process
Started	Commence Procurement of Equipment	In Process
Started	Commence Installation of Equipment	In Process
Aug 2013	Submit 6 Month Status Report	
Nov 2013	Develop Strategies/Contract with RRC	
Feb. 2014	Submit 6 Month Status Report	
1st Qtr 2014	Complete Engineering and Design	
June 2014	Create Maintenance and Testing Procedures	
Aug. 2014	Submit 6 Month Status Report	
Sept. 2014	Procedure Changes Training Material Complete	
Nov 2014	Develop Training Plan	
Feb. 2015	Submit 6 Month Status Report	
Apr. 2015	Issue FLEX Support Guidelines	
May 2015	Provide onsite and augmented staffing assessment considering functions related to NTTF Recommendation 4.2. (References 8 and 9)	
Jun 2015	Implement Training	
Aug. 2015	Submit 6 Month Status Report	
3rd Qtr 2015	Complete Procurement of Equipment	
Fall 2015	Full compliance with EA-12-049 is achieved (Reference 10)	
4th Qtr 2015	Submit Completion Report	

Attachment 3 – Conceptual Sketches

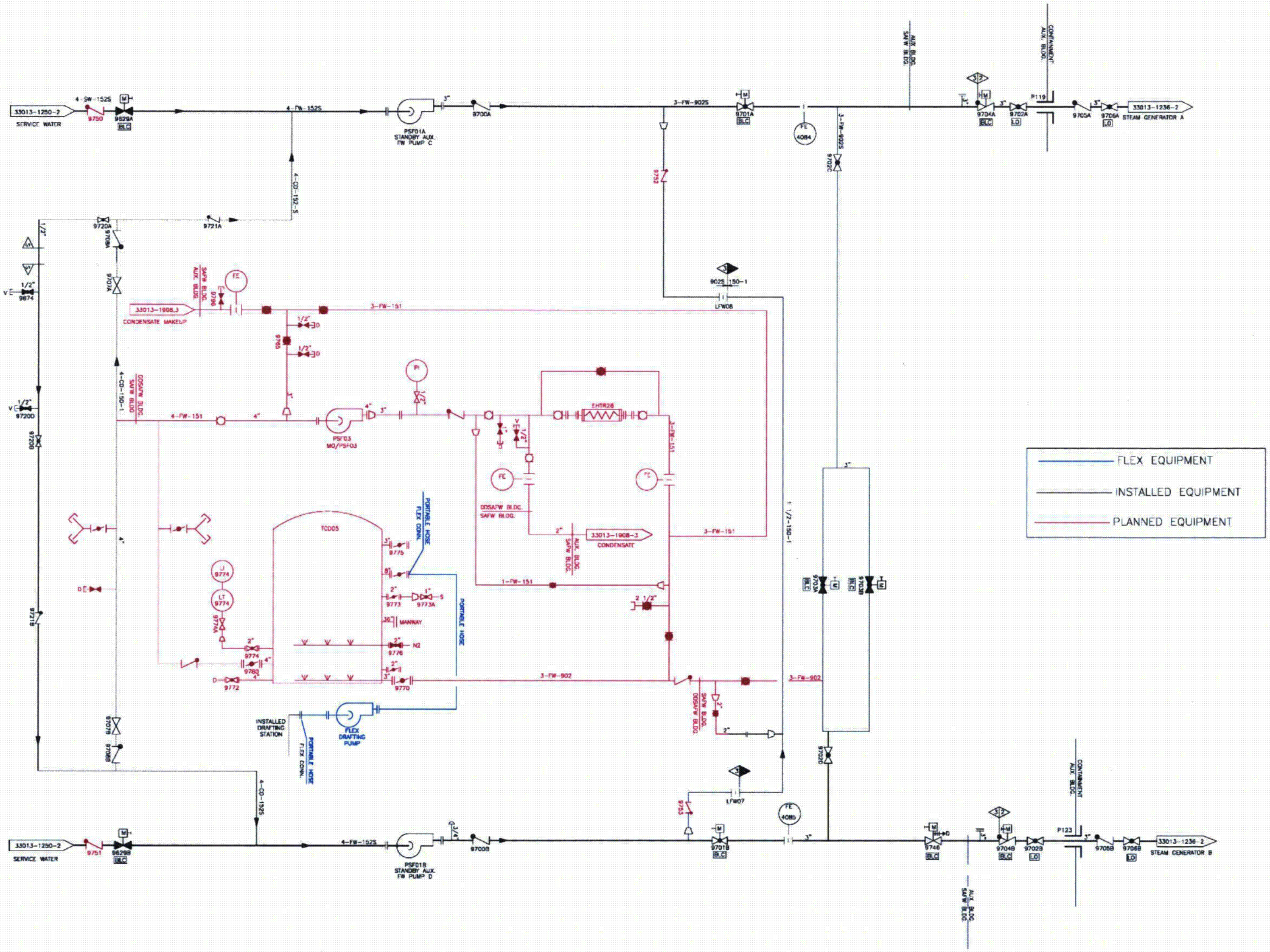

FIGURE 1: STANDBY AUXILIARY FEEDWATER SYSTEM MODIFICATION

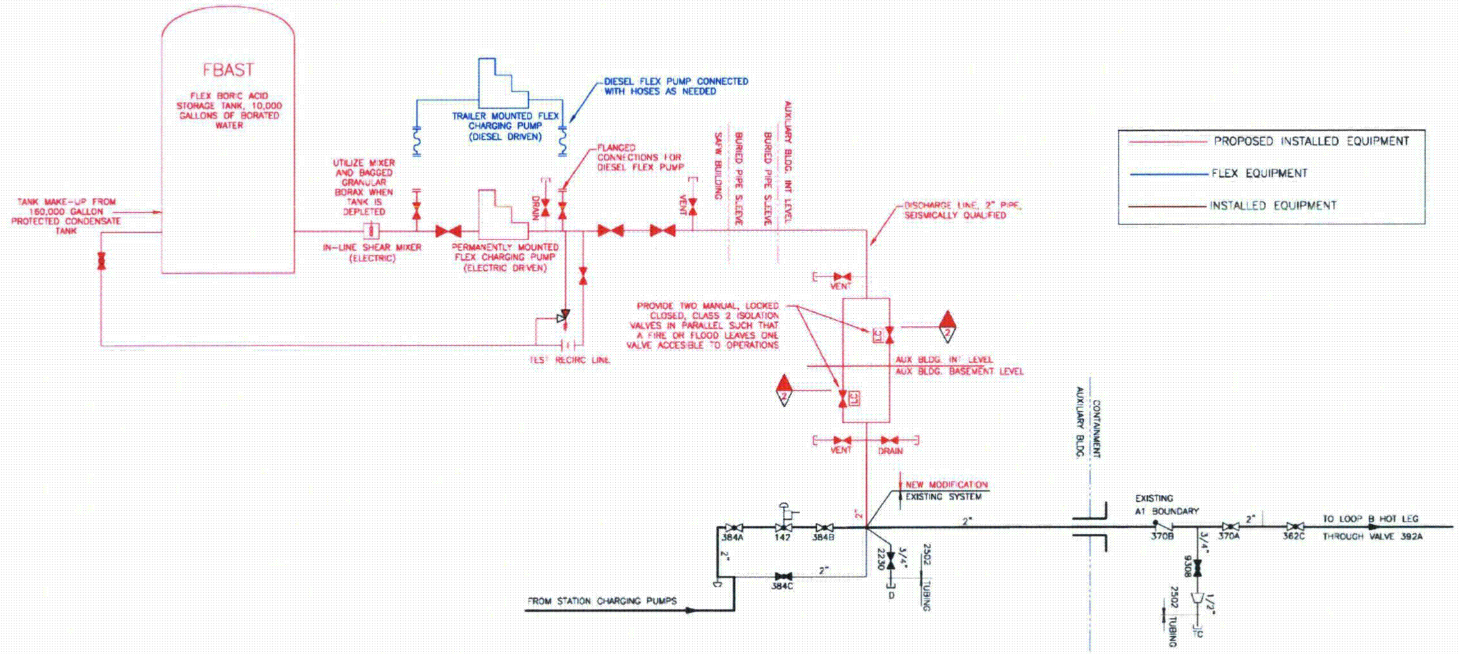

FIGURE 2: FLEX CHARGING PUMPS AND CONNECTIONS

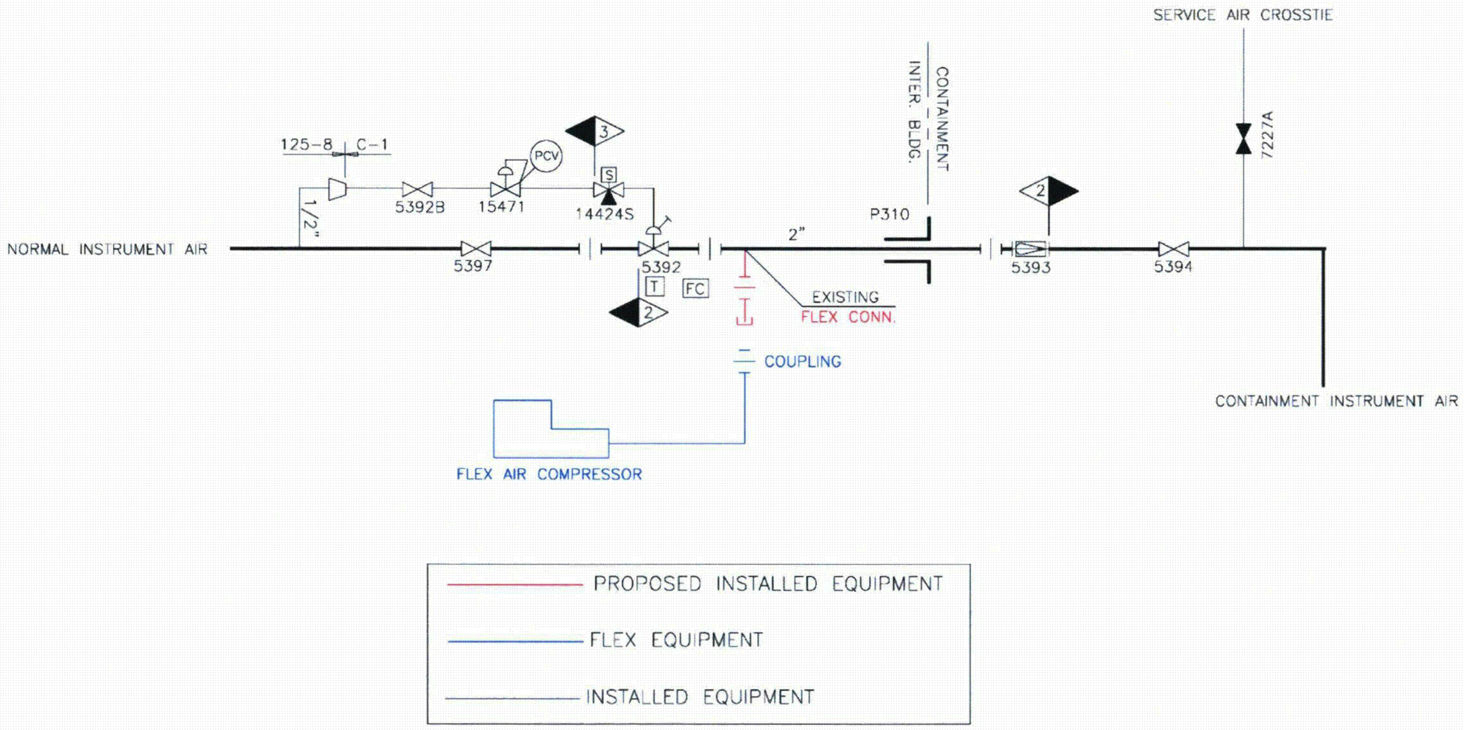

FIGURE 3: FLEX AIR COMPRESSOR TO INSTRUMENT AIR SYSTEM/CONTAINMENT

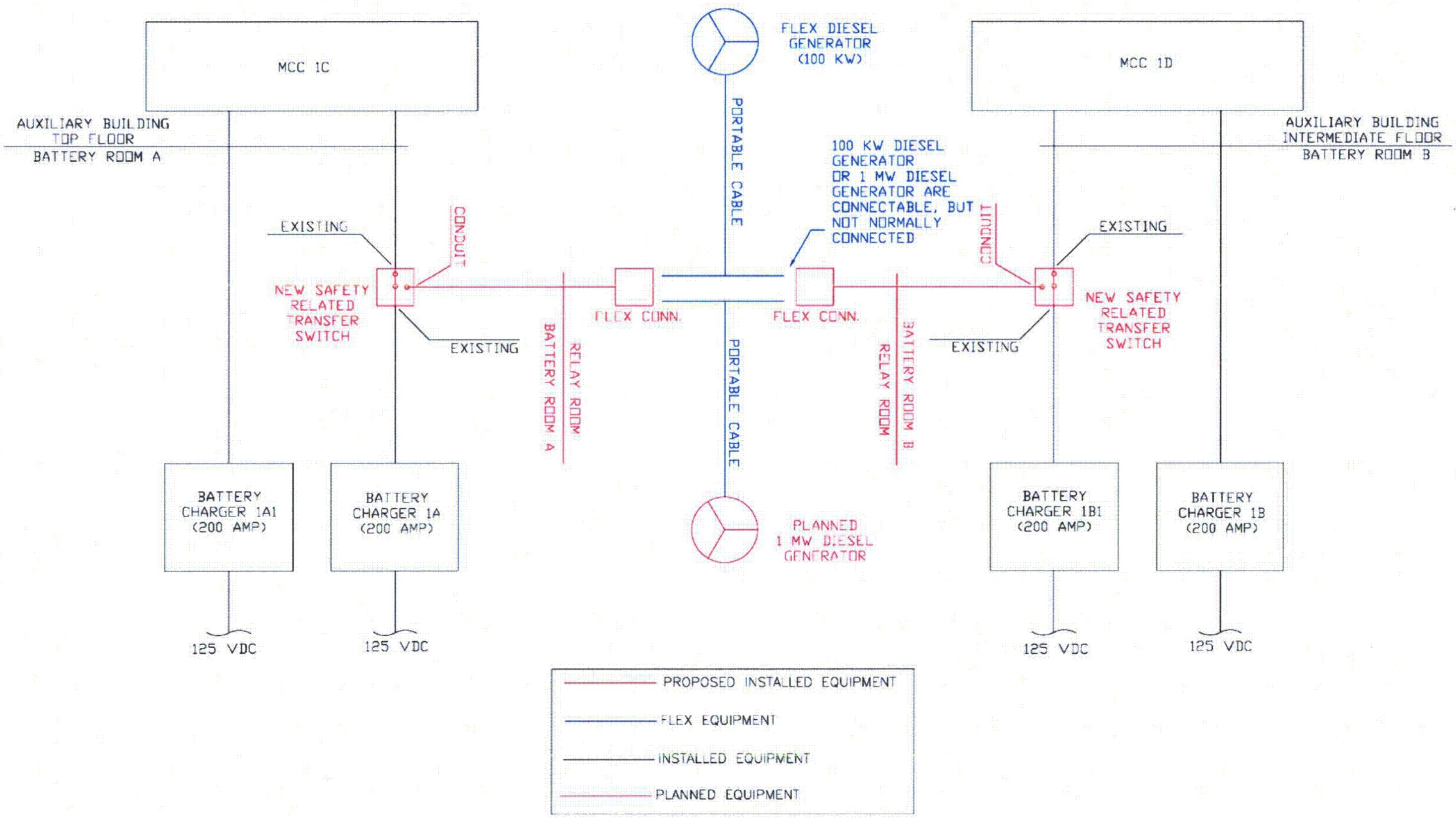

FIGURE 4: FLEX D/G TO BATTERY CHARGERS

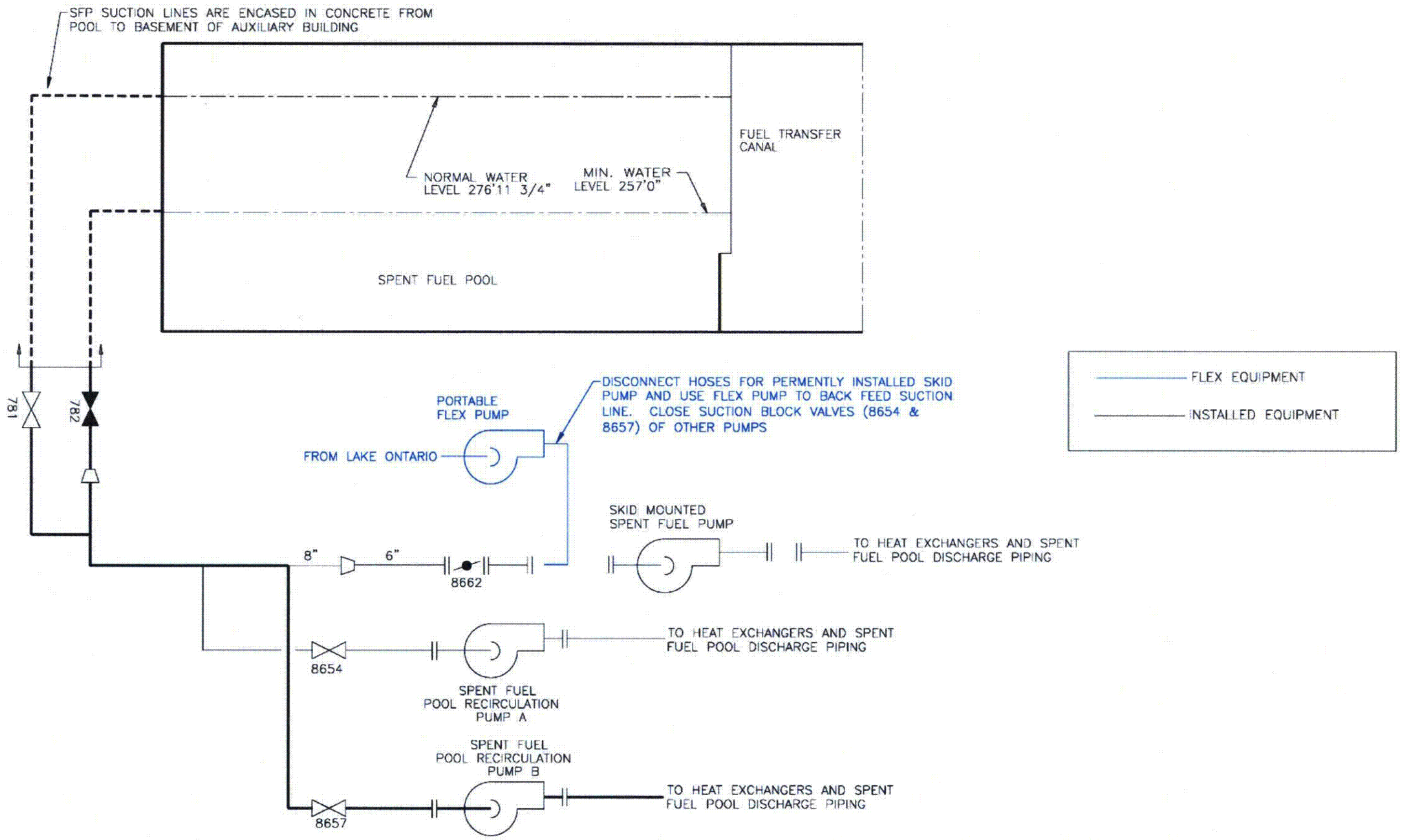

FIGURE 5: FLEX SFP MAKEUP OPTION TO SFP COOLING SYSTEM

ATTACHMENT (2)

NINE MILE POINT UNIT 1 INTEGRATED PLAN FOR MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS

Constellation Energy Nuclear Group, LLC
February 28, 2013

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Introduction

Nuclear Regulatory Commission (NRC) Order EA-12-049, *Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, (Reference 1) requires a three-phase approach for mitigating beyond-design-basis external events (BDBEEs). 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, on-site equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from off site. The final phase requires obtaining sufficient off-site resources to sustain those functions indefinitely.

These strategies must be capable of mitigating a simultaneous loss of Alternating Current (AC) power and loss of normal access to the ultimate heat sink (LUHS) and have adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. Reasonable protection must be provided for the associated equipment from external events. Such protection must demonstrate that there is adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities. The strategies must be implementable in all modes.

NRC Interim Staff Guidance (ISG) JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, (Reference 3) provides guidance to assist nuclear power reactor applicants and licensees with the identification of measures needed to comply with the requirements to mitigate challenges to key safety functions contained in Order EA-12-049. This ISG endorses, with clarifications, the methodologies described in NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide* (Reference 4).

NEI 12-06 outlines the process to be used by individual licensees to define and implement site-specific diverse and flexible mitigation strategies that reduce the risks associated with beyond-design-basis conditions. NEI 12-06 requires that each plant establish the ability to cope with the baseline conditions for a simultaneous extended loss of AC power (ELAP) and LUHS event and then evaluate the FLEX protection and deployment strategies in consideration of the challenges of the external hazards applicable to the site.

This integrated plan provides the Nine Mile Point Unit 1 (NMP1) approach for complying with Order EA-12-049 using the methods described in NRC JLD-ISG-2012-01. The current revision of the NMP1 Integrated Plan is based on conceptual design information and will be revised as detailed design engineering progresses. Consistent with the requirements of Order EA-12-049 and the guidance in NEI 12-06, the NMP1 six-month reports will delineate progress made, including an update of milestones accomplished since the last report, any proposed changes in compliance methods, updates to the schedule, and if needed, requests for relief and the basis.

Implementation Capability Requirements Overview

The primary FLEX objective is to develop the capability for coping with a simultaneous ELAP and LUHS event for an indefinite period through a combination of installed plant equipment, portable on-site equipment, and off-site resources. The baseline assumptions have been established on the presumption that other than the loss of normal and alternate AC power sources and normal access to the Ultimate Heat Sink (UHS), installed equipment that is designed to be robust with respect to design basis external events is assumed to be fully available. Installed equipment that is not robust is assumed to be unavailable. Permanent plant equipment, cooling and makeup water inventories, and fuel for FLEX equipment contained in systems or structures with designs that are robust with respect to seismic events, floods, high winds and associated missiles are available. Other equipment, such as portable AC power sources, portable back up DC power supplies, spare batteries, and equipment for Title 10 of the Code of Federal Regulations 10 CFR Section 50.54 (hh) (2), may be used provided it is reasonably protected from the applicable external hazards and has predetermined hookup strategies with appropriate procedures/guidance and the equipment is stored in a relative close vicinity to the site. Installed electrical distribution systems, including inverters and battery chargers remain available provided they are protected consistent with current station design.

The FLEX strategy relies upon the following principles:

1. Initially cope by relying on installed plant equipment. (Phase 1)
2. Transition from installed plant equipment to on-site FLEX equipment. (Phase 2)
3. Obtain additional capability and redundancy from off-site resources until power, water, and coolant injection systems are restored or commissioned. (Phase 3)
4. Response actions will be prioritized based on available equipment, resources, and time constraints. The initial coping response actions can be performed by available site personnel post-event.
5. Transition from installed plant equipment to on-site FLEX equipment may involve on-site, off-site, or recalled personnel as justified by evaluation.
6. Strategies that have a time constraint to be successful are identified and a basis provided that the time can reasonably be met.

An element of a set of strategies to maintain or restore core and SFP cooling and containment functions includes knowledge of the time that NMP1 can withstand challenges to these key safety functions using installed equipment during a BDBEE. This knowledge provides an input to the choice of storage locations and conditions of readiness of the equipment required for the follow-on phases. This duration is related to, but distinct from the specified duration for the requirements of 10 CFR 50.63, *Loss of all alternating current power*, (Reference 6) paragraph (a), because it represents the NMP1 current capabilities rather than a required capability. As such NMP1 will 1) account for the SFP cooling function, which is not addressed by 10 CFR 50.63(a); and 2) assume the non-availability of alternate AC sources, which may be included in meeting the specified durations of 10 CFR 50.63(a). This is implicit in the FLEX principles described in Section 3.2.1.7, Paragraph (6) and Section 3.2.2, Paragraph (1) of NEI 12-06. Maintenance of the guidance and strategies addressing the estimate of capability will be kept current to reflect plant conditions following facility changes such as modifications or equipment outages. NMP1 recognizes that changes in the facility can impact the duration for which the initial response phase can be accomplished, the required initiation times for the transition phase, and the required delivery and initiating times for the final phase.

Implementation Plan

Capabilities for responding to ELAP and LUHS scenarios caused by BDBEE are described in the following sections.

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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.*

The applicable extreme external hazards for NMP1 are seismic, external flooding, ice, snow, high winds (including tornadoes), extreme low temperature and extreme high temperature as detailed below:

<u>Seismic Hazard Assessment</u>
Per NMP1 Design Criteria Document, DCD-115 (Reference 8), the seismic criteria for NMP1 is the Design Basis Earthquake (DBE) (Safe Shutdown Earthquake). The Operating Basis Earthquake (OBE) is not included in the NMP1 License Basis. The licensing basis DBE is 0.11g (Reference 8). New equipment that is installed at NMP1 is designed to 0.13g as a result of upgraded design basis requirements instituted in 1984. Per Nuclear Energy Institute (NEI) 12-06 Section 5.2 (Reference 4), all sites will consider the seismic hazard.

The NMP1 UFSAR (Reference 7) and the Nine Mile Point Unit 2 (NMP2) Updated Safety Analysis Report (USAR) (Reference 32) were reviewed to determine the potential for soil liquefaction under design earthquake conditions at the site. Per the NMP2 USAR Section 2.5.4.8 (Reference 32);

> "All major Category 1 structures are founded on bedrock or concrete fill. The Category 1 structural fill is limited to small areas that are bounded by foundation walls resting on bedrock and the fill functions only as a form during construction."

Although this statement is identified for NMP2, it does not appear to extend to NMP1 nor does it account for the potential deployment routes of FLEX portable equipment. **(Open Item: Evaluate potential soil liquefaction for the Nine Mile Point site considering final storage location of FLEX portable equipment and deployment routes established for this equipment)**

NMP1 screens in for an assessment for seismic hazard including liquefaction.

<u>External Flood Assessment</u>
NMP1 is constructed below the design basis flood level and therefore cannot be considered a "dry" site as described in NEI 12-06 guidance (Section 6.2.1). The source of the event that leads to the design basis flood level is the maximum Probable Maximum Precipitation (PMP) flood level in the vicinity of the plant and is elevation 261.75 feet per the NRC Technical Evaluation Report for the NMP1 Individual Plant Evaluation for External Events (IPEEE) dated July 18, 2000. The maximum water level was determined from regional precipitation in combination with historical maximum lake level. Per Table 6-1 of NEI 12-06, the warning time would be days and the persistence of the event would be many hours to months.

NMP1 screens in for an assessment for external flooding.

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High Winds Hazard Assessment

Per NEI 12-06 Figure 7-1, NMP1 has a 1 in 1 million chance per year of a hurricane induced peak-gust wind speed of > 120 miles per hour (mph). Thus, NMP1 does not need to address high straight wind hazards.

Per NEI 12-06 Figure 7-2, NMP1 has a 1 in 1 million chance of tornado wind speeds of 169 mph. This is greater than the threshold of 130 mph; therefore NMP1 will address tornado hazards, including tornado missiles, impacting FLEX deployment.

NMP1 screens in for an assessment of tornado hazards but not straight wind hazards.

Extreme Cold Hazard Assessment

The guidelines provided in NEI 12-06 (Reference 4, Section 8.2.1) generally include the need to consider extreme snowfall at plant sites above the 35th parallel. NMP1 site is located at 43°31' 17" N latitude and 76° 24' 36" W longitude. The NMP1 site is located above the 35th parallel (Reference 4); thus, the capability to address hindrances caused by extreme snowfall with snow removal equipment will be provided. Per Section 8.2.1 of NEI 12-06, "It will be assumed that this same basic trend applies to extremely low temperatures." The lowest recorded temperature at or near NMP1 is -26°F and occurred in 1979 (Reference 32, Section 2.3.1.2.2). The NMP1 site is located within the region characterized by the Electric Power Research Institute (EPRI) as ice severity level 5 (Reference 4, Figure 8-2).

NMP1 screens in for an assessment for low temperature, snow and ice.

Extreme High Temperature Hazard Assessment

Per NEI 12-06 Section 9.2, "all sites will address high temperatures" for impact on deployment of FLEX equipment. The maximum temperature observed at NMP1 was 98°F and occurred in 1953 (Reference 32, Section 2.3.1.2.2). Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.

NMP1 screens in for an assessment for Extreme High Temperature.

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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:* • *Flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes.* • *Exceptions for the site security plan or other (license/site specific) requirements of 10CFR may be required.* • *Deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours.* • *Certain Technical Specifications cannot be complied with during FLEX implementation.*

Key assumptions associated with implementation of FLEX Strategies for NMP1 are described below:

- Staffing re-evaluations pursuant to US Nuclear Regulatory Commission (NRC) letter, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 12, 2012, have not been completed and therefore not assumed in this submittal.
- Flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed.
- Following conditions exist for the baseline case:
  - Seismically designed Direct Current (DC) battery banks are available.
  - Seismically designed Alternating Current (AC) and DC distribution is available.
  - Entry into Extended Loss of AC Power (ELAP) will occur by the one hour point.
  - Plant initial response is the same as Station Blackout (SBO).
  - Best estimate decay heat load analysis and decay heat is used to establish operator time and action.
  - No additional failure of Structures, Systems or Components (SSCs) is assumed. Therefore, Emergency Condensers (ECs) will perform as designed.

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- Portable FLEX components will be procured commercially.
- Margin will be added to design FLEX components and hard connection points to address future requirements as re-evaluation warrants. This margin will be determined during the detailed design or evaluation process.
- The design hardened connections are protected against external events or are established at multiple and diverse locations. **(Open Item: Implement a design change to install permanent protected FLEX equipment connection points)**
- Deployment strategies and deployment routes, when established in accordance with the detailed design process, will be assessed for hazards impact. **(Open Item: Evaluate deployment strategies and deployment routes for hazards impact)**
- Phase 2 FLEX components are stored at the site and will be protected against the "screened in" hazards. At least 2 sets of equipment will be available after the event they were designed to mitigate. **(Open Item: Provide for on-site storage of Phase 2 FLEX components that is protected against "screened in" events by design or location)**
- The event impedes site access as follows (NEI 12-01, Reference 5)
    - Post event time: 0 to 6 hours – No site access. This duration reflects the time necessary to clear roadway obstructions, use different travel routes, mobilize alternate transportation capabilities (e.g., private resource providers or public sector support), etc.
    - Post event time: 6 to 24 hours – Limited site access. Individuals may access the site by walking, personal vehicle or via alternate transportation capabilities (e.g., private resource providers or public sector support).
    - Post event time: 24+ hours – Improved site access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver equipment, supplies and large numbers of personnel.
- Maximum environmental room temperatures for habitability or equipment availability is based on NUMARC 87-00 (Reference 10) guidance if other design basis information or industry guidance is not available. Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.
- This plan defines strategies capable of mitigating a simultaneous loss of all AC power and loss of normal access to the ultimate heat sink resulting from a beyond-design-basis event by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at all units on a site. Though specific strategies are being developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety will be incorporated into the unit emergency operating procedures in accordance with established EOP change processes, and their impact to the design basis capabilities of the unit evaluated under 10 CFR 50.59. The plant Technical Specifications contain the limiting conditions for

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normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the beyond-design-basis event may place the plant in a condition where it cannot comply with certain Technical Specifications and/or with its Security Plan, and, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p). **(Open Item: Exceptions for the site security plan or other (license/site specific – 10 CFR 50.54x) requirements of a nature requiring NRC approval will be communicated in a future 6 month update following identification)**

- FLEX equipment storage location(s) have not been selected. Once a location or locations are finalized, implementation routes will be defined. **(Open Item: Evaluate requirements and options and develop strategies related to the storage on site of the FLEX portable equipment)**

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.*

NMP1 has no known deviations to the guidelines in JLD-ISG-2012-01 and NEI 12-06 (References 3 and 4). If deviations are identified, the deviations will be communicated in a future 6 month update following identification.

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 Attachment 1A*

<u>Discussion of time constraints identified in Attachment 1A</u>

- ≤ 15 minutes, operator dispatched to the Turbine Building to open the disconnect switches at standby Uninterruptible Power Supply (UPS) Battery Charger 162 or 172. These actions are currently dictated in Station Blackout procedures (Reference 11) and are performed in order to reduce battery service loading and extend coping time.
- ≤ 30 minutes, operator dispatched to the Turbine Building in accordance with current Station Blackout procedures to perform the following actions;

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- Open the disconnect switches at standby UPS Battery Charger 162 or 172 not previously opened (Reference 11). These actions are performed in order to reduce battery service loading and extend coping time.
- Open all doors on the Main and Auxiliary Control Room Instrument Cabinets (Reference 11). These actions are performed to ensure adequate ventilation to vital instrumentation and components. Due to loss of forced air ventilation, it is necessary to provide the maximum free air space for heat transfer.
- Manually throttle the makeup blocking valve to the EC to conserve makeup water in the makeup tanks and preserve the operation of the ECs for an extended period (Reference 11). This level control valve would fail open as a result of the loss of power/instrument air and if not manually controlled, makeup tank water will be drained through the ECs to the Waste Collector Tanks. Manual throttling is necessary to control the level in the ECs for optimum cooling and maximize the duration of availability.
- At the safety related 102 and 103 Emergency Diesel Generators (EDGs), operators take actions to reduce battery service loading to extend coping time and to override automatic EDG start upon restoration of power (Reference 11). These specific actions include
    - Close starting air blocking valve (override automatic start)
    - Shutdown the Circulating Oil Pump (reduce battery loading)

- Shutdown the Turbo Oil Pump (reduce battery loading) ≤ 1 hour, Main Control Room (MCR) staff verifies the short term duration of the event or that an ELAP condition exists. The time period of one (1) hour is selected conservatively to ensure that ELAP entry conditions can be verified by Control Room staff and validate that EDGs are not available. One hour is a reasonable assumption for operators to be able to ascertain from power control that off-site power will be unavailable for an extended period of time. Timely entry into ELAP procedures is necessary to ensure that FLEX portable equipment is deployed at the appropriate times.
- 3 hours, DC load shedding is completed by manually opening Generator Hydrogen Emergency Dump Valve and stopping the Emergency Seal Oil Pump when generator hydrogen reaches atmospheric pressure.

Technical Basis Support information

1. On behalf of the Boiling Water Reactor Owners Group (BWROG), GE-Hitachi (GEH) developed a document (NEDC-33771P, Revision 1 (Reference 25)) to supplement the guidance in NEI 12-06 by providing additional BWR-specific information regarding the individual plant response to the ELAP and LUHS events. The document includes identification of the generic event scenario and expected plant response, the associated analytical bases and recommended actions for performance of a site-specific gap analysis. In the document, GEH utilized the NRC accepted SuperHex computer code methodology for BWR's long term containment analysis for the ELAP analysis. As part of this document, a generic BWR 2/Mark I containment Nuclear Steam Supply System (NSSS)

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evaluation was performed. The BWR 2/Mark I containment analysis is applicable to the NMP1 (a BWR 2/Mark I plant) coping strategy because it supplements the guidance in NEI 12-06 by providing BWR-specific information regarding plant response for core cooling, containment integrity, and SFP cooling. The information provided in the guidance was utilized, as applicable, to develop coping strategies and for prediction of plant response.

2. **(Open Item: Evaluate NMP1 containment integrity for Phases 1 through 3 using the Modular Accident Analysis Program (MAAP) and provide analysis in a future required six month status report)**
3. A best estimate bounding decay heat curve was developed by GEH using American National Standards Institute (ANSI 5.1-1979) (NEDC-33771P, Revision 1, Reference 25) for use in NSSS modeling.
4. Environmental conditions within the station areas were evaluated utilizing methods and tools in NUMARC 87-00 (Reference 10).
5. Per the guidance in 10 CFR 50.63 and Regulatory Guide 1.155, NMP1 is a 4 hour coping plant for SBO considerations. Applicable portions of supporting analysis have been used in ELAP evaluations (Reference 24).

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.*

Deployment routes will be established once the storage locations for FLEX equipment are defined. **(Open Item: Establish deployment routes from FLEX equipment storage location to connection points)** The identified paths and deployment areas will be accessible during all modes of operation. This deployment strategy will be included within an administrative program in order to keep pathways clear or provide actions to clear the pathways. **(Open Item: Develop and implement a program and/or procedures to keep FLEX equipment deployment pathways clear or identify actions to clear the pathways)**

Provide a milestone schedule. This schedule should include:
• **Modifications timeline**
  o **Phase 1 Modifications**
  o **Phase 2 Modifications**
  o **Phase 3 Modifications**
• **Procedure guidance**
	The dates specifically required by the 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.

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development complete o **Strategies** o **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**	

See milestone schedule in Attachment 2.

The schedule for when Regional Response Centers will be fully operational is still to be determined. **(Open Item: Determine schedule for when Regional Response Centers will be fully operational)**

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.*

NMP1 will establish a system designation for emergency portable equipment and will manage this system in a manner consistent with medium-risk plant systems per CNG-CM-4.01, Configuration Management (Reference 27). All elements of the program described in Section 11 of NEI 12-06, including recommended "should" items will be evaluated for inclusion in the station program. The equipment for FLEX will have unique identification numbers. Installed structures, systems and components pursuant to 10 CFR 50.63 (a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, Station Blackout. Preventive Maintenance (PM) procedures will be established for all components and testing procedures will be developed with frequencies established based on type of equipment, original equipment manufacturer (OEM) recommendations and considerations made within EPRI guidelines. **(Open Item: Develop preventive maintenance and testing procedures with frequencies based on OEM recommendation and EPRI guidelines)**

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Describe training plan	*List training plans for affected organizations or describe the plan for training development*

New training of general station staff and Emergency Planning (EP) personnel will be performed no later than 2015, prior to NMP1 design implementation. These programs and controls will be implemented in accordance with the Systematic Approach to Training (Reference 26).

Describe Regional Response Center plan	*Discussion in this section may include the following information and will be further developed as the Regional Response Center development is completed.* • *Site-specific Regional Response Center (RRC) plan* • *Identification of the primary and secondary RRC sites* • *Identification of any alternate equipment sites (i.e. another nearby site with compatible equipment that can be deployed)* • *Describe how delivery to the site is acceptable* • *Describe how all requirements in NEI 12-06 are identified*

Constellation Energy Nuclear Group (CENG) has signed contracts and issued purchase orders to Pooled Inventory Management (PIM) for all five CENG units for participation in the establishment and support of two (2) Regional Response Centers (RRCs) through the Strategic Alliance for FLEX Emergency Response (SAFER). 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 two RRCs are located in Phoenix, Arizona and Memphis, Tennessee. There are no designated alternate equipment sites; however, each site has agreed to enter portable FLEX equipment inventory into the Rapid Parts Mart which is an internet based search capability currently used for other spare part needs. This capability provides a diverse network of potential alternate equipment sites for portable FLEX equipment.

SAFER will provide requested portable FLEX equipment to a local staging area where the equipment will be serviced (e.g., fuel and lubricating oil) and made ready for transport to the site. The criteria for the local staging area will be defined by June 2013. The staging area must be outside the 25 mile radius of the site, because the FLEX strategy evaluations assume that there will be significant damage and no power or communications within the 25 mile radius. If an individual site provides qualified power and communications to a staging area within the 25 mile radius, then that staging area will be considered acceptable. The RRC will support initial portable FLEX equipment delivery to the site within 24 hours of a request for deployment. **(Open Item: Define criteria for the local staging area by June 2013) (Open Item: Establish a suitable local staging area for portable FLEX equipment to be delivered from the RRC to the site)**

Each site will develop a playbook which will provide the detail necessary to ensure the

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successful delivery of the portable FLEX equipment from the RRC to the local staging area and from the local staging area to the site. Pilot playbooks are to be developed and ready for use by each site as a template by June 2013. **(Open Item: Develop site specific playbook for delivery of portable FLEX equipment from the RRC to the site)**

Notes:

Identify analyses or actions:

- Evaluate potential soil liquefaction for the Nine Mile Point site considering final storage location of FLEX portable equipment and deployment routes established for this equipment.
- Implement a design change to install permanent protected FLEX equipment connection points.
- Evaluate deployment strategies and deployment routes for hazards impact.
- Provide for on-site storage of Phase 2 FLEX components that is protected against "screened in" events by design or location.
- Exceptions for the site security plan or other (license/site specific – 10 CFR 50.54x) requirements of a nature requiring NRC approval will be communicated in a future 6 month update following identification.
- Evaluate requirements and options and develop strategies related to the storage on site of the FLEX portable equipment.
- NMP1 containment integrity for Phases 1 through 3 will be further evaluated using MAAP and analysis will be provided in a future required six month status report.
- Establish deployment routes from FLEX equipment storage location to connection points.
- Develop and implement a program and/or procedures to keep FLEX equipment deployment pathways clear or identify actions to clear the pathways.
- Determine schedule for when Regional Response Centers will be fully operational.
- Develop preventive maintenance and testing procedures with frequencies based on OEM recommendation and EPRI guidelines.
- Define criteria for the local staging area by June 2013.
- Establish a suitable local staging area for portable FLEX equipment to be delivered from the RRC to the site.
- Develop site specific playbook for delivery of portable FLEX equipment from the RRC to the site.

Maintain Core Cooling

STRATEGIES

Under a loss of all AC power, the operators will initiate ECs and begin load shedding to preserve battery power. Decisions to enter ELAP procedures are made within 1 hour, Operators are dispatched to energize a 600 VAC power board using a FLEX portable diesel generator (DG) and to restart a Control Rod Drive (CRD) pump thereby providing makeup water to the reactor. By maintaining appropriate reactor water inventory, the successful implementation of the FLEX strategy Phase 1 to 3 will prevent core damage.

Under Phase 1 (using installed equipment), the Operators will rely on the ECs to remove decay heat and to cool down the reactor. Inventory from the reactor is only lost through recirculation pump seals and other small sources (i.e. valve packing or seating leakage). Reactor water level without any injection will remain above the top of active fuel (TAF) for at least 8 hours in this condition (Reference 35). Station batteries will last at least 8 hours and will provide the necessary power to maintain critical instrumentation and provide critical parameter monitoring (Reference 29). When the ECs are exhausted (i.e. makeup water is depleted), the reactor pressure will be less than 150 pounds per square inch gauge (psig) and operators will continue the cooldown using the electromatic relief valves (ERVs) allowing decay heat to be exhausted to the Torus.

Under Phase 2 (using portable on-site FLEX equipment), the operators will energize a 600 VAC power board thereby providing the electrical power to restart a CRD pump and inject water from the Condensate Storage Tanks (CSTs) into the reactor. The CSTs contain sufficient water to provide water for at least 20 hours to the suction of the CRD pump. Operators will also deploy a portable FLEX pump to provide makeup water from Lake Ontario to the CSTs ensuring a long term indefinite supply of water for cooling the reactor. In addition, when the 600 VAC power board is reenergized, operators will restart a safety related battery charger to ensure long term capability for critical instrumentation to monitor the reactor and other parameters. Hardened Containment Vents will be opened to maintain containment parameters subsequent to the opening of ERVs in Phase 1. Portable equipment will be deployed early during the Phase 1 sequence, so as to ensure continuity of the strategy.

Under Phase 3 (using off-site RRC supplied equipment), portable equipment and consumables will be used to reinforce and secure for an indefinite coping time the measures implemented during Phase 2, mainly the make-up to the CST and the long-term operation of a low pressure portable injection pump. Restoration of installed plant equipment for core cooling (e.g., service water system, shutdown cooling system) begins in Phase 3.

OBJECTIVES

Reactor core cooling and heat removal requires reactor makeup sufficient to maintain or restore level to provide core cooling. Baseline capabilities include the use of installed equipment and FLEX equipment for Phase 1 and Phase 2 coping strategies. Performance attributes include cool down of the reactor and re-energizing a 600 VAC power board to ensure makeup injection sources are restored. Analysis should demonstrate that the guidance and equipment for combined reactor cool down and makeup capability supports continued core cooling. Sustained sources of water are available and sufficient to supply water indefinitely including consideration of concurrent makeup or spray of SFP. **(Open Item: Perform analysis for long term makeup capabilities with the CRD pump to ensure adequate makeup after ECs are exhausted and ERVs are opened to the Torus)**

ACCEPTANCE CRITERIA

No core damage will occur. Coping times will be calculated such that they preclude core damage. The codes used will ensure no core damage occurs including maintaining adequate core cooling through submergence.

Maintain Core Cooling

BWR Installed Equipment Phase 1

Determine Baseline coping capability with installed coping[1] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06:

- **RCIC/HPCI/IC**
- **Depressurize RPV for injection with portable injection source**
- **Sustained water source**

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

Power Operation, Startup, and Hot Shutdown

At the initiation of the BDBEE, main steam isolation valves (MSIVs) automatically close, feed water flow to the reactor is lost, and ERVs automatically cycle to control pressure, causing reactor water level to decrease. ECs will automatically initiate on high reactor pressure or low-low reactor water level (Reference 15) after the initiation of the SBO. In support of an ELAP condition, in order to preserve inventory in the reactor, Special Operating Procedure N1-SOP-33A.2 (Reference 11) will be revised such that Operators will manually initiate both ECs and close MSIV's when it is determined that an SBO condition exists versus waiting for an automatic initiation to occur. Currently, to conserve makeup water in the EC makeup tanks, operators are directed by the Special Operating Procedure for SBO (Reference 11) to throttle the makeup block valve to the ECs within the first 30 minutes of the SBO and to remove one EC loop from service in an attempt to limit the cool down to less than a 100°F per hour. The action to remove one EC from service may be counter to ensuring the longer term strategies under ELAP conditions are preserved. In order to ensure challenges to the recirculation pump seals are minimized and that leakage into the containment is maintained low, it is appropriate to initiate both ECs regardless of the resulting reactor cooldown rate. **(Open Item: Revise SBO procedures and ELAP procedures, when written, to direct that both EC's are immediately manually placed in service and to manually close MSIV's)**

After determination that EDGs cannot be restarted and off-site power cannot be restored for a period greater than the SBO coping time (currently 4 hours), the operating crew determines the event is an ELAP. It is assumed that this determination is made less than one 1 hour into the event. Overall coping time for core cooling in Phase 1 is greater than 8 hours (Reference 35). This assumes both ECs are in service at or near the onset of the event and adequate core cooling as a result of core submergence due to reactor water level staying above TAF during this time period. This coping time is based on limited leakage from the reactor coolant pressure boundary as explained below.

Total reactor coolant pressure boundary leakage during an ELAP condition can be assumed to be

[1]Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increased operating time on battery powered equipment.

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less than 45 gallons per minute (gpm) (recirculation pump total seal leakage is less than or equal to 20 gpm plus 25 gpm Technical Specification total allowable leakage) extending overall coping time to 8 hours based on NMP1 Appendix R Safe Shutdown Analysis (Reference 35). This seal leakage is based on the testing that was performed on the CAN2A seal cartridge in 1992 and 1997 and documented in References 36 and 37. **(Open Item: Perform an evaluation to ensure that the recirculation pump seal operating conditions are consistent with the referenced vendor test report.)**

Although the reactor level will remain above TAF for at least 8 hours, upon recognition of an ELAP, plant personnel will proceed immediately with the restoration of an installed 600 VAC power board (see diagram in Attachment 3D) with a portable FLEX DG. The DG will be sized to provide adequate power to the installed battery charger for the normal DC battery and battery board supply and to enable restarting a CRD pump (Reference 22) for reactor makeup from the CSTs (see diagram in Attachment 3C). The modification design will provide for this capability to be achievable within 3 hours from the onset of the ELAP. Alternate injection capability for core cooling from a portable FLEX diesel driven pump through the feed water system (see diagram in Attachment 3G) can be deployed in approximately 6 hours. The portable pump will be installed to take suction from a dry hydrant installed (see diagram in Attachment 3A) to take suction from the intake/Lake Ontario. **(Open Item: Implement a design change to install a permanent FLEX 600 VAC DG connection point to the 600 VAC power board) (Open Item: Implement a design change to install a permanent connection point for FLEX portable pump injection through feedwater) (Open Item: Implement a design change to install permanent dry hydrants in the intake structure for FLEX portable pump suction) (Open Item: Perform time validation of the core cooling injection capabilities when detailed design is complete, implementation procedures are drafted and final storage facility locations are determined for the portable equipment)**

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

If an ELAP occurs during Cold Shutdown, water in the reactor pressure vessel (RPV) will heat up. When temperature reaches 212°F, (Hot Shutdown) the RPV will begin to pressurize. During the heat up, the EC(s) can be returned to service, or ERVs can be opened to prevent reactor heatup and re-pressurization. The primary strategies for Cold Shutdown are the same as those for Power Operation, Startup, and Hot Shutdown as discussed above for core cooling.

During Refueling, many variables impact the ability to cool the core. In the event of an ELAP during Refueling, there are no installed plant systems to provide makeup water to cool the core. Thus, the deployment of Phase 2 equipment will begin immediately. To accommodate the activities of RPV disassembly and refueling, water levels in the RPV and the reactor cavity are often changed. The most limiting condition is the case in which the reactor head is removed and

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water level in the RPV is at or below the reactor vessel flange. If an ELAP/LUHS occurs during this condition then (depending on the time after shutdown) boiling in the core may occur in a relatively short period of time (e.g. approximately 3 hours). **(Open Item: Evaluate and implement procedures that direct immediate deployment of Phase 2 equipment during Refueling conditions)**

Pre-staging of FLEX equipment can be credited for some predictable hazards, but cannot be credited for all hazards per the guideline of NEI 12-06. Deployment of portable FLEX pumps to supply injection flow should commence immediately from the time of the event. This is plausible because more personnel are on site during outages to provide the necessary resources. During outage conditions, sufficient area and haul paths should be maintained in order to ensure FLEX deployment capability is maintained. **(Open Item: Provide administrative guidance to ensure that sufficient area is available for deployment and that haul paths remain accessible without interference from outage equipment during outages)**

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the Emergency Operating Procedures (EOPs).

Identify modifications	*List modifications*

- Implement a design change to install a permanent FLEX 600 VAC DG connection point to the 600 VAC distribution center.
- Implement a design change to install a permanent connection point for FLEX portable pump injection through feed water.
- Implement a design change to install permanent dry hydrants in the intake structure for FLEX portable pump suction.

Key Reactor Parameters	*List instrumentation credited for this coping evaluation.*

Reactor Vessel Essential Instrumentation	**Safety Function**
RPV Level LI 36-43, LI 36-44 (Ref. 14)	Reactor vessel inventory and core heat removal
RPV Pressure PI 36-31A, PI 36-32A (Ref. 14)	Reactor vessel pressure boundary and pressure control
EC Level LI 60-28A, LI 60-29A (Ref. 34)	Reactor vessel pressure boundary and pressure control

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Containment Essential Instrumentation	Safety Function
Drywell Pressure PI 201.2-105A, PI 201.2-106A (Ref. 14)	Containment integrity
Torus Pressure PI 201.2-594A, PI 201.595A (Ref. 14)	Containment integrity
Drywell Temperature TI 201-27B, TI 201-33B (Ref. 14)	Containment integrity
Torus Temperature TI 201.2-519, TI 201.2-520 (Ref. 14)	Containment integrity
Torus Level LI 58-06A, LI 58-05A (Ref. 14)	Containment integrity

Notes:

The current SBO coping capabilities are dependent upon injection to the reactor from the diesel fire pump (DFP). The mitigating strategies guidance (NEI 12-06, Reference 4) does not allow for crediting this capability (the DFP takes a suction from the UHS). The strategy associated with energizing a 600 VAC power board and restarting a CRD pump effectively replaces the capability to inject to the reactor in a short period of time following a loss of AC power event during an ELAP.

Identify analyses or actions:

- Perform analysis for long term makeup capabilities with the CRD pump to ensure adequate makeup after ECs are exhausted and ERVs are opened to the Torus.
- Revise SBO procedures and ELAP procedures, when written, to direct that both EC's are immediately manually placed in service and to manually close MSIV's.
- Perform an evaluation to ensure that the recirculation pump seal operating conditions are consistent with the referenced vendor test report.
- Perform time validation of the core cooling injection capabilities when detailed design is complete, implementation procedures are drafted and final storage facility locations are determined for the portable equipment.
- Evaluate and implement procedures that direct immediate deployment of Phase 2 equipment during Refueling conditions.
- Provide administrative guidance to ensure that sufficient area is available for deployment and that haul paths remain accessible without interference from outage equipment during outages.
- Implement a design change to install a permanent FLEX 600 VAC DG connection point to the 600 VAC distribution center.
- Implement a design change to install a permanent connection point for FLEX portable pump injection through feedwater.
- Implement a design change to install permanent dry hydrants in the intake structure for FLEX portable pump suction.

Maintain Core Cooling

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Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (RCIC/HPCI/IC) and strategy (ies) utilized to achieve this coping time.

Primary Strategy

Deployment of Phase 2 portable equipment will begin when it is recognized an ELAP condition exists (within 1 hour) in Phase 1. A portable DG will be deployed and will enable re-energizing an existing safety related 600 VAC power board (PB16B) (Reference 22). This will provide power for restarting CRD Pump 11 and UPS 162 Battery Charger as well as other small loads (e.g., Motor Operated Valves). Reactor core cooling will be maintained by starting a CRD pump within the coping time for Phase 1 (8 hours). **(Open Item: Design and implement a modification that provides the connection and capability to reenergize the 600 VAC power board (PB16B) from a portable DG)**

CRD takes suction from the CSTs. During power operation, the minimum level required in the CST is 105,000 gallons of water (Reference 15). This amount of water will provide at least 20 hours (Reference 17) of injection into the RPV. During this time, a FLEX pump will be connected to the makeup line to the CST (see diagram in Attachment 3C). **(Open Item: Design and implement a modification that will provide a makeup connection to enable a portable pump to refill the CSTs)**

The 125 VDC batteries are available for up to 8 hours without recharging (References 18 and 29). Before battery voltage can no longer support essential loads, the battery charger will be restarted from the 600 VAC power board that the portable DG is supplying. An analysis will be performed to verify the capability of the portable DG to power one 125 VDC battery charger, the CRD Pump and other small selected loads. **(Open Item: Perform an analysis of the portable generator to determine it will be capable of supplying all expected loads)**

The UHS for NMP1 is Lake Ontario. A design change will install dry hydrants (see drawing in Attachment 3A) that will provide the ability for FLEX portable pump(s) to take a suction from the intake structure for the plant. As an alternative, if the intake structure were rendered unavailable, Nine Mile Point Unit 2 (NMP2) intake structure will have similar dry hydrant capability. This provides the ability to take suction from the intake and discharge to the CST's for an indefinite supply of makeup water. **(Open Item: Design and implement a modification that will provide suction source connection (e.g., dry hydrant) for a portable pump at the NMP1 and NMP2 intake structures)**

Alternative Strategy

An alternative to powering PB16B from the portable DG will be the ability to re-energize the

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BWR Portable Equipment Phase 2

opposite bus power board (PB17B). If for some reason it is required to energize PB17B equipment (e.g., PB16B unavailable), CRD operations will be with pump 12 and 172 Battery Charger (Reference 22). **(Open Item: Design and implement a modification that provides the alternative connection and capability to reenergize the 600 VAC power board (PB17B) from a portable DG)**

If the situation existed in which the CRD pumps were not available, the capability will exist to connect a FLEX portable pump to the dry hydrant and discharge to a connection into normal feedwater to the reactor in the Turbine Building (see diagram in Attachment 3G). **(Open Item: Design and implement a modification that will provide a makeup connection to enable a portable pump to inject to the reactor through a feed water connection)**

For Cold Shutdown and Refueling strategies, the strategies are the same as those discussed in the Phase 1 section.

Refueling Phase 2 strategies for makeup water include deployment of a FLEX portable generator for restoration of an installed 600 VAC power board with a portable DG sized to adequately provide power to the installed battery charger for the normal DC battery and battery board supply (Reference 16) which will enable restarting a CRD pump (Reference 22) for reactor makeup from CSTs. FLEX pumps will also be available to take suction from the intake (lake) and connect to the feed water connection as described in the Power Operation, Startup, and Hot Shutdown descriptions or provide makeup.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs. **(Open Item: Develop procedures/guidelines to address the criteria in NEI 12-06 to support existing symptom based strategies in the EOP's)**

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Identify modifications	*List modifications*

- Implement a design change to install a permanent FLEX 600 VAC DG connection point to the 600 VAC distribution center (Primary PB16B and Alternate PB17B)
- Implement a design change to install a permanent connection point for FLEX portable pump injection to the reactor through feed water
- Implement a design change to install permanent dry hydrants in the intake structures for NMP1 and NMP2 for FLEX portable pump suction
- Implement a design change to install permanent make up line to the CSTs to refill with a FLEX portable pump

Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Same as instruments listed in above section, Maintain Core Cooling Phase 1.

Phase 2 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

Storage / Protection of Equipment :

Describe storage / protection plan or schedule to determine storage requirements

Seismic	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level	*List how equipment is protected or schedule to protect.*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

Maintain Core Cooling

BWR Portable Equipment Phase 2

Severe Storms with High Winds	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

High Temperatures	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

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*
The storage structure(s) and location(s) have not yet been determined. Deployment routes and strategies will be identified after the storage location(s) are defined.	Implement staging area for the FLEX pumps to connect to the dry hydrants when the final designs are established.	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles, and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

Maintain Core Cooling

BWR Portable Equipment Phase 2

Notes:
The dry hydrants constructed for similar purposes at NMP2 are also available for the portable pumps at NMP1. Other sources of water include the potential for taking suction from the NMP2 Circulating Water Cooling Tower basin or directly from Lake Ontario (this option may be limited by weather).

Identify analyses or actions:

- Design and implement a modification that provides the connection and capability to reenergize the 600 VAC power board (PB16B) from a portable DG.
- Design and implement a modification that will provide a makeup connection to enable a portable pump to refill the CSTs.
- Perform an analysis of the portable generator to determine it will be capable of supplying all expected loads.
- Design and implement a modification that will provide suction source connection (e.g., dry hydrant) for a portable pump at the NMP1 and NMP2 intake structures.
- Design and implement a modification that provides the alternative connection and capability to reenergize the 600 VAC power board (PB17B) from a portable DG.
- Design and implement a modification that will provide a makeup connection to enable a portable pump to inject to the reactor through a feed water connection.
- Develop procedures/guidelines to address the criteria in NEI 12-06 to support existing symptom based strategies in the EOP's.

Maintain Core Cooling

BWR 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 (RCIC/HPCI/IC) and strategy (ies) utilized to achieve this coping time.

Primary Strategy

For Phase 3, the reactor core cooling strategy is to place one loop of Shutdown Cooling (SDC) in service. This will be accomplished by powering emergency bus 102 (PB102) (Reference 22) by utilizing a 4160 VAC DG supplied by the RRC. **(Open Item: Evaluate and implement a design change to install permanent generator connection points for the RRC 4160 VAC DG to PB102)**

By energizing the 4160 VAC bus, the Reactor Building Closed Loop Cooling (RBCLC) system and SDC can be restarted. To supply the cooling water to RBCLC (normally Lake Ontario from the Service Water system), a portable diesel pump from the RRC may take a suction from a dry hydrant or the lake, and connect the discharge to a currently existing fire water flange supplying the Emergency Service Water (ESW) system in the Reactor Building (see diagram in Attachment 3E). The RRC pump will be sized to provide sufficient flow to RBCLC to support SDC. This strategy for SDC can be accomplished utilizing a single large RRC pump or multiple RRC pumps. **(Open Item: Perform an analysis to determine the flow/capacity needed for the portable pump from the RRC to adequately supply the ESW system) (Open Item: Evaluate the connection point for the RRC portable pump to ESW and implement a design change to ensure that the pump can be connected) (Open Item: Evaluate implementation of makeup capability for the RBCLC system expansion tank to support restarting the system in Phase 3)**

Alternate Strategy

Alternate means of core cooling can be provided by powering emergency bus 103 (PB103) (Reference 22) and using the opposite SDC and RBCLC pumps that are used for the primary strategy. **(Open Item: Evaluate and implement a design change to install permanent generator connection points for the RRC 4160 VAC DG to PB103)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Maintain Core Cooling

BWR Portable Equipment Phase 3

Identify modifications	*List modifications*

- Implement a design change to install permanent 4160 VAC bus connection points to be able to connect to the RRC supplied DG including paralleling capability, as required, to connect more than one DG to an electrical bus.
- Implement a design change to ensure that the RRC pump can be connected to the Emergency Service Water system.

Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Same as instruments listed in above section, Maintain Core Cooling Phase 1.

Phase 3 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

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*
RRC equipment will be provided by a RRC. Initially, the RRC equipment will be transported to an interim staging area at least 25 miles from the Nine Mile Point site location. When delivered to the staging area, it will be prepared for operation and transported to the point of use area on site. NMP1 will evaluate and identify the staging area and deployment paths to move equipment from the staging area to the site point of use.	Implement a design change to install permanent DG connection point(s) to the 4160 VAC busses to connect to the RRC supplied DG.	Connection points for RRC equipment will be located in a structure protected against flooding, tornado missiles and seismic events. RRC connections will be installed to meet station and procedure requirements.

Maintain Core Cooling

BWR Portable Equipment Phase 3

Notes:

Identify analyses or actions:

- Evaluate and implement a design change to install permanent generator connection points for the RRC 4160 VAC DG to PB102.
- Perform an analysis to determine the flow/capacity needed for the portable pump from the RRC to adequately supply the ESW system.
- Evaluate the connection point for the RRC portable pump to ESW and implement a design change to ensure that the pump can be connected.
- Evaluate implementation of makeup capability for the RBCLC system expansion tank to support restarting the system in Phase 3.
- Evaluate and implement a design change to install permanent generator connection points for the RRC 4160 VAC DG to PB103.

Maintain Containment Integrity

STRATEGIES

With an ELAP, containment cooling is lost and over an extended period of time containment temperature and pressure can be expected to slowly increase. An analysis will be performed to determine the containment pressure profile during an ELAP / LUHS event, and to justify that the instrumentation and controls in containment which are relied upon by the operators are sufficient to perform their intended functions. Acceptance criteria will be defined and justified. The results of this analysis will be used to develop an appropriate mitigating strategy, including any necessary modifications. **(Open Item: Perform an analysis to determine the containment pressure profile during an ELAP / LUHS event and verify the instrumentation and controls in containment which are relied upon by the operators are sufficient to perform their intended function.)**

Heat addition to the containment during Phase 1 is directly related to the radiative heat and leakage from the recirculation pump seals and components. This leakage is less than 45 gpm and does not result in any significant pressure or temperature challenge to the containment. Early in Phase 2, the ERV's are opened and decay heat from the reactor previously being removed by ECs is directed to the Torus, thereby heating up the Torus water and eventually resulting in temperature and pressure in the containment that will require use of the Hardened Containment Vent System (HCVS) to maintain containment parameters.

In Phase 3, normal cooling systems restoration such as SDC and ventilation should result in being able to establish reduced heat load to the containment and eventual normalization of heat removal capability (i.e. RBCLC).

OBJECTIVES

Maintain containment parameters within design and provide adequate control of containment cooling capability in order to prevent any challenge to the containment structure or function.

ACCEPTANCE CRITERIA

Containment pressure and temperature are monitored and installed systems are utilized to maintain parameters and mitigate any challenges to the containment.

Maintain Containment

BWR Installed Equipment Phase 1

Determine Baseline coping capability with installed coping[2] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06:

- **Containment Venting or Alternate Heat Removal**
- **Hydrogen Igniters (Mark III containments only)**

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain core cooling. Identify methods (containment vent or alternative / Hydrogen Igniters) and strategy (ies) utilized to achieve this coping time.

During Phase 1, containment integrity is maintained by normal design features of the containment, such as the containment isolation valves and HCVS to be installed in accordance with NRC Order EA-12-050. In accordance with NEI 12-06 (Reference 4), the containment is assumed to be isolated following the event. **(Open Item: Implement a design change to install a HCVS in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents)**

ECs will be initiated manually per the procedure changes identified to support immediate manual initiation identified in Maintain Core Cooling Phase 1. The ECs will remove the energy from the Reactor and return the water to the RPV. The energy deposited to the containment is from radiative heat transfer, leakage from the reactor recirculation pump seals, and unidentified containment leakage. The drywell design pressure is 62 psig and the torus design pressure is 35 psig (Reference 7). The total leakage to the containment is nominally less than 45 gpm. In accordance with the evaluation contained in NEDC-33771P (Reference 25), this energy input is expected to result in containment parameters (temperature, pressure or level) staying well below any design limits. **(Open Item: Perform a site specific analysis to confirm that the containment parameters (temperature, pressure and level) stay below their design limits during Phase 1 following an ELAP)**

Containment integrity is maintained throughout Phase 1. Only permanently installed equipment will be utilized to maintain containment integrity.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control

[2] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increased operating time on battery powered equipment.

Maintain Containment

BWR Installed Equipment Phase 1

strategies in the EOPs.

Identify modifications	*List modifications*

NMP1 will implement a design change to install a HCVS in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents.

Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Containment Essential Instrumentation	**Safety Function**
Torus Water Temperature TI 201.2-519, TI 201.2-520 (Ref. 14)	Containment integrity
Torus Water Level LI 201.2-594C, LI 201.2-595D (Ref. 14)	Containment integrity
Torus Pressure PI 201.2-594A, PI 201.2-595A (Ref. 14)	Containment integrity
Drywell Ambient Temperature TI 201-27B, TI 201-33B (Ref. 14)	Containment integrity
Drywell Pressure PI 201.2-483A, PI 201.2-484A (Ref. 14)	Containment integrity
HCVS Rad Monitor (Component No. TBD)	HCVS effluent radioactivity
HCVS system valve position indication (Component No. TBD)	HCVS functionality
HCVS system pressure indication (Component No. TBD)	HCVS functionality
HCVS system power status (Component No. TBD)	HCVS functionality
Nitrogen system supply status (Component No. TBD)	HCVS functionality
HCVS effluent temperature (Component No. TBD)	HCVS functionality

Notes:

Identify analyses or actions:

- Implement a design change to install a HCVS in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents.
- Perform a site specific analysis to confirm that the containment parameters (temperature, pressure and level) stay below their design limits during Phase 1 following an ELAP.

Maintain Containment

BWR Portable Equipment Phase 2

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (containment vent or alternative / Hydrogen Igniters) and strategy (ies) utilized to achieve this coping time.

Containment integrity is maintained by permanently installed equipment. See Phase 1 description for discussion of containment integrity applicable throughout the event. Permanently installed equipment includes the HCVS to be installed as required by NRC Order EA-12-050.

At the end of Phase 1, the EC's will have exhausted the supply of makeup water rendering the ECs unavailable to remove decay heat. At this point, it will be necessary to open ERV's in order to maintain the reactor depressurized. Decay heat from the reactor will be transferred through the open ERV's to the Torus, thereby heating the Torus and necessitating the use of the HCVS to vent and maintain containment parameters.

Current analysis identifies that makeup water for the ECs (and therefore EC functionality) will be available for approximately 8 hours (Reference 38). At the end of this time the reactor will be at approximately 150 psig and 350°F (Reference 35). ERV's will need to be opened at this point to stabilize reactor pressure and to continue with the cool down. These actions are encompassed and defined in the current EOPs (Reference 12). As identified in Maintain Core Cooling Phase 2, a portable DG is connected and powering a 600 VAC power board providing a battery charger and continuous DC supply for ERV operations. **(Open Action: Perform analysis to identify the heat load expected during ELAP conditions and the time required to open vents to maintain containment parameters)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications*

NMP1 will implement a design change to install a HCVS in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents.

Maintain Containment

BWR Portable Equipment Phase 2

Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*

See instrumentation list in Phase 1 section.

Phase 2 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

Storage / Protection of Equipment :
Describe storage / protection plan or schedule to determine storage requirements

Seismic	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

Severe Storms with High Winds	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

Maintain Containment

BWR Portable Equipment Phase 2

High Temperatures	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.

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*
HCVS is designed as permanently installed equipment. No deployment strategy is required.	Implement a design change to install HCVS in accordance with NRC Order EA-12-050.	HCVS is designed as permanently installed equipment. No connection points are required.

Notes:

All Open Items associated with the installation and design of the HCVS in accordance with the requirements of NRC Order EA-12-050 are remanded to the Integrated Plan specifically written as required by that order and due to be delivered to the NRC by 2/28/13.

Identify analyses or actions:

- Perform analysis to identify the heat load expected during ELAP conditions and the time required to open vents to maintain containment parameters.

Maintain Containment

BWR 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 (containment vent or alternative / Hydrogen Igniters) and strategy (ies) utilized to achieve this coping time.

Containment integrity during Phase 3 will be maintained in accordance with the strategy defined for Phase 2. Once core cooling is maintained with SDC the decay heat from the reactor will no longer be added to the containment. Ambient losses from containment should overcome radiant and convective heat input to containment and the containment will cool. **(Open Item: Perform an analysis to determine when ambient heat losses will be enough to cool the containment with SDC in Phase 3)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications*

NMP1 will implement a design change to install a HCVS in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents.

Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*

See instrumentation list in Phase 1 section.

Phase 3 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

Maintain Containment

BWR Portable Equipment Phase 3

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*
HCVS is designed as permanently installed equipment. No deployment strategy is required.	Implement a design change to install HCVS in accordance with NRC Order EA-12-050.	HCVS is designed as permanently installed equipment. No connection points are required.

Notes:

All Open Items associated with the installation and design of the HCVS in accordance with the requirements of NRC Order EA-12-050 are remanded to the Integrated Plan specifically written as required by that order and due to be delivered to the NRC by 2/28/13.

Identify analyses or actions:

- Perform an analysis to determine when ambient heat losses will be enough to cool the containment with SDC in Phase 3.

Spent Fuel Pool Cooling

STRATEGIES

During an ELAP / LUHS event, SFP cooling capability is lost which, in the long term, can result in SFP boiling and loss of adequate SFP water level for protection of the spent fuel, as well as for maintenance of sufficient radiation shielding if no operator action is taken. Following a loss of SFP cooling, the SFP will heat up to a bulk temperature of 212^{0}F, at which time heat removal from the SFP will be due to boiling of the water with the steam removing the heat from the SFP. In these circumstances, a minimum water level of 10 feet above the top of the fuel has been determined to provide adequate short term shielding (Reference NEI 12-02).

The basic FLEX strategy for maintaining SFP cooling is to monitor SFP water level and provide makeup water capability to the SFP sufficient to recover and maintain SFP water level at or near normal.

The FLEX strategy during Phase 1 of an ELAP / LUHS event for SFP cooling is to utilize the SFP water level instrumentation installed in response to NRC Order EA-12-051 (Reference 2) to continuously monitor the SFP water level. Within the first 16 hours, stage a portable diesel driven pump for the addition of makeup water to the SFP as it is needed to restore and maintain the normal level in Phase 2. In Phase 3 (using off-site RRC supplied equipment); portable equipment will be used to restart normal installed SFP cooling systems if available. Note that the strategy in Phase 2 can be maintained indefinitely.

OBJECTIVES

Makeup to the SFP from portable injection sources must be provided. The various baseline capabilities must include:

- Provide adequate makeup via external connection to SFP cooling piping or other alternate location that provides a means to supply SFP makeup without accessing the interior of any building.
- Provide adequate makeup to the SFP via hoses on the refueling floor.
- Ensure a vent pathway for steam and condensate from SFP or provide analysis to justify the need does not exist.
- A minimum of 200 gpm to the SFP, or 250 gpm if overspray occurs, consistent with 10 CFR 50.54(hh)(2) will be provided.

ACCEPTANCE CRITERIA

No SFP fuel damage will occur. Coping times will be calculated such that they preclude fuel damage, including maintaining water level above the top of the active fuel.

Maintain Spent Fuel Pool Cooling	
BWR Installed Equipment Phase 1	
Determine Baseline coping capability with installed coping[3] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06: • **Makeup with Portable Injection Source**	
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 with portable injection source) and strategy (ies) utilized to achieve this coping time. Phase 1 strategy is to monitor SFP level to ensure expected level is maintained. A modification to install a new level indication with integral backup power supply, in accordance with the requirements of NRC Order EA-12-051, will allow for remote monitoring. Analysis indicate that SFP temperature will reach 212°F in approximately 8 hours and that water makeup to maintain level during this time is 42.8 gpm (Reference 21). Therefore, water addition is not required before the end of Phase 1. Fuel in the SFP is cooled by the design water level at the onset of the event, which is approximately 23' over the top of the fuel (Reference 19 and 20). Since the SFP is expected to reach boiling during an ELAP, an analysis is required to ensure there is a vent pathway for steam and condensate from the SFP or justification that the need does not exist. **(Open Item: Evaluate a strategy to provide a pathway for steam and condensate or justify why it is not needed)** An analysis is necessary for exceeding the current SFP design temperature of the NMP1 spent fuel pool. **(Open Item: Perform an evaluation to determine the effects and required actions for Spent Fuel Pool temperatures expected above design of 140°F during an ELAP)**	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.	
Identify any equipment modifications	*List modifications*
Design and install reliable wide range SFP water level instrumentation in accordance with the requirements of NRC Order EA-12-051.	

[3] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increased operating time on battery powered equipment.

Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.*
<u>Spent Fuel Pool Instrumentation</u>	**<u>Safety Function</u>**
Wide Range SFP Water Level (Component # TBD)	Maintain SFP Water Level

Notes:

All Open Items associated with the installation and design of the Spent Fuel Pool level instrumentation in accordance with the requirements of NRC Order EA-12-051 are remanded to the Integrated Plan specifically written as required by that order and due to be delivered to the NRC by 2/28/13.

Identify analyses or actions:

- Evaluate a strategy to provide a pathway for steam and condensate or justify why it is not needed.
- Perform an evaluation to determine the effects and required actions for Spent Fuel Pool temperatures expected above design of 140°F during an ELAP.

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 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 with portable injection source) and strategy (ies) utilized to achieve this coping time.

The normal SFP water level at the event initiation is approximately 23' feet (References 19 and 20) over the top of the stored spent fuel. Maintaining the SFP full of water at all times during the ELAP and LUHS event is not required; the requirement is to maintain adequate water level to protect the stored spent fuel and limit exposure to personnel on-site and off-site. For the purposes of this strategy, the objective is to maintain the higher of these and is the radiological restrictive level. This is conservatively identified as Level 2 in NEI 12-02, *Industry Guidance for Compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation"* and is specified as at least 10 feet above the fuel seated in the spent fuel racks.

Using the design basis maximum heat load, the SFP water inventory will heat up from 140°F to 212°F during the first 8 hours (Reference 21). Calculations identify that the required makeup rate to maintain the SFP filled during this time is 42.8 gpm (Reference 21). There are approximately 9,900 gallons per foot of level in the SFP. Using the makeup rate identified above, preliminary calculations identify that SFP water level will lower approximately 1 foot every 3.5 hours. At 23 feet above the fuel, it will take approximately 45 hours to reach a level 10 feet above the spent fuel (the level below which is assumed to prohibit access to the refuel floor from a radiological perspective). Thus, the transition from Phase 1 to Phase 2 for SFP cooling function is conservatively established to occur in Phase 2 within 24 hours of the onset of the ELAP event.

SFP cooling will be established in Phase 2 utilizing a portable pump to makeup to the SFP keeping the spent fuel covered. Phase 2 actions to have the pump connected and available for makeup are targeted to occur at ≤ 16 hours. By then, SFP water level should only have lowered by about 4.5 feet (Reference 21). **(Open Item: Perform analysis to verify SFP temperature and level after an ELAP event and adequate level for maintaining radiological access to the refuel floor)**

Makeup to the SFP will be provided by one of two baseline capabilities.

Primary Strategy

NMP1 will implement a design change to install a permanent connection point for a FLEX diesel driven portable pump to supply lake water to the SFP (see drawing in Attachment 3H). The pump will take suction from a dry hydrant to supply water from the intake as described in the Maintain Core Cooling Phase 2 section with a discharge connection point to the return line of the SFP cooling system. The line will be piped to the exterior wall of the Reactor Building. The connection points from the dry hydrant and to the SFP cooling system will be protected from external hazards consistent with the requirements in NEI 12-06. **(Open Item: Design and implement a modification that provides for connection of a FLEX portable pump to makeup to the SFP**

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 2

through the return line of the SFP cooling system)

Alternate Strategy

The alternate injection method to provide water to SFP is to run a fire hose from the FLEX diesel driven portable pump to the refuel floor and inject to the SFP. The pump will take suction from the dry hydrant discussed above. The discharge of the pump can be simply inserted into the SFP from the refuel floor or alternatively the discharge hose from the portable pump can be attached to a spray nozzle stored on the refuel floor (for B.5.b). The oscillating spray nozzle can be used to provide spray flow over the SFP. A variable to the alternate strategy includes the use of the existing B.5.b pump to satisfy the makeup water requirements. **(Open Item: Develop procedures to implement the connection of a FLEX portable pump to makeup water to the SFP during an ELAP event to include both Primary and Alternate strategies)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications*

- Design and implement a modification that provides for connection of a FLEX portable pump to makeup to the SFP through the return line of the SFP cooling system.
- Design and implement a modification to install SFP Wide Range Level indication addressing NRC Order EA-12-051.

Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.*

Spent Fuel Pool Instrumentation	**Safety Function**
Wide Range SFP Water Level (Component # TBD)	Maintain SFP Water Level

Maintain Spent Fuel Pool Cooling	
BWR Portable Equipment Phase 2	
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.	
High Temperatures	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.	

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 2

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*
The storage structure(s) and location(s) have not yet been determined. Deployment routes and strategies will be identified after the storage location(s) are defined. The spray nozzle and fire hoses needed to provide spray or makeup to the SFP will be kept at an accessible and protected location.	Implement a modification to install an external emergency fill connection for SFP inventory makeup. Implement a modification to install SFP Wide Range Level indication addressing NRC Order EA-12-051. Implement staging area for the FLEX pumps to connect to the dry hydrants when the final designs are established.	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles, and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

Notes:

All Open Items associated with the installation and design of the SFP water level instrumentation in accordance with the requirements of NRC Order EA-12-051 are remanded to the Integrated Plan specifically written as required by that order and due to be delivered to the NRC by 2/28/13.

Dry hydrants to be constructed for similar purposes at NMP2 (i.e. portable pump suction from the intake or fore bay) are also available for the portable pumps at NMP1. Other sources of water include the potential for taking suction from the NMP2 Circulating Water Cooling Tower basin or directly from Lake Ontario (this option may be limited by weather).

Identify analyses or actions:

- Perform analysis to verify SFP temperature and level after an ELAP event and adequate level for maintaining radiological access to the refuel floor.
- Design and implement a modification that provides for connection of a FLEX portable pump to makeup to the SFP through the return line of the SFP cooling system.
- Develop procedures to implement the connection of a FLEX portable pump to makeup water to the SFP during an ELAP event to include both Primary and Alternate strategies.

Maintain Spent Fuel Pool Cooling

BWR 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 with portable injection source) and strategy (ies) utilized to achieve this coping time. Cooling and filtration capability will need to be restored to reduce radiation levels for habitability.

For Phase 3, SFP cooling will continue as in Phase 2, fuel submergence via makeup water to the SFP from portable pumps. During Phase 3, the equipment from the RRC will be used to reenergize 4160 VAC power boards and the objective is to be able to restart and maintain the SFP cooling system. **(Open Item: An analysis of SFP cooling system capability for restoration activities will be performed considering that the SFP temperatures will be elevated)**. These evaluations may result in further requests to the RRC for equipment designed to enable cooling the spent fuel pool to restore normal system capability from reenergized 4160 VAC busses.

<u>Primary Strategy</u>
For Phase 3, the SFP cooling strategy is to place one loop of SFP Cooling in service. This will be accomplished by powering safety related 4160 VAC PB102 by utilizing a 4160 VAC portable DG. This capability and strategy is consistent with the discussion in Maintain Core Cooling Phase 3 using a DG from the RRC.

<u>Alternate Strategy</u>
Alternate means of SFP cooling can be provided by powering PB103 and using the opposite SFP cooling pump and RBCLC pumps that are used for the primary strategy.

Schedule:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications*

Implement a design change to install permanent generator connection point(s) to the 4160 VAC busses to connect to the RRC supplied DG. This is the same modification as described in the Maintain Core Cooling Phase 3 section.

Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation*

See instrumentation identified in Spent Fuel Pool Cooling Phase 1.

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 3

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*
Phase 3 equipment will be provided by the RRC. Equipment to be transported to the site will be staged initially at an interim area at least 25 miles from the Nine Mile Point site location. When delivered to the staging area, it will be prepared for operation and transported to the point of use area on site. NMP1 will evaluate and identify the staging area and deployment paths to move equipment from the staging area to the site point of use.	Implement a design change to install permanent generator connection point(s) to the 4160 VAC busses to accept the RRC DG(s).	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles, and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

Notes:
All Open Items associated with the installation and design of the Spent Fuel Pool level instrumentation in accordance with the requirements of NRC Order EA-12-051 are remanded to the Integrated Plan specifically written as required by that order, and due to be delivered to the NRC by 2/28/13.

Identify analyses or actions:

- An analysis of SFP cooling system capability for restoration activities will be performed considering that the SFP temperatures will be elevated.

Safety Functions Support

BWR Installed Equipment Phase 1

Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications.

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 strategy (ies) utilized to achieve coping times.

Main Control Room Habitability

Under current SBO conditions with no mitigating actions, the current analysis projects the control room temperature will peak at 102°F in 2 hours. This temperature remains constant for the remaining 4 hours of the SBO analysis (References 23 and 24). This temperature remains below the NUMARC 87-00 temperature of 110°F, the assumed temperature for efficient human performance (Reference 10). **(Open Item: Perform an analysis to evaluate long term temperature profiles in NMP1 Main Control Room (MCR) under ELAP conditions)**

Emergency Condenser Makeup Tank Area Habitability

Currently, the SBO response requires operators to respond and control level in the ECs by throttling the manual makeup isolation valves from the EC Makeup Tanks. These actions are currently bounded for at least 8 hours by the Appendix R Safe Shutdown analysis. These valves located in the Turbine Building are in a mild environment during normal operation. The environment is expected to remain mild following a plant trip. **(Open Item: Perform an analysis to validate the mild environment in NMP1 EC Makeup Tank Area during an ELAP)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.*

NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications and describe how they support coping time.*

None

Key Parameters	*List instrumentation credited for this coping evaluation phase.*

Temperature indication for the MCR is a Meter and Test Equipment Temperature Indicator.

[4] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increased operating time on battery powered equipment.

Safety Functions Support
BWR Installed Equipment Phase 1
(Open Item: Implement necessary administrative controls to ensure that appropriate M&T temperature equipment is maintained in the MCR for use)
Notes: A temperature indicator is used to record the MCR and Auxiliary Control Room temperatures per current procedure N1-ST-SO, Shift Checks. **Identify analyses or actions:** • Perform an analysis to evaluate long term temperature profiles in NMP1 Main Control Room (MCR) under ELAP conditions. • Perform an analysis to validate the mild environment in NMP1 EC Makeup Tank Area during an ELAP. • Implement necessary administrative controls to ensure that appropriate M&T temperature equipment is maintained in the MCR for use.

Safety Functions Support
BWR 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 strategy (ies) utilized to achieve coping times.

Main Control Room Habitability

(Open Item: Evaluate requirements and options and develop strategies to maintain MCR habitability after the long-term MCR temperature profile is developed)

Battery Room Ventilation

Hydrogen production begins when the battery charger is restored to service. During an ELAP, hydrogen gas will migrate out of the battery room through the exhaust ductwork into the Turbine Building atmosphere with concentration remaining below the explosive limits. (Reference 33). **(Open Item: Perform an analysis for long term environmental conditions in NMP1 Battery Rooms during an ELAP and evaluate any actions to mitigate the impact of this hydrogen production as required)**

Spent Fuel Pool Area

Per the NEI 12-06 guidance (see Table C-3), a baseline capability for the SFP may be required to provide a vent pathway for steam and condensate from the SFP. At NMP1, the EC's are located on the Refuel Floor and are a large addition of heat to the floor, therefore temperature as an environmental condition will need to be evaluated. **(Open Item: Perform an analysis of Refuel Floor/SFP area for long term environmental conditions) (Open Item: Evaluate the ELAP/FLEX strategy to cope with the potential pressurization of the refueling floor and to prevent buildup of steam and condensation if required)**

Debris Removal

(Open Item: Evaluate requirements and options and develop strategies related to the storage and transport of the on-site FLEX portable equipment) (Open Item: Purchase and maintain the required equipment to ensure debris removal capability to re-establish deployment routes, during all modes of operation) This deployment strategy will be included within an administrative program in order to keep pathways clear or actions to clear the pathways.

Transportation Equipment

(Open Item: Evaluate requirements and options and develop strategies related to the storage and transport of the on-site FLEX portable equipment) (Open Item: Purchase and maintain the required equipment to ensure the ability to transport FLEX portable equipment during all modes of operation)

Fuel Management (for portable equipment)

Nine Mile Point currently has 2 fuel trucks on site. Each truck has a capacity of approximately 1500 gallons of diesel fuel. The fuel trucks will be used to refuel the FLEX portable equipment. Fuel oil replenishment for the portable diesel equipment will be accomplished using the fuel oil transfer

Safety Functions Support

BWR Portable Equipment Phase 2

trucks referenced above. The fuel oil trucks will be re-filled from on-site safety related diesel fuel storage tanks utilizing portable fuel oil transfer pumps. The underground fuel oil storage tanks at NMP1 are maintained at > 23,300 gallons (Reference 15) and at NMP2 the storage tanks are maintained at > 118,813 gallons (Reference 30). Total fuel availability following an event is > 141,000 gallons. Procedures have been established that provide guidance for the ability to pump fuel from storage tanks to the fuel oil trucks (Reference 31). This provides well over 7 days of fuel for all FLEX portable equipment including NMP2. **(Open Item: Perform an evaluation to validate assumptions of fuel consumption and determine when off-site replenishment will be required)**

Procedures have been put in place to provide specific direction to utilize portable gasoline fueled transfer pumps to fill the fuel trucks from the on-site storage tanks (Reference 31).

Gasoline for operation of the small portable generators and the fuel oil transfer pumps will be provided in fire proof storage cabinets. **(Open Item: Provide the necessary storage facilities in order to provide fuel to the transfer pumps during an ELAP event)**

<u>Communications</u>
Backup power for the fixed satellite telephones:

- Power for the fixed satellite telephones in use at the plants will be from a high power UPS or similar modification providing backup power. **(Open Item: Perform an evaluation of the UPS strategy and design and implement a modification as required or formalize the use of the small portable gas generators (see below))**
- As an alternative, use of the FLEX portable gas generators may be considered in lieu of the high power UPS.

Power for the radio repeaters will be from a high powered UPS or similar modification providing battery backup for at least 24 hours. **(Open Item: Perform an evaluation of the redundant power strategy for radio repeaters and design and implement modifications or programmatic changes as required)**

Six (6) 1 kW gas generators are to be used to power communications and are to be accompanied by 5 gallons of gas in long term storage cans and lockers. These will be used to charge portable communication devices at the NMP1 and NMP2 MCRs and emergency response facilities. **(Open Item: Verify plans for the FLEX storage facilities in accordance with NEI 12-06 requirements also accommodate the storage and availability of fuel for the small gas generators)**

A supply of portable satellite telephone batteries will be provided at each of these locations to provide a minimum of 24 hours of operation.

Sound powered capabilities exist through the Maintenance Communication system. **(Open Item: Perform an analysis to determine the feasibility to utilize the sound powered telephone system for on-site communications for FLEX strategies)**

Safety Functions Support

BWR Portable Equipment Phase 2

Emergency Lighting
Installed emergency lighting in the MCR and the Emergency Battery Pack Lighting in the plant have a burn time of 8 hours. The MCR emergency lighting power is supplied from Battery 12 and Battery 14 (Reference 16). The duty cycle for Battery 12 and Battery 14 is 8 hours (Reference 29). The emergency battery packs are tested per S-EPM-GEN-813 to verify an 8 hour burn time.

A supply of flashlights, headlights, batteries and other lighting tools will be provided in strategic storage locations throughout the site, including the FLEX protected storage locations. **(Open Item: Verify plans for the FLEX storage facilities in accordance with NEI 12-06 requirements also accommodate the storage and availability of lighting tools such as flashlights and batteries)**

Dewatering
(Open Item: Perform an analysis of the need for dewatering based on leak rates and flood response capabilities and implement dewatering portable equipment and strategies based on this analysis). At a minimum, it is anticipated that four small pumps will be required to remove water from service water pump bays to prevent flooding the pump motors with an expected capability of at least 30 gpm. Separate generators may be required if electric submersible types are used. Educator types may also be considered. Water from dewatering may require processing or storage, depending on contaminants. Note that this is not a required strategy for core, containment or spent fuel pool cooling but for the long term consideration of normalization of plant systems.

Consumables (Food, Water, Toiletries, Sleeping Bags, etc.)
(Open Item: Evaluate required consumables and options for storage and availability during an ELAP and implement programmatic controls to ensure required inventory is maintained)

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.*

NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications necessary for phase 2*

The results of the analysis and evaluation identified to be performed in the Safety Functions Support Portable Equipment Phase 2 section above may require additional modifications or programmatic changes.

Safety Functions Support	
BWR Portable Equipment Phase 2	
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Phase 2 FLEX Safety Function Support equipment, if required, will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.	
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be stored in storage structures designed and constructed to meet the seismic requirements of NEI 12-06.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be stored in storage buildings designed and protected for storms and high winds in accordance with NEI 12-06.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be stored in storage buildings designed and protected for snow, ice, and extreme cold in accordance with NEI 12-06.	
High Temperatures	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be stored in storage buildings designed and protected for high temperatures in accordance with NEI 12-06.	

Safety Functions Support		
BWR Portable Equipment Phase 2		
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*
Deployment routes and strategies will be established once the decisions associated with the storage location and the required changes are identified through the analysis and evaluations above.	The results of the analysis and evaluation identified to be performed in the Safety Functions Support Portable Equipment Phase 2 section above may require additional modifications.	If required, connections will be designed to withstand the hazards as required in NEI 12-06.

Notes:

Identify analyses or actions:

- Evaluate requirements and options and develop strategies to maintain MCR habitability after the long-term MCR temperature profile is developed.
- Perform an analysis for long term environmental conditions in NMP1 Battery Rooms during an ELAP and evaluate any actions to mitigate the impact of this hydrogen production as required.
- Perform an analysis of Refuel Floor/SFP area for long term environmental conditions.
- Evaluate the ELAP/FLEX strategy to cope with the potential pressurization of the refueling floor and to prevent buildup of steam and condensation if required.
- Evaluate requirements and options and develop strategies related to the storage and transport of the on-site FLEX portable equipment.
- Purchase and maintain the required equipment to ensure debris removal capability to re-establish deployment routes, during all modes of operation.
- Purchase and maintain the required equipment to ensure the ability to transport FLEX portable equipment during all modes of operation.
- Perform an evaluation to validate assumptions of fuel consumption and determine when off-site replenishment will be required
- Provide the necessary storage facilities in order to provide fuel to the transfer pumps during an ELAP event.
- Perform an evaluation of the UPS strategy and design and implement a modification as required or formalize the use of the small portable gas generators.
- Perform an evaluation of the redundant power strategy for radio repeaters and design and implement modifications or programmatic changes as required.
- Verify plans for the FLEX storage facilities in accordance with NEI 12-06 requirements also accommodate the storage and availability of fuel for the small gas generators.
- Perform an analysis to determine the feasibility to utilize the sound powered telephone system for on-site communications for FLEX strategies.

Safety Functions Support
BWR Portable Equipment Phase 2
• Verify plans for the FLEX storage facilities in accordance with NEI 12-06 requirements also accommodate the storage and availability of lighting tools such as flashlights and batteries. • Perform an analysis of the need for dewatering based on leak rates and flood response capabilities and implement dewatering portable equipment and strategies based on this analysis. • Evaluate required consumables and options for storage and availability during an ELAP and implement programmatic controls to ensure required inventory is maintained.

Safety Functions Support

BWR 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 strategy (ies) utilized to achieve coping times.

Main Control Room Habitability

As identified in Safety Functions Support section for Phase 1, the MCR habitability is not expected to be a concern. Temperatures are expected to remain below habitability or equipment design maximum levels.

It would be desirable to restore some plant computer capability. Therefore, a strategy for restoring the environment of the MCR during Phase 3 is to power the MCR chillers and air handling units from the 600 VAC power board, which is energized from the 4160 VAC power board with large DG(s) from the RRC. Cooling water will be provided to the MCR air conditioning units by connecting a pump from the RRC to the Fire Water to Emergency Service Water flange (see drawing in Attachment 3E) to Reactor Building Service Water piping that supplies cooling water to the RBCLC. The RBCLC System in turn supplies the MCR air conditioning units (Reference 28). Attachment 3F illustrates the system interconnections and arrangements required to support this strategy. These are not being identified as Open Items, simply because they are not required to ensure long term maintenance of any of the key safety functions.

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.*

NMP1 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications necessary for phase 3*

Implement a design change to install permanent generator connection point(s) to the 4160 VAC busses to accept the RRC DG.

Key Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Phase 3 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

Safety Functions Support		
BWR Portable Equipment Phase 3		
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*
Deployment routes and strategies will be established once the decisions associated with the storage location and the required changes are identified through the analysis and evaluations above.	Implement a design change to install permanent generator connection points(s) to the 4160 VAC busses to accept the RRC DG. The results of the analysis and evaluation identified to be performed in the Safety Functions Support Portable Equipment Phase 2 section above may require additional modifications.	If required, connections will be designed to withstand the hazards as required in NEI 12-06.
Notes: None		

References

References used in this integrated plan and listed here are available for audit.

1) NRC Order 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
2) NRC Order EA-12-051, Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, March 12, 2012
3) NRC Interim Staff Guidance (ISG) JLD-ISG-2012-01, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, August 29, 2012
4) NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, August 2012
5) NEI 12-01, Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities, Revision 0, April 2012
6) 10 CFR Section 50.63, Loss of all alternating current power
7) Nine Mile Point Unit 1 Updated Final Safety Analysis Report, Revision 15
8) DCD-115, Design Criteria Document, Revision 1
9) Not used
10) NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, Revision 1, August 1991
11) N1-SOP-33A.2, Station Blackout, Revision 00700, December 2012
12) N1-EOP-2, RPV Control, Revision 1500, April 2011
13) PRAER N1-2013-001, NMP1 ELAP MAAP Results, Revision Draft, January 2013
14) N1-SOP-29.1, EOP Key Parameters--Alternate Instrumentation, Revision 000101, September 2011
15) Nine Mile Point Unit 1 Technical Specifications
16) N1-OP-47A, 125 VDC Power System, Revision 02401, October 2012
17) MDC-11, Pump Curves AND Acceptance Criteria, Revision 17, April 2011
18) Calculation 125VDC-SYSTEM-APPR, Appendix R Duty Cycle, Revision 6, July 2007
19) N1-OP-6, Fuel Pool Filtering and Cooling System, Revision 2700, September 2012
20) P & ID C-15132-C sheet 014, Revision 5, January 2004
21) S14-54HX018 Full Core Offload RFO 18, Revision 0, January 2005
22) N1-OP-30, 4.16KV, 600V and 480V House Service, Revision 03100, July 2012
23) S0-SBO-M015, Evaluation of Control Room Heat up During Station Blackout, Revision 0, January 1991
24) NER-1M-025, Station Blackout Evaluation, Revision 01, May 2008
25) NEDC-33771P, Project Task Report BWROG GEH Evaluation of FLEX Implementation Guidelines, Revision 1, January 2013
26) CNG-TR-1.01-1000, Conduct of Training, Revision 00900, August 2012
27) CNG-CM-4.01, Configuration Management, Revision 00000, July 2009

28) C-19409-C, sheet 11, One Line Diagram PB 1671, Revision 22, September 2002
29) System Design Basis Document SDBD-806, Electrical Distribution System, Revision 06, September 2008
30) Nile Mile Point Unit 2 Technical Specifications
31) S-DRP-OPS-004, Refueling Diesel Portable Equipment, Revision 0000, January 2013
32) Nine Mile Point Unit 2 Updated Safety Analysis Report, Revision 20, October 2012
33) S10H2GASHV01,Hydrogen Gas Concentration in Battery Rooms 11 and 12, Revision 0, November 1991
34) P&ID C-18017-C-001, Emergency Cooling System Piping & Instrumentation Diagram, Revision 55, June 2009
35) Calculation S22.2-XX-EOP001, NMP1 Appendix R Safe Shutdown Analysis, Revision 01
36) ACEL Research Report ET-S-331, 1992
37) ACEL Research Report ET-S-426, 1997
38) SDBD-204, Emergency Cooling System Design Basis Document, Revision 08, January 2008

BWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Five (5) 3419MX self-prime, diesel driven pumps (site total)	X		X			770 gpm 365 psi	Will follow EPRI template requirements
Five (5) enclosed 14' trailers (site total)	X		X			Means to store and transport hoses, strainers, cables, and miscellaneous equipment	Will follow EPRI template requirements
Three (3) 600 [2] VAC diesel driven, generators (site total)	X	X		X	X	500 kW [1]	Will follow EPRI template requirements
Two (2) B.5.b 3HA self-prime, diesel driven pumps (site total)	X		X			850 gpm 165 psi	Will follow EPRI template requirements

BWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Six (6) 1kW, 120 VAC, gas generators (site total)							Will follow EPRI template requirements for charging the batteries for the portable radios and satellite phones
Two (2) gas driven fuel oil transfer pumps (site total)	X		X	X			Will follow EPRI template requirements
Two (2) diesel driven air compressors						375 cfm 150 psig	
One (1) monitor spray nozzles for SFP spray and required hoses			X			Sized for 250 gpm	Will follow EPRI template requirements
Two (2) diesel fuel trucks	X		X	X		Approximately 1500 gallons	Will follow EPRI template requirements

1. Preliminary estimate of 500 kW actual capacity will be verified when load calculations are completed (Open Item identified in body of plan)
2. Current portable generators are 480 VAC and will be rewired or 600 VAC generators will be purchased. This compatibility is recognized as resolute in the design process.

BWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Ten (10) submersible dewatering pumps				X	X	30 gpm	Self-powered, electric or air discharge to ground level or temporary tanks
Ten (10) small capacity generators				X	X	6 kVA	Power for Electric dewatering
Two (2) 4160 VAC generators	X		X	X	X	2 MW	Portable 4160 VAC generator will power one installed SDC train
Six (6) portable exterior lighting					X	6 kW	Self-powered diesel, 30" mask
One (1) medium capacity generator						250 kVA 600 VAC	Power for TSC and OSC
Two (2) SFP makeup pumps			X			500 gpm 500 psig	Self-powered, low pressure pump (1 per unit)
Two (2) RCS inventory/cooling pumps	X					500 gpm 500 psig	Self-powered, low pressure pump (1 per unit)
Two (2) containment cooling pumps		X				2500 gpm 300 psig	Function for containment spray if required (1 per unit)

Phase 3 Response Equipment/Commodities	
Item	**Notes**
Radiation Protection Equipment • Survey instruments • Dosimetry • Off-site monitoring/sampling	
Commodities • Food • Potable water	
Fuel Requirements	
Heavy Equipment • Transportation equipment • Debris clearing equipment	

Attachment 1A Sequence of Events Timeline

Action item	Elapsed Time	Action	Time Constraint Y/N [5]	Remarks / Applicability
	0	Event Starts	NA	Plant @ 100% power
1	15 min	Emergency Condensers in service	N	Actuate on High Reactor Pressure or LOW-LOW Reactor water level. Manually placing the EC's in service early is desired and procedure revisions to support are necessary
2	15 min	Begin Battery load reduction	Y	N1-SOP-33A.2 Att. 4, reduce DC loads to extend station batteries
3	≤ 30 min	Perform action N1-SOP-33A.2 Attachments 2 and 4 • Open opposite charger disconnect • Open Main and Auxiliary Control Room panel doors • Throttle EC Makeup tank manual blocking valves • Configure the Emergency Diesel Generators	Y	Extend station battery Preserve make up water inventory to ECs

[5] Instructions: Provide justification if No or NA is selected in the remark column
If yes include technical basis discussion as required by NEI 12-06 Section 3.2.1.7

Attachment 1A (cont'd)
Sequence of Events Timeline

Action item	Elapsed Time	Action	Time Constraint Y/N [5]	Remarks / Applicability
4	≤1 hr	Attempts to start EDG have been unsuccessful. Enter ELAP procedures	Y	Entry into ELAP provides guidance for operators to perform ELAP Actions
5	1 hr	Deploy FLEX DG to re-energize PB16B	N	Water level remains above TAF for 8 hours
6	3 hrs	Verify 11 CRD pump has been started for RPV injection	N	8 hr RPV coping time
7	3 hrs	Battery Load reduction completed	Y	N1-SOP-32A.2
8	5 hrs	Battery Charger restarted for 125 VDC loads	N	8 hr battery coping time
9	8 hrs	SFP temperature reaches 212° F. Monitor level for boil off and leakage	N	Boil-off rate is slow with a large volume of water in SFP
10	10 hrs	Begin fuel oil consumption monitoring and replenishment actions	N	Approximately 12 to 14 hours run time on portable generator
11	12 hrs	Diesel driven pump connected for CST Makeup	N	20 hours of makeup from minimum CST level
12	16 hrs	Diesel driven pump connected for SFP Makeup	N	Boil-off rate is slow with a large volume of water in SFP
13	72 hrs	Transition from Phase 2 to Phase 3 for Core Cooling function by placing RRC Pumps in service	N	

Attachment 1B Analysis Deviation Table

Item	Parameter of Interest	Analysis Value	Page	Plant Applied Value	Gap and Discussion
	None				

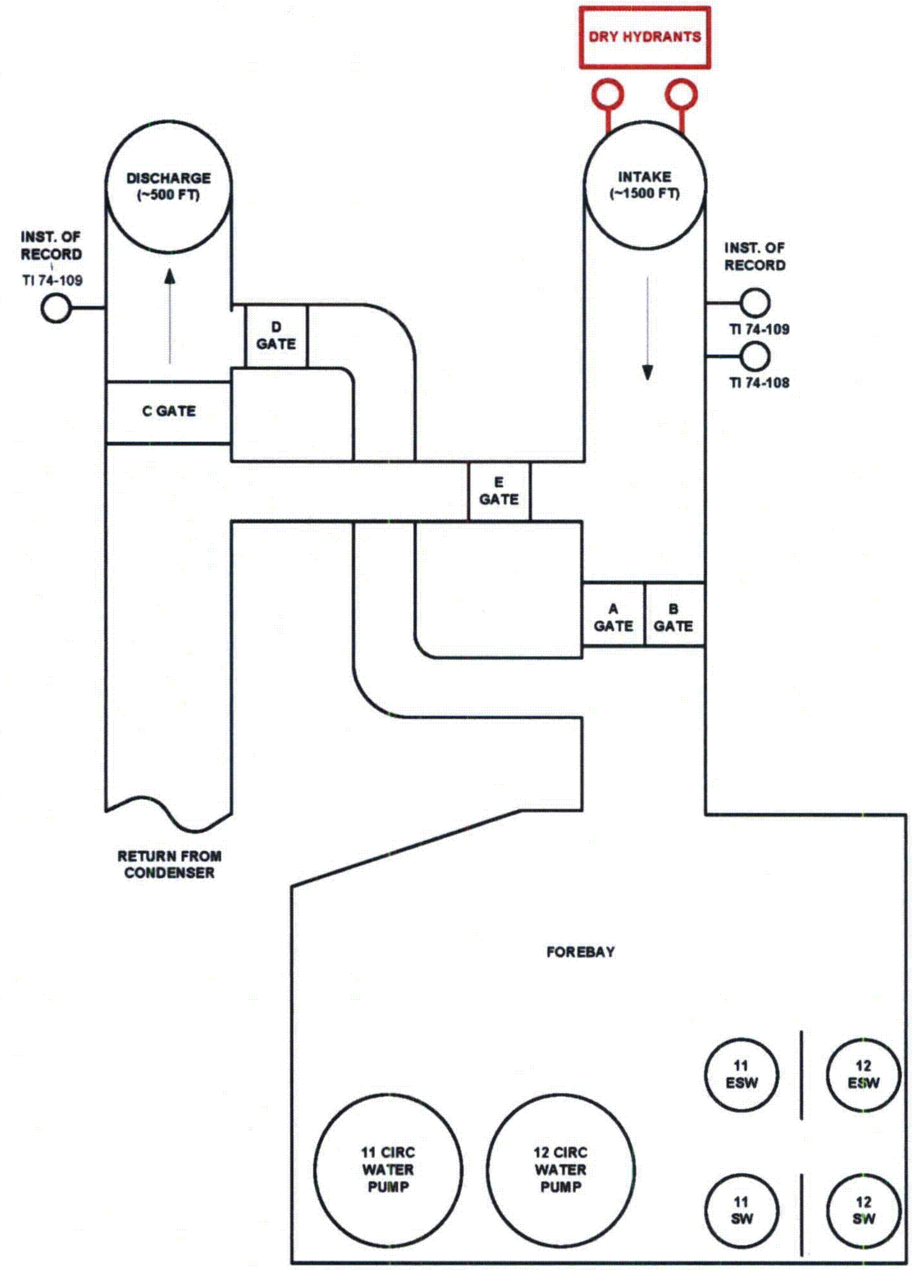
Attachment 2 Milestone Schedule

The following milestone schedule is provided. The dates are planning dates subject to change as design and implementation details are developed. Any changes to the following target dates will be reflected in the subsequent 6 month status reports.

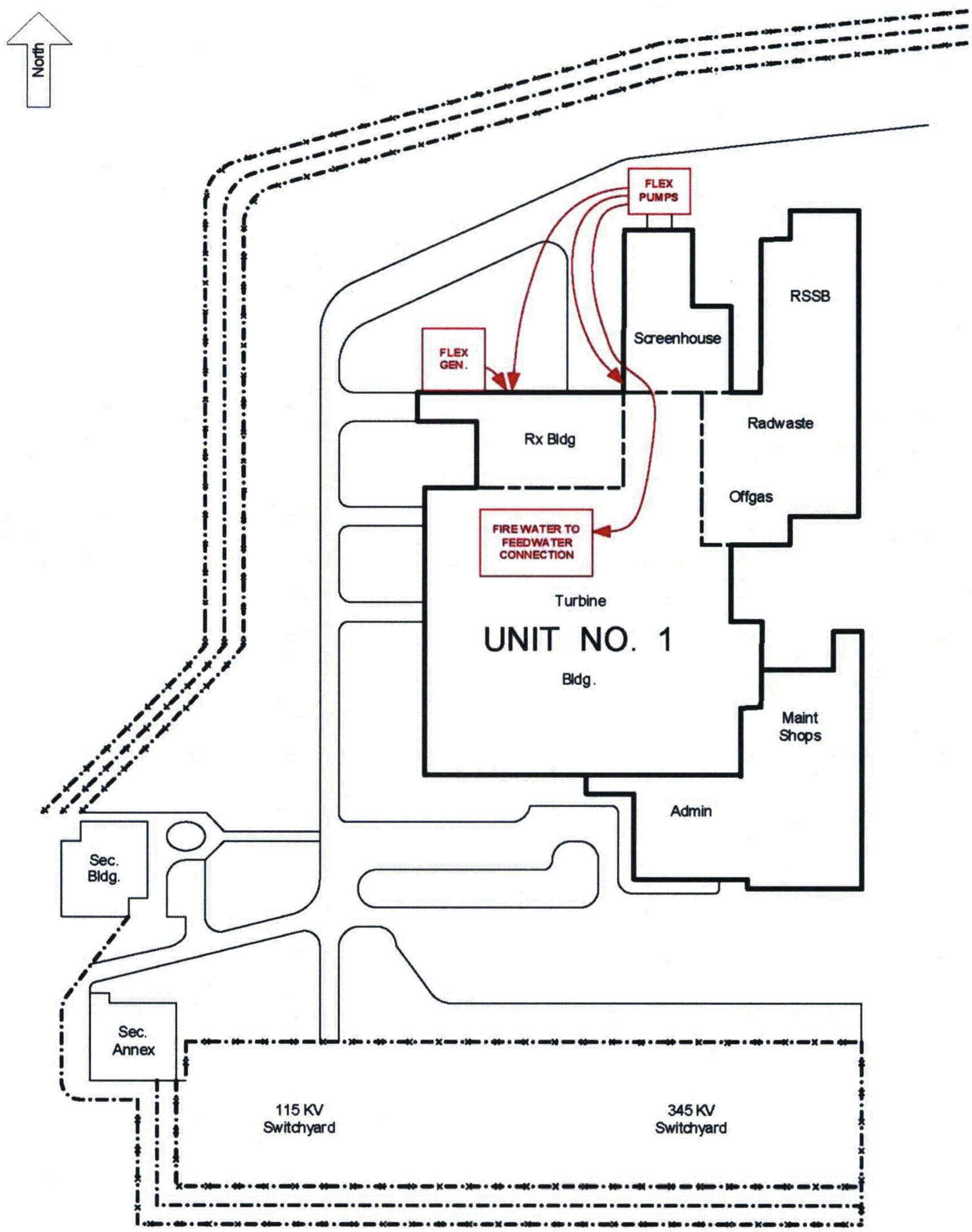
Original Target Date	Activity	Status (Include Date Changes in this column)
October 2012	Submit 60 Day Status Report	Completed
February 2013	Submit Overall Integrated Implementation Plan	
Spring 2013	Refueling Outage	
August 2013	6 Month Integrated Plan Progress Report	
January 2014	Engineering and Design Completion - Equipment Storage Facility	
February 2014	6 Month Integrated Plan Progress Report	
February 2014	Engineering and Design Completion - Portable Equipment Connections	
August 2014	6 Month Integrated Plan Progress Report	
February 2015	6 Month Integrated Plan Progress Report	
March 2015	Non-outage Installation-Portable Equipment Connection	
March 2015	Portable Equipment Procedures Changes	
April 2015	FLEX Training	
May 2015[1]	Outage Installation- Portable Equipment Connections	
May 2015[1]	Equipment Storage Facility Installation	
July 2015	Final Implementation Notification to USNRC	

Note [1]: This is when full implementation is expected to be complete. The subsequent report will only document and notify the NRC as required.

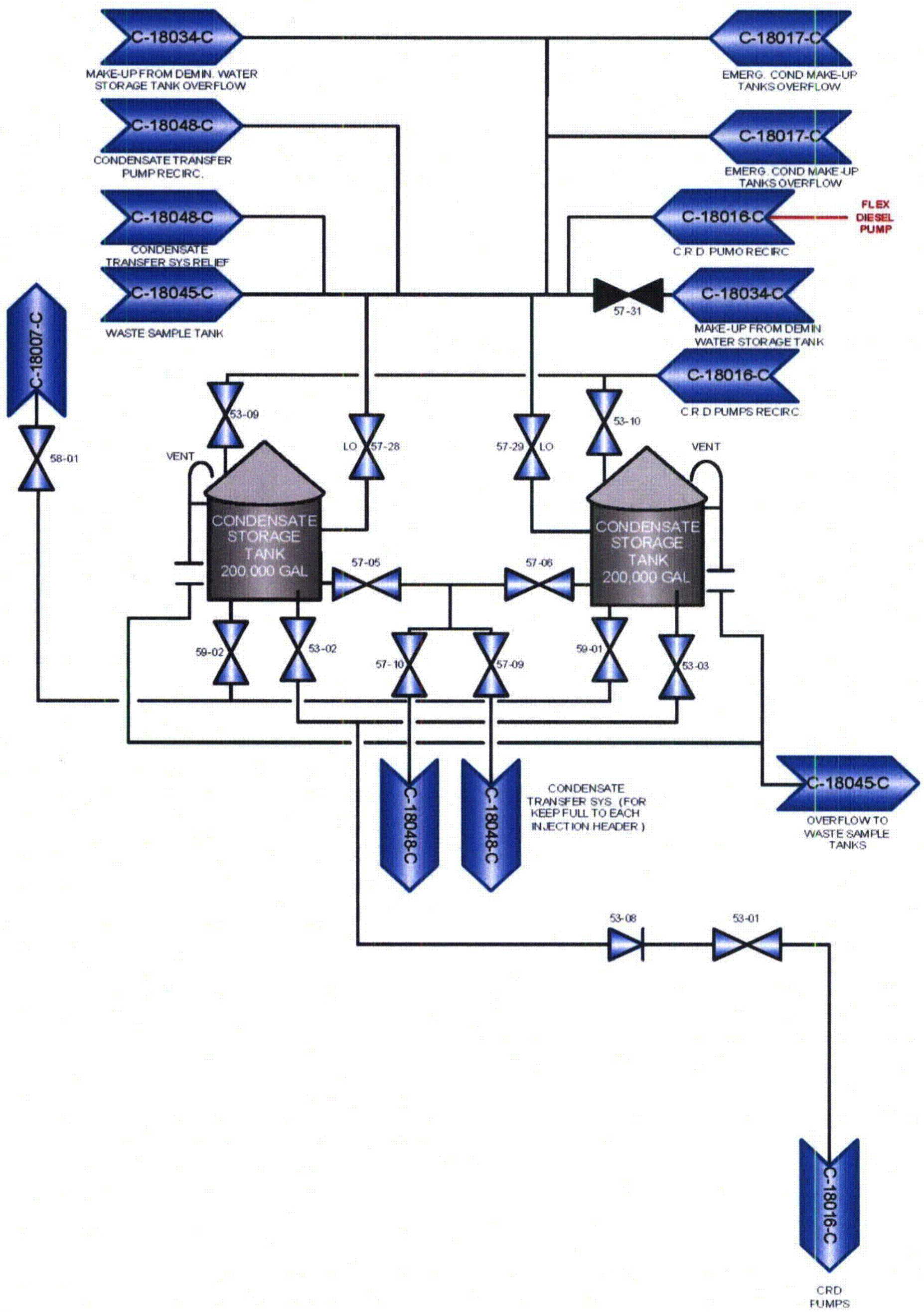
Attachment 3A FLEX Diesel Pump Connection



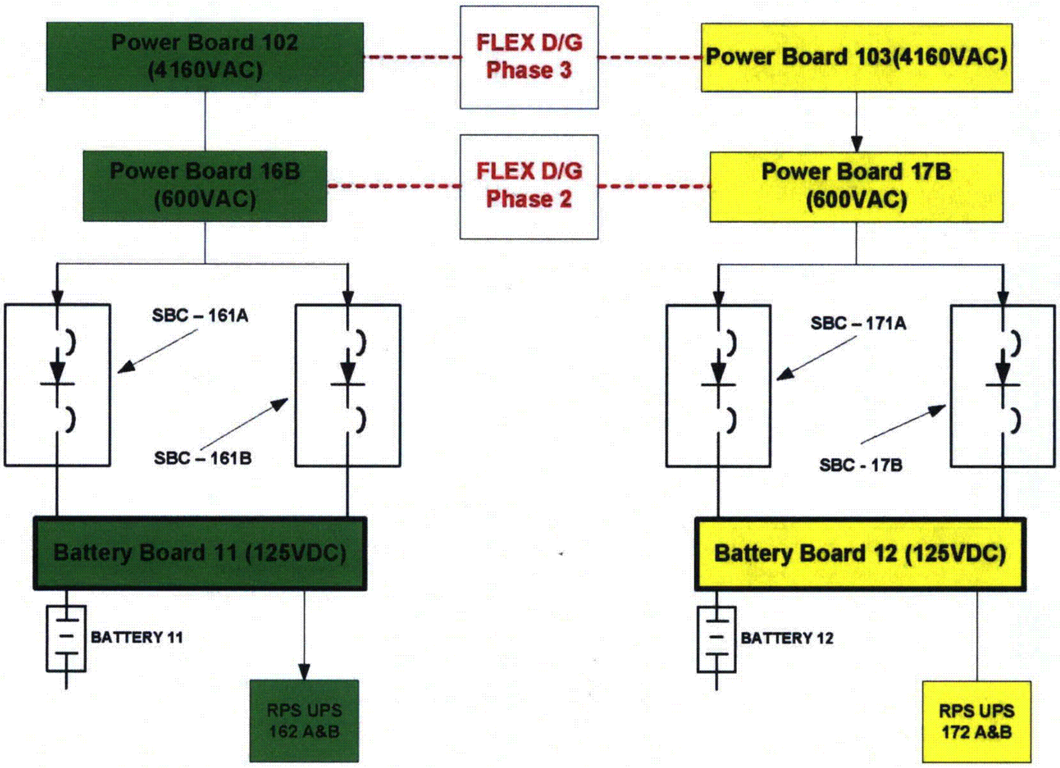
Attachment 3B NMP1 Deployment Sites



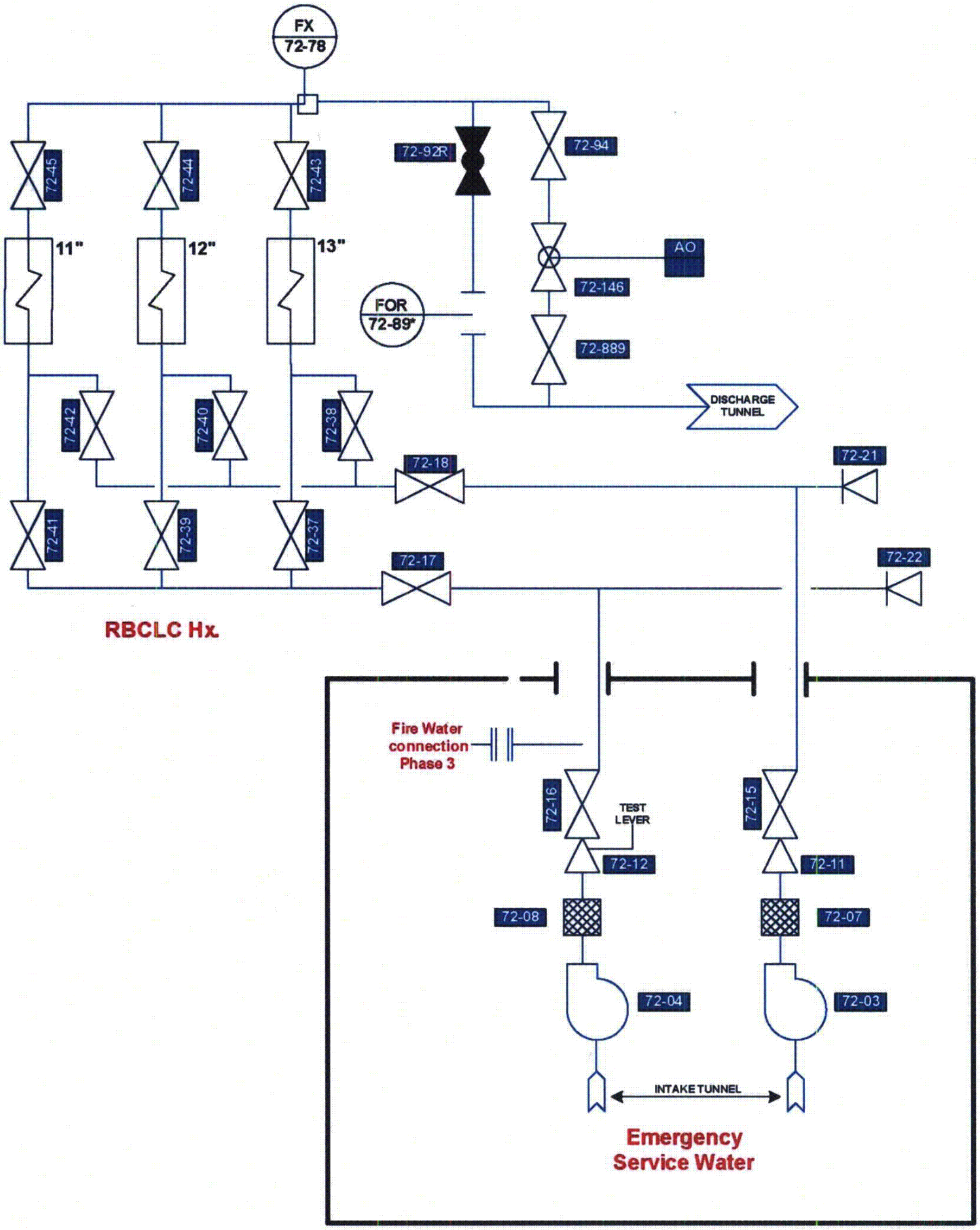
Attachment 3C Makeup to Condensate Storage Tanks



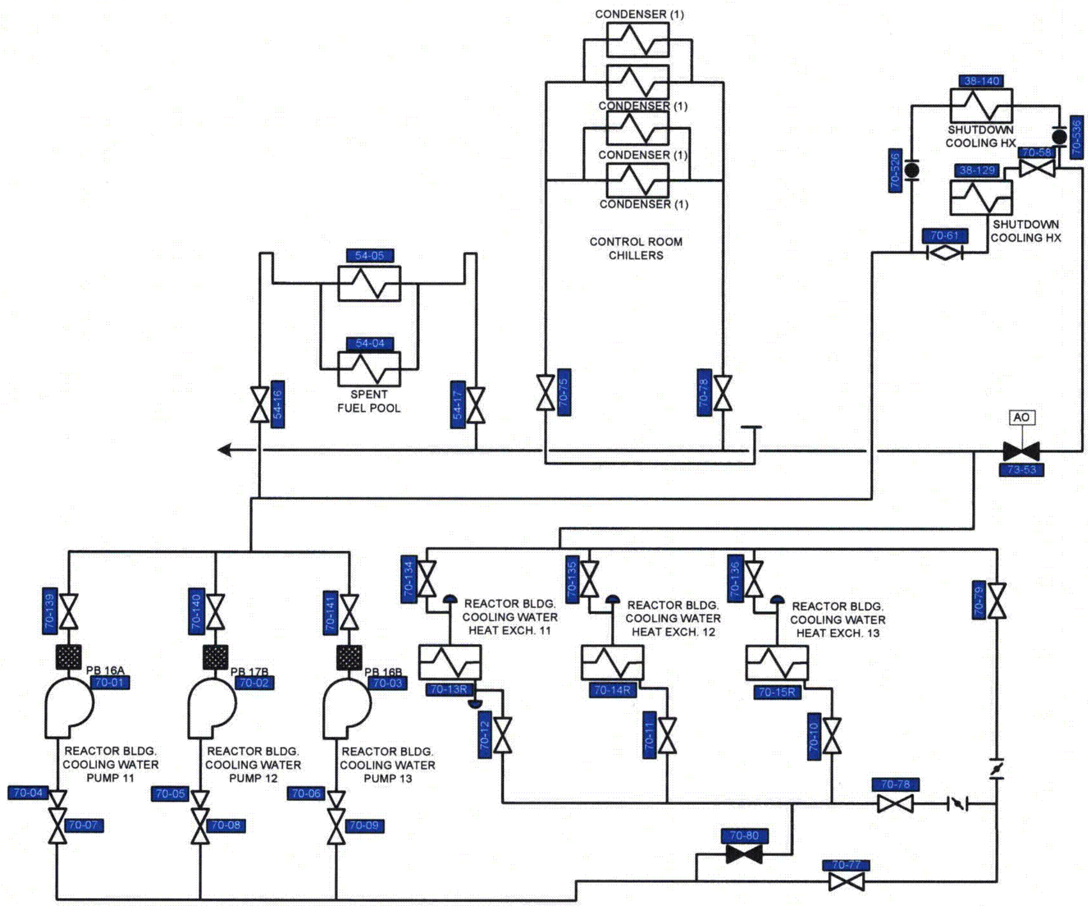
Attachment 3D FLEX Diesel Generators



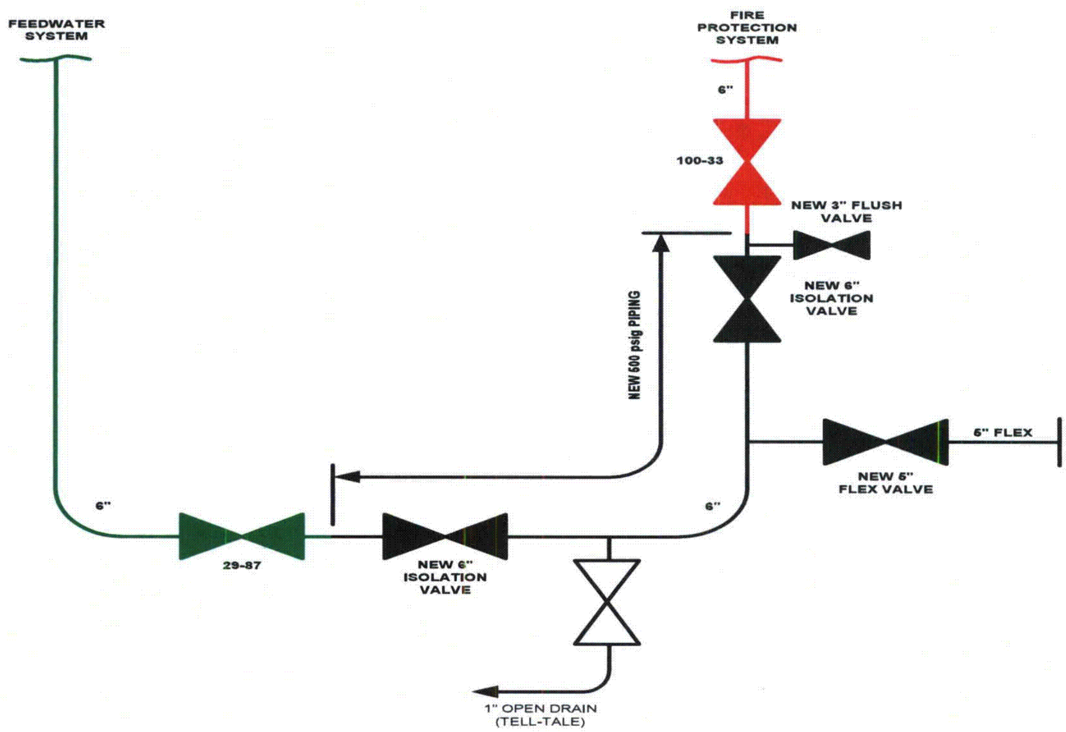
Attachment 3E Emergency Service Water to Reactor Building Closed Loop Cooling



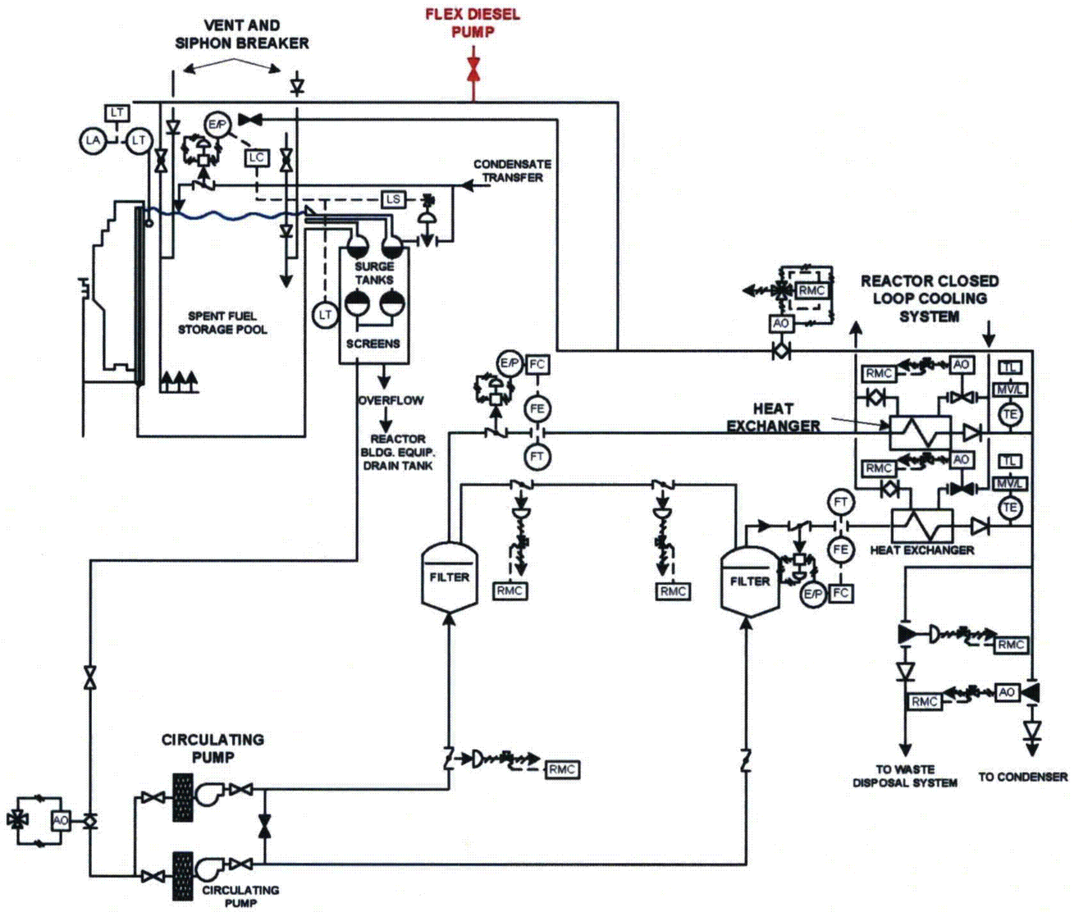
Attachment 3F Reactor Building Closed Loop Cooling Loads



Attachment 3G Firewater to Feedwater Connection



Attachment 3H Spent Fuel Pool Makeup



ATTACHMENT (3)

NINE MILE POINT UNIT 2 INTEGRATED PLAN FOR MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS

Constellation Energy Nuclear Group, LLC
February 28, 2013

Table of Contents

Introduction

Nuclear Regulatory Commission (NRC) Order EA-12-049, *Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, (Reference 31) requires a three-phase approach for mitigating beyond-design-basis external events (BDBEEs). 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, on-site equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from off site. The final phase requires obtaining sufficient off-site resources to sustain those functions indefinitely.

These strategies must be capable of mitigating a simultaneous loss of Alternating Current (AC) power and loss of normal access to the ultimate heat sink (LUHS) and have adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities following a beyond-design-basis external event. Reasonable protection must be provided for the associated equipment from external events. Such protection must demonstrate that there is adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities. The strategies must be implementable in all modes.

NRC Interim Staff Guidance (ISG) JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, (Reference 33) provides guidance to assist nuclear power reactor applicants and licensees with the identification of measures needed to comply with the requirements to mitigate challenges to key safety functions contained in Order EA-12-049. This ISG endorses, with clarifications, the methodologies described in NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide* (Reference 3).

NEI 12-06 outlines the process to be used by individual licensees to define and implement site-specific diverse and flexible mitigation strategies that reduce the risks associated with beyond-design-basis conditions. NEI 12-06 requires that each plant establish the ability to cope with the baseline conditions for a simultaneous extended loss of AC power (ELAP) and LUHS event and then evaluate the FLEX protection and deployment strategies in consideration of the challenges of the external hazards applicable to the site.

This integrated plan provides the Nine Mile Point Unit 2 (NMP2) approach for complying with Order EA-12-049 using the methods described in NRC JLD-ISG-2012-01. The current revision of the NMP2 Integrated Plan is based on conceptual design information and will be revised as detailed design engineering progresses. Consistent with the requirements of Order EA-12-049 and the guidance in NEI 12-06, the NMP2 six-month reports will delineate progress made, including an update of milestones accomplished since the last report, any proposed changes in compliance methods, updates to the schedule, and if needed, requests for relief and the basis.

Implementation Capability Requirements Overview

The primary FLEX objective is to develop the capability for coping with a simultaneous ELAP and LUHS event for an indefinite period through a combination of installed plant equipment, portable on-site equipment, and off-site resources. The baseline assumptions have been established on the presumption that other than the loss of normal and alternate AC power sources and normal access to the Ultimate Heat Sink (UHS), installed equipment that is designed to be robust with respect to design basis external events is assumed to be fully available. Installed equipment that is not robust is assumed to be unavailable. Permanent plant equipment, cooling and makeup water inventories, and fuel for FLEX equipment contained in systems or structures with designs that are robust with respect to seismic events, floods, high winds and associated missiles are available. Other equipment, such as portable AC power sources, portable back up DC power supplies, spare batteries, and equipment for Title 10 of the Code of Federal Regulations 10 CFR 50.54(hh) (2), may be used provided it is reasonably protected from the applicable external hazards and has predetermined hookup strategies with appropriate procedures/guidance and the equipment is stored in a relative close vicinity to the site. Installed electrical distribution systems, including inverters and battery chargers, remain available provided they are protected consistent with current station design.

The FLEX strategy relies upon the following principles:

1. Initially cope by relying on installed plant equipment. (Phase 1)
2. Transition from installed plant equipment to on-site FLEX equipment. (Phase 2)
3. Obtain additional capability and redundancy from off-site resources until power, water, and coolant injection systems are restored or commissioned. (Phase 3)
4. Response actions will be prioritized based on available equipment, resources, and time constraints. The initial coping response actions can be performed by available site personnel post-event.
5. Transition from installed plant equipment to on-site FLEX equipment may involve on-site, off-site, or recalled personnel as justified by evaluation.
6. Strategies that have a time constraint to be successful are identified and a basis provided that the time can reasonably be met.

An element of a set of strategies to maintain or restore core and SFP cooling and containment functions includes knowledge of the time that NMP2 can withstand challenges to these key safety functions using installed equipment during a BDBEE. This knowledge provides an input to the choice of storage locations and conditions of readiness of the equipment required for the follow-on phases. This duration is related to, but distinct from the specified duration for the requirements of 10 CFR 50.63, *Loss of all alternating current power*, (Reference 30) paragraph (a), because it represents the NMP2 current capabilities rather than a required capability. As such, NMP2 will 1) account for the SFP cooling function, which is not addressed by 10 CFR 50.63(a); and 2) assume the non-availability of alternate AC sources, which may be included in meeting the specified durations of 10 CFR 50.63(a). This is implicit in the FLEX principles described in Section 3.2.1.7, Paragraph (6) and Section 3.2.2, Paragraph (1) of NEI 12-06. Maintenance of the guidance and strategies addressing the estimate of capability will be kept current to reflect plant conditions following facility changes such as modifications or equipment outages. NMP2 recognizes that changes in the facility can impact the duration for which the initial response phase can be accomplished, the required initiation times for the transition phase, and the required delivery and initiating times for the final phase.

Implementation Plan

Capabilities for responding to ELAP and LUHS scenarios caused by (BDBEEs) are described in the following sections.

General Integrated Plan Elements BWR

Determine Applicable Extreme External Hazard **Ref: NEI 12-06 (Reference 3) 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 (Reference 3) sections 5 – 9 were applied and the basis for why the plant screened out for certain hazards.*

The applicable extreme external hazards for Nine Mile Point Unit 2 (NMP2) are seismic, external flooding, ice, snow, high winds (including tornadoes), extreme low temperature and extreme high temperature as detailed below:

Seismic Hazard Assessment:
Per the NMP2 Updated Safety Analysis Reports (USAR) (References 1, Sections 2.5.2.6 and 2.5.2.7), the seismic criteria for NMP2 include two design basis earthquake spectra: Operating Basis Earthquake (OBE) and the Safe Shutdown Earthquake (SSE). The OBE and the SSE are 0.075g and 0.15g, respectively; these values constitute the design basis of NMP2. Per Nuclear Energy Institute (NEI) 12-06 (Reference 3 Section 5.2), all sites will consider the seismic hazard.

The NMP2 Updated Safety Analysis Report (USAR) (Reference 1) and the Nine Mile Point Unit 1 (NMP1) Updated Final Safety Analysis Report (UFSAR) (Reference 36) were reviewed to determine the potential for soil liquefaction under design earthquake conditions at the site. Per the NMP2 USAR Section 2.5.4.8 (Reference 1);

> "All major Category 1 structures are founded on bedrock or concrete fill. The Category 1 structural fill is limited to small areas that are bounded by foundation walls resting on bedrock and the fill functions only as a form during construction."

Although this statement is identified for NMP2 structures, it does not account for the potential deployment routes of FLEX portable equipment. **(Open Item: Evaluate potential soil liquefaction for the Nine Mile Point site considering final storage location of FLEX portable equipment and deployment routes established for this equipment)**

NMP2 screens in for an assessment for seismic hazard including liquefaction.

External Flood Assessment:
NMP2 is constructed below the design basis flood level and therefore cannot be considered a "dry" site as described in NEI 12-06 guidance (Section 6.2.1). Per the NMP2 USAR (Reference 1, Sections 2.4.2.3.3), the source of the event that leads to the design basis flood level of elevation 262.5', is a local Probable Maximum Precipitation (PMP) event in combination with historical maximum lake level. Per Table 6-1 of NEI 12-06 (Reference 3), the warning time would be days and the persistence of the event would be many hours to months.

NMP2 screens in for an assessment for external flooding impact.

General Integrated Plan Elements BWR

High Winds Hazard Assessment:

Per NEI 12-06 (Reference 3) Figure 7-1, NMP2 has a 1 in 1 million chance per year of a hurricane induced peak-gust wind speed of > 120 miles per hour (mph). Thus, NMP2 does not need to address high straight wind speeds and associated hazards.

Per NEI 12-06 (Reference 3) Figure 7-2, NMP2 has a 1 in 1 million chance of tornado wind speeds of 169 mph. This is greater than the threshold of 130 mph, therefore NMP2 will address tornado hazards, including tornado missiles, impacting FLEX deployment.

NMP2 screens in for an assessment of tornado hazards but not straight wind hazards.

Extreme Cold Hazard Assessment:
The guidelines provided in NEI 12-06 (Reference 3) Section 8.2.1, generally include the need to consider extreme snowfall at plant sites above the 35th parallel. The NMP2 reactor is located at latitude 43° 31' 17" north and longitude 76° 24' 27" west (Reference 1, Section 2.1.1.1). The NMP2 plant site is located above the 35th parallel thus the capability to address hindrances caused by extreme snowfall with snow removal equipment will be provided. Per Section 8.2.1 of NEI 12-06 (Reference 3), "It will be assumed that this same basic trend applies to extremely low temperatures." The lowest recorded temperature at or near NMP2 is -26°F and occurred in 1979 (Reference 1 Section 2.3.1.2.2). NMP2 site is located within the region characterized by the Electric Power Research Institute (EPRI) as ice severity level 5 (Reference 3, Figure 8-2).

NMP2 screens in for an assessment for low temperature, snow and ice.

Extreme High Temperature Hazard Assessment:
Per NEI 12-06 (Reference 3) Section 9.2, all sites will address high temperatures for impact on deployment of FLEX equipment. The maximum temperature observed at or near NMP2 was 98°F and occurred in 1953 (Reference 1, Section 2.3.1.2.2). Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.

NMP2 screens in for an assessment for Extreme High Temperature.

General Integrated Plan Elements BWR

Key Site assumptions to implement NEI 12-06 (Reference 3) strategies. **Ref: NEI 12-06 (Reference 3) section 3.2.1**	*Provide key assumptions associated with implementation of FLEX Strategies:* • *Flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes.* • *Exceptions for the site security plan or other (license/site specific) requirements of 10CFR may be required.* • *Deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours.* • *Certain Technical Specifications cannot be complied with during FLEX implementation.*

Key assumptions associated with implementation of FLEX Strategies for NMP2 are described below:

- Staffing re-evaluations pursuant to US Nuclear Regulatory Commission (NRC) letter, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force (NTTF) Review of Insights from the Fukushima Dai-ichi Accident, dated March 12, 2012, have not been completed and therefore not assumed in this submittal.
- Flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action program and addressed.
- Following plant conditions exist for the baseline case:
  - Seismically designed Direct Current (DC) battery banks are available.
  - Seismically designed Alternating Current (AC) and DC distribution is available.
  - Entry into Extended Loss of AC Power (ELAP) will occur by the one hour point.
  - Plant initial response is the same as Station Blackout (SBO).
  - Best estimate decay heat load analysis and decay heat is used to establish operator time and action.
  - No additional failure of Structures, Systems or Components (SSC) is assumed. Therefore, the Reactor Core Isolation Cooling system (RCIC) will perform as designed.

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- Portable FLEX components will be procured commercially.
- The design hardened connections will be protected against external events or are established at multiple and diverse locations. **(Open Item: Implement a design change to install permanent protected FLEX equipment connection points)**
- Deployment strategies and deployment routes, when established in accordance with the detailed design process, will be assessed for hazard impact. **(Open Item: Evaluate deployment strategies and deployment routes for hazard impact)**
- All Phase 2 FLEX components will be stored on site and will be protected against external events either by design or location. **(Open Item: Provide for on-site storage of Phase 2 FLEX components that is protected against "screened in" events by design or location)**
- The event impedes site access as follows: (NEI 12-01, Reference 5)
    - Post event time: 0 to 6 hours – No site access. This duration reflects the time necessary to clear roadway obstructions, use different travel routes, mobilize alternate transportation capabilities (e.g., private resource providers or public sector support), etc.
    - Post event time: 6 to 24 hours – Limited site access. Individuals may access the site by walking, personal vehicle or via alternate transportation capabilities (e.g., private resource providers or public sector support).
    - Post event time: 24+ hours – Improved site access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver equipment, supplies and large numbers of personnel.
- Maximum environmental room temperatures for habitability or equipment availability is based on NUMARC 87-00 (Reference 4) guidance if other design basis information or industry guidance is not available. Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.
- This plan defines strategies capable of mitigating a simultaneous loss of all alternating current (AC) power and loss of normal access to the ultimate heat sink resulting from a beyond-design-basis event by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at all units on a site. Though specific strategies are being developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety will be incorporated into the unit emergency operating procedures in accordance with established EOP change processes, and their impact to the design basis capabilities of the unit evaluated under 10 CFR 50.59. The plant Technical Specifications contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the beyond-design-basis event may place

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the plant in a condition where it cannot comply with certain Technical Specifications and/or with its Security Plan, and, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p). **(Open Item: Exceptions for the site security plan or other (license/site specific – 10 CFR 50.54x) requirements of a nature requiring NRC approval will be communicated in a future 6 month update following identification)**

- FLEX equipment storage location(s) have not been selected. Once a location or locations are finalized, implementation routes will be defined. **(Open Item: Evaluate requirements and options and develop strategies related to the storage on site of the FLEX portable equipment)**

Extent to which the guidance, JLD-ISG-2012-01 and NEI 12-06 (Reference 3), are being followed. Identify any deviations to JLD-ISG-2012-01 and NEI 12-06 (Reference 3). **Ref: JLD-ISG-2012-01** **NEI 12-06 (Reference 3) 13.1**	*Include a description of any alternatives to the guidance, and provide a milestone schedule of planned action.*

NMP2 has no known deviations to the guidelines in JLD-ISG-2012-01 and NEI 12-06 (Reference 3). If deviations are identified, the deviations will be communicated in a following 6 month update.

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 (Reference 3) 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 Attachment 1A*

Discussion of time constraints identified in Attachment 1A

- ≤ 15 minutes, operators bypass the Reactor Core Isolation Cooling (RCIC) room high temperature isolations from the Main Control Room (MCR). Due to loss of reactor building (RB) ventilation and RCIC turbine seal leakage, the RCIC pump room temp has been calculated (Reference 12) to exceed the RCIC room high temperature isolation set point during the SBO. This action is time critical in order to preserve the high pressure injection capability of RCIC. The actions are currently directed and bounded by NMP2 SBO analysis and directed by current procedures (References 7, 8 and 9).
- ≤ 30 minutes, open all MCR and Relay Room doors and all MCR and Relay Room panel access doors. This action promotes cooling of panel internals and minimizes local circuit heating (leading to failures). NMP2 calculation (Reference 14) identifies that MCR (99.7

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°F) and Relay Room (105.6°F) temperatures peak within two (2) hours. Due to loss of forced air ventilation, it is necessary to provide the maximum free air space for heat transfer and allow communication between components and that free air space. In order to accomplish this, the operator is directed to open all MCR and Relay Room Doors as well as Panel Access Doors by SBO procedures (References 7, 8 and 9). Panel Access Doors are opened to prevent localized heating of components inside of the panels. For the purposes of the heat up calculations (References 14 and 18) the MCR doors to the main corridors were the only doors assumed to be opened.

- ≤ 1 hour, Operators (2 or more if available) would be dispatched in accordance with current SBO procedures to perform the following actions;
    - Plant process computer shutdown for MCR habitability. The Plant Process Computer is a large load on the station non-class 1E batteries as well as a very large heat load in the MCR and Relay Room. Upon a loss of ventilation, malfunctions with the Plant Process Computers have been experienced at temperatures as low as 90°F. For these reasons, it was decided that the computers (Plant Process, Digital Radiation Monitoring, and 3-D Monicore) should be shutdown in the first hour of the event. The action is currently directed and bounded by NMP2 SBO analysis and procedures (References 7, 8 and 9).
    - Essential lighting load shedding for MCR habitability and DC conservation. These actions are currently directed and bounded by NMP2 SBO analysis and procedures (References 8, 9, 14 and 17).
- ≤ 1 hour, MCR staff verifies the short term duration of the event or that an ELAP condition exists. The time period of one (1) hour is selected conservatively to ensure that ELAP entry conditions can be verified by MCR staff and validate that EDGs are not available. One hour is a reasonable assumption for operators to be able to ascertain from power control that off-site power will be unavailable for an extended period of time. Timely entry into ELAP procedures is necessary to ensure that FLEX portable equipment is deployed at the appropriate times.
- ≥ 1 hour, the reactor pressure control band is lowered to 200 – 400 psig. The reduced pressure band is necessary to reduce pressure dependent leakage, increase the margin to the Heat Capacity Temperature Limit (HCTL) and approach the injection pressure for FLEX portable pumps. Currently, the Emergency Operating Procedures (EOPs) direct lowering reactor pressure when HCTL is going to be challenged. However, this proactive approach will require the development and implementation of procedures for this FLEX strategy. **(Open Item: Revise procedures to provide pressure control direction during an ELAP event)**
- ≤ 2 hours, operators dispatched in accordance with current SBO procedures (References 8 and 9) to complete the following actions:
    - Final actions for DC load shedding actions (load shedding is completed). Loads are selected and prior analysis provides for their removal based on necessity to support operation during a SBO. The actions are bounded by NMP2 SBO analysis

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(References 7 and 17).

- Open the RCIC room door maximizing natural circulation and minimizing RCIC room and equipment temperature. Equilibrium room temperature is calculated at 146°F (Reference 12). The action is bounded by NMP2 SBO analysis (Reference 7). **(Open Item: Perform an analysis for long term RCIC Room temperatures (for equipment qualification and habitability) under ELAP conditions considering elevated Suppression Pool and Secondary Containment temperatures)**
- Remove DC turbine bearing oil pump. The action is bounded by NMP2 Station Blackout analysis (Reference 7).
- Manually open Generator Hydrogen Emergency Dump Valve and stop the Emergency Seal Oil Pump when generator hydrogen reaches atmospheric pressure. This action is not in the current SBO procedures which assume restoration of power within 4 hours. **(Open Item: Develop and implement procedure direction to ensure that the Main Turbine Hydrogen is vented prior to battery depletion)**

- < 8 hours, portable FLEX generator is connected to a safety related 600 VAC bus to provide power to a battery charger and selected loads. Restoration of power for the battery charger is critical because instrumentation and Safety Relief Valve (SRV) control is lost if battery voltage decreases below 105 VDC. Present calculations support the most heavily loaded battery (Division I) to last 6.9 hours with load shedding (References 11 and 17). The remaining Divisional battery is encompassed by this calculation for SBO. **(Open Item: Perform an analysis to identify necessary actions to maximize battery coping time to at least 8 hours)**
- ≤ 8 hours, deploy a FLEX portable pump to connect to the division of Residual Heat Removal system (RHR) that has motor operated valves (MOVs) energized from the 600 VAC bus identified above.

Preliminary Modular Accident Analysis Program (MAAP) analyses performed for NMP2 indicate it will take approximately 8 hours for suppression pool temperature to reach 230°F, at which time the Hardened Containment Vent System (HCVS) valves will be opened and mass loss from the suppression pool will begin. Calculation of the rate at which the Suppression Pool level is expected to lower at this point and reach the minimum level necessary for accurate temperature indication is an additional 8 hours (reference the Maintain Containment Phase 2 section of this plan). Given the above, Suppression Pool makeup will be required at 16 hours from the initiation of the ELAP. The connection of the FLEX portable pump providing this capability is conservatively placed at ≤ 8 hours.

The same FLEX portable pump will be able to supply water for reactor inventory when RCIC is no longer available or desired. Securing RCIC will stop heat addition to the Suppression Pool. Based on the initial conditions required by NEI 12-06 of 100 days of full power operation preceding the event, preliminary NMP2 MAAP results (Reference 19) identify that enough decay heat exists for RCIC to have sufficient steam pressure and

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flow to supply injection for at least 72 hours. The FLEX portable pump primary water source will be lake water through dry hydrants installed into the service water forebay (see drawing in Attachment 3D). Lake Ontario is the UHS and provides an indefinite water supply.

- ≤ 8.3 hours, Operators initiate use of the Hardened Containment Vent System (HCVS) to maintain containment parameters and preserve RCIC operation. The Boiling Water Reactor Owners Group (BWROG), utilizing General Electric – Hitachi (GEH), has identified that extended RCIC operation at elevated Suppression Pool temperatures is possible (Reference 15). Modifications to RCIC will likely be necessary to allow operation at an elevated Suppression Pool temperature. Preliminary NMP2 MAAP analyses identify that it will take approximately 8.3 hours until Suppression Pool reaches approximately 230°F (Reference 19) and then venting the primary containment will be necessary to maintain approximately 230°F Suppression Pool temperature. **(Open Item: Perform a plant specific analysis to verify temperature limitations for Primary Containment performance to support RCIC operations) (Open Item: Implement a design change to RCIC that will support operation of the system at elevated Suppression Pool temperatures as identified in GEH 000-0155-1545, BWROG RCIC Pump and Turbine Durability Evaluation – Pinch Point Study (Reference 15))**

Technical Basis Support information

1. On behalf of the BWROG, GEH developed a document (Reference 21) to supplement the guidance in NEI 12-06 by providing additional BWR-specific information regarding the individual plant response to the ELAP and LUHS events. The document includes identification of the generic event scenario and expected plant response, the associated analytical bases and recommended actions for performance of a site-specific gap analysis. In the document, GEH utilized the NRC accepted SuperHex computer code methodology for BWR's long term containment analysis for the ELAP analysis. As part of this document, a generic BWR 5/Mark II containment NSSS evaluation was performed. The BWR 5/Mark II containment analysis is applicable to the NMP2 (a BWR 5/Mark II plant) coping strategy because it supplements the guidance in NEI 12-06 by providing BWR-specific information regarding plant response for core cooling, containment integrity, and SFP cooling. The information provided in the guidance was utilized as appropriate to develop coping strategies and for prediction of the plant's response.
2. **(Open Item: Evaluate NMP2 containment integrity for Phases 1 through 3 using MAAP and update calculations (Reference 23))**
3. A best estimate bounding decay heat table was developed by GEH using American National Standard Institute (ANSI 5.1-1979) (NEDC-33771P, Revision 1, Reference 21) for use in Nuclear Steam Supply System (NSSS) modeling.
4. Environmental conditions within NMP2 areas were evaluated utilizing methods and tools in NUMARC 87-00 (Reference 4).
5. Per the criteria in 10 CFR 50.63 and Regulatory Guide 1.155, NMP2 is a 4 hour coping plant for SBO considerations (Reference 11). Applicable portions of supporting analysis

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have been used in ELAP evaluations.

Identify how strategies will be deployed in all modes. **Ref: NEI 12-06 (Reference 3) section 13.1.6**	*Describe how the strategies will be deployed in all modes.*

Deployment routes will be established once the storage locations for FLEX equipment are defined. **(Open Item: Establish deployment routes from FLEX equipment storage location to connection points)** The identified paths and deployment areas will be accessible during all modes of operation. This deployment strategy will be included within an administrative program in order to keep pathways clear or provide actions to clear the pathways. **(Open Item: Develop and implement a program and/or procedures to keep FLEX equipment deployment pathways clear or identify actions to clear the pathways)**

Provide a milestone schedule. This schedule should include:
• **Modifications timeline**
  o **Phase 1 Modifications**
  o **Phase 2 Modifications**
  o **Phase 3 Modifications**
• **Procedure guidance development complete**
  o **Strategies**
  o **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 (Reference 3) section 13.1
	The dates specifically required by the 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 milestone schedule Attachment 2

See milestone schedule in Attachment 2.

The schedule for when Regional Response Centers will be fully operational is still to be determined. **(Open Item: Determine schedule for when Regional Response Centers will be fully operational).**

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Identify how the programmatic controls will be met. **Ref: NEI 12-06 (Reference 3) 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 (Reference 3). 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.*

NMP2 will establish a system designation for emergency portable equipment and will manage this system in a manner consistent with medium-risk plant systems per CNG-CM-4.01, Configuration Management (Reference 25). All elements of the program described in Section 11 of NEI 12-06 (Reference 3), including recommended "should" items will be evaluated for inclusion in the station program. The equipment for FLEX will have unique identification numbers. Installed structures, systems and components pursuant to 10 CFR50.63 (a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, Station Blackout. Preventive Maintenance procedures (PMs) will be established for all components and testing procedures will be developed with frequencies established based on type of equipment, original equipment manufacturer (OEM) recommendations and considerations made within EPRI guidelines. **(Open Item: Develop preventive maintenance and testing procedures with frequencies based on OEM recommendation and EPRI guidelines)**

Describe training plan	*List training plans for affected organizations or describe the plan for training development*

New training of general station staff and Emergency Planning (EP) personnel will be performed no later than 2016, prior to the NMP2 design implementation. These programs and controls will be implemented in accordance with the Systematic Approach to Training (Reference 26).

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Describe Regional Response Center plan	*Discussion in this section may include the following information and will be further developed as the Regional Response Center development is completed.* • *Site-specific Regional Response Center (RRC) plan* • *Identification of the primary and secondary RRC sites* • *Identification of any alternate equipment sites (i.e. another nearby site with compatible equipment that can be deployed)* • *Describe how delivery to the site is acceptable* • *Describe how all requirements in NEI 12-06 (Reference 3) are identified*

Constellation Energy Nuclear Group (CENG) has signed contracts and issued purchase orders to Pooled Inventory Management (PIM) for all five CENG units for participation in the establishment and support of two (2) Regional Response Centers (RRCs) through the Strategic Alliance for FLEX Emergency Response (SAFER). 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 two RRCs are located in Phoenix, Arizona and Memphis, Tennessee. There are no designated alternate equipment sites; however, each site has agreed to enter portable FLEX equipment inventory into the Rapid Parts Mart, which is an internet based search capability currently used for other spare part needs. This capability provides a diverse network of potential alternate equipment sites for portable FLEX equipment.

SAFER will provide requested portable FLEX equipment to a local staging area where the equipment will be serviced (e.g., fuel and lubricating oil) and made ready for transport to the site. The criteria for the local staging area will be defined by June 2013. The staging area must be outside the 25 mile radius of the site, because the FLEX strategy evaluations assume that there will be significant damage and no power or communications within the 25 mile radius. If an individual site provides qualified power and communications to a staging area within the 25 mile radius, then that staging area will be considered acceptable. The RRC will support initial portable FLEX equipment delivery to the site within 24 hours of a request for deployment. **(Open Item: Define criteria for the local staging area by June 2013) (Open Item: Establish a suitable local staging area for portable FLEX equipment to be delivered from the RRC to the site)**

Each site will develop a playbook which will provide the detail necessary to ensure the successful delivery of the portable FLEX equipment from the RRC to the local staging area and from the local staging area to the site. Pilot playbooks are to be developed and ready for use by each site as a template by June 2013. **(Open Item: Develop site specific playbook for delivery of portable FLEX equipment from the RRC to the site)**

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Notes:

Identify analyses or actions:

- Evaluate potential soil liquefaction for the Nine Mile Point site considering final storage location of FLEX portable equipment and deployment routes established for this equipment.
- Implement a design change to install permanent protected FLEX equipment connection points.
- Evaluate deployment strategies and deployment routes for hazards impact.
- Provide for on-site storage of Phase 2 FLEX components that is protected against "screened in" events by design or location.
- Exceptions for the site security plan or other (license/site specific – 10 CFR 50.54x) requirements of a nature requiring NRC approval will be communicated in a future 6 month update following identification.
- Evaluate requirements and options and develop strategies related to the storage on site of the FLEX portable equipment.
- Revise procedures to provide pressure control direction during an ELAP event.
- Perform an analysis for long term RCIC Room temperatures (for equipment qualification and habitability) under ELAP conditions considering elevated Suppression Pool and Secondary Containment temperatures.
- Develop and implement procedure direction to ensure that the Main Turbine Hydrogen is vented prior to battery depletion.
- Perform an analysis to identify necessary actions to maximize battery coping time to at least 8 hours.
- Perform a plant specific analysis to verify temperature limitations for Primary Containment performance to support RCIC operations.
- Implement a design change to RCIC that will support operation of the system at elevated Suppression Pool temperatures as identified in GEH 000-0155-1545, BWROG RCIC Pump and Turbine Durability Evaluation – Pinch Point Study (Reference 15).
- Evaluate containment integrity for Phases 1 through 3 using MAAP and update calculations (Reference 23).
- Establish deployment routes from FLEX equipment storage location to connection points.
- Develop and implement a program and/or procedures to keep FLEX equipment deployment pathways clear or identify actions to clear the pathways.
- Determine schedule for when Regional Response Centers will be fully operational.
- Develop preventive maintenance and testing procedures with frequencies based on OEM recommendation and EPRI guidelines.
- Define criteria for the local staging area by June 2013.
- Establish a suitable local staging area for portable FLEX equipment to be delivered from the RRC to the site.
- Develop site specific playbook for delivery of portable FLEX equipment from the RRC to the site.

Maintain Core Cooling

STRATEGIES

Under a loss of all AC power, the operators ensure RCIC initiates to maintain reactor inventory. Operators will take actions to maximize availability of RCIC. The water source for RCIC will be the CSTs (if available) or the Suppression Pool. Reactor pressure will be lowered to reduce pressure dependent leakage and maintain primary containment margin. Steam will be drawn off to lower pressure through Safety Relief Valve (SRV) manual actuation in the Control Room. RCIC will also draw steam from the reactor. Pressure control bands will be established to lower reactor pressure. Lowering pressure to a final 100 - 200 psig target will maintain RCIC as an injection source until a portable FLEX pump is deployed with a suction from Lake Ontario. RCIC will remain in service as long as possible for water quality considerations. Within 1 hour, Operators are dispatched to energize a 600 VAC power board using a FLEX portable diesel generator (DG) and place a battery charger in service to maintain critical parameter indications, SRV control and RCIC controls. By maintaining appropriate reactor water inventory, the successful implementation of the FLEX strategy Phase 1 to 3 will prevent core damage.

Under Phase 1 (using installed equipment); the Operators will rely on core submergence for adequate core cooling. Inventory from the reactor is lost through recirculation pump seals, SRV steam flow, RCIC steam flow and other small sources (i.e. valve packing or seating leakage). RCIC will recover and maintain reactor water level above top of active fuel (TAF). The BWROG pinch point study (Reference 15) indicates that RCIC can run for an extended period of time with elevated temperatures. The HCVS will be used to limit Suppression Chamber pressure and Suppression Pool water temperature to allow continued operation of the RCIC system. Preliminary computer analysis (MAAP, Reference 19) identifies that there will be enough decay heat and steam production to maintain RCIC available and reactor water level for at least 72 hours. Station batteries are expected to last at least 8 hours and will provide the necessary power to maintain critical instrumentation, provide critical parameter monitoring, and maintain SRV and RCIC control.

Under Phase 2 (using portable on-site FLEX equipment), the operators will energize a 600 VAC bus thereby providing the electrical power to place a battery charger in service to maintain critical indications, SRV control and RCIC controls. AC power will be available to operate selected small AC loads. Among these will be Motor Operated Valves (MOV) allowing operations to remotely operate installed Residual Heat Removal (RHR) MOVs to add water to the Suppression Pool or the reactor. Operators will also deploy a portable FLEX pump to provide makeup water from Lake Ontario to the Suppression Pool ensuring a long term supply of water for cooling the reactor. The portable FLEX pump discharge will be connected to a division of RHR through connections external to the reactor building. In addition, when the 600 VAC bus is reenergized, operators will restart a safety related battery charger to ensure long term capability for critical instrumentation to monitor the reactor and control critical parameters. HCVS will be utilized to control containment parameters the same as they were in Phase 1. Portable equipment will be deployed early during the Phase 1 sequence so as to ensure continuity of the strategy. Eventually RCIC will be removed from service and the portable FLEX pump will continue reactor core inventory makeup and SRVs will be opened to remove decay heat.

Under Phase 3 (using off-site RRC supplied equipment), portable equipment and consumables will be used to reinforce and secure for an indefinite coping time the measures implemented during Phase 2. A 4160 VAC RRC FLEX generator will be used to re-energize a safety related bus and a division of shutdown cooling will be restored using the RHR pump. To provide cooling water to the RHR system heat exchanger for SDC, a higher capacity RRC FLEX pump capable of taking water from Lake Ontario and pumping it through the service water (SWP) system piping FLEX connections will be required. Restoration of installed plant equipment for core cooling (e.g., service water system, shutdown cooling system) begins in Phase 3.

OBJECTIVES

Reactor core cooling and heat removal requires reactor makeup sufficient to maintain or restore level to provide core cooling. Baseline capabilities include the use of installed equipment and FLEX equipment for Phase 1 and Phase 2 coping strategies. Performance attributes include cool down of the reactor and re-energization of a 600 VAC bus to ensure makeup injection sources are restored. Analysis should demonstrate that the guidance and equipment for combined reactor cool down and makeup capability supports continued core cooling. Long term sources of water are available and sufficient to supply water, including consideration of concurrent makeup or spray of SFP.

ACCEPTANCE CRITERIA

No core damage will occur. Coping times will be calculated such that they preclude core damage. The codes used will ensure no core damage occurs including maintaining adequate core cooling through submergence.

Maintain Core Cooling

BWR Installed Equipment Phase 1

Determine Baseline coping capability with installed coping[1] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06 (Reference 3):

- **RCIC/HPCI/IC**
- **Depressurize RPV for injection with portable injection source**
- **Sustained water source**

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

Power Operation, Startup, and Hot Shutdown

At the initiation of the loss of all AC power event, the main steam isolation valves (MSIVs) will automatically close, feedwater is lost, and SRVs automatically cycle to control pressure. The inventory passing through the SRVs causes reactor water level to decrease. When reactor water level reaches 108.8 inches, RCIC automatically starts with suction from the Condensate Storage Tanks (CSTs) (Reference 13, Technical Specification (TS) Bases 3.3.5.2) and operates to inject makeup water to the reactor vessel (note that the CSTs are not seismically qualified and if damaged, RCIC will automatically transfer suction to the Suppression Pool). This injection is sufficient to recover the reactor level to the normal band. After determination that Emergency Diesel Generators (EDGs) cannot be restarted and off-site power cannot be restored, the operating crew determines the event is an ELAP. This determination is made less than or equal to 1 hour into the event.

Initially, Operators take manual control of SRVs to control reactor pressure 500 – 1000 psig (References 6, 10 and 20). After an hour has elapsed, operators will lower reactor pressure using SRVs to 200 – 400 psig providing margin to the HCTL and maintaining pressure close to the injection capability of the portable FLEX pumps. Approximately one hour later (two hours into the event), operators will lower the pressure range to as low as possible while continuing to maintain RCIC operation (approximately 100 – 200 psig). During a loss of all AC power event, given the required assumptions of NEI 12-06 (i.e. seismic, flood, etc.), RCIC is the only injection system to maintain core cooling. Current SBO procedures provide for the ability to depressurize and inject with the diesel fire pump, but this system is not seismically robust and is assumed unavailable during an ELAP event. If emergency depressurization is required by EOPs, operators will terminate the depressurization to ensure continued RCIC availability for adequate core cooling (Reference 22). **(Open Item: Revise current EOPs to implement EOP actions necessary to support the strategy to terminate emergency depressurization to preserve RCIC operation)**

[1] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increased operating time on battery powered equipment.

Maintain Core Cooling

BWR Installed Equipment Phase 1

The primary method of reactor pressure control is by operation of the SRVs. Operator control of reactor pressure using SRVs requires DC control power and pneumatic pressure supplied by station batteries and pneumatics. For Phase 1, the power for the SRVs is supplied by the station batteries. At event initiation, the normal pneumatic supply to replenish the valve accumulators is lost due to loss of power. Each of the seven (7) Automatic Depressurization System (ADS) SRVs is provided with an accumulator which contains enough pneumatic pressure to operate each valve through 5 open/close cycles, for a total of 35 manual cycles without nitrogen supply replenishment (Reference 1). SRV operation is also available in the mechanical safety mode of operation and requires no power or pneumatic supply. According to current SBO analysis (Reference 11), safety related DC power is predicted to last at least 6.9 hours to operate SRVs and it is estimated that only 5-6 SRV manual actuation would be required to control reactor pressure during the current 4 hour coping time. Beyond 4 hours, decay heat will decrease and the number of cycles required in the next 4 hours should be equal to or less than 6 manual actuations. In conclusion, the expected cycles for ADS SRVs is ≤ 12 total during Phase 1 and ADS SRV accumulator nitrogen should be sufficient for Phase 1. **(Open Item: Perform an analysis to verify assumptions related to an adequate nitrogen supply during ELAP conditions and revise or provide ELAP procedures that optimize SRV control during an ELAP condition)**

RCIC valves and controls are powered by station safety related DC power. RCIC provides all makeup flow to the reactor vessel in a total loss of AC power until portable pumps are available or power is restored. The SBO procedure, N2-SOP-01 (Reference 8) directs the operator to bypass high RCIC room temperature isolations in the Control Room and place the local fire zone to 'alarm only' within 15 minutes. The RCIC trip and isolation signals that could possibly prevent RCIC operation when needed during the ELAP are also overridden in accordance with EOPs (Reference 20). With suction lined up to the CST it will remain in this configuration until an automatic swap of suction from the CST to the Suppression Pool occurs when the CST level lowers to the automatic swap over level set point (as previously identified, this potential exists immediately in a seismic event). Operation of RCIC from the CSTs is not expected to add sufficient water to the containment to challenge any operating limits. When the swap over to the Suppression Pool occurs, RCIC continues feeding the reactor vessel. No credit is taken for the CSTs as a source of water in the preliminary NMP2 MAAP analysis (Reference 19). As an alternative to automatic RCIC operations, the RCIC system is also capable of manual local operation in accordance with current station operating procedures (Reference 16) without power. The Suppression Pool continues to heat up due to RCIC exhaust and SRV cycling. Based on experience derived from Fukushima BWROG GEH study (Reference 15), the RCIC system can run at a much higher lube oil temperature and suction source temperature than originally assumed for the operation of RCIC. Additionally, the BWROG RCIC study identified that operation of RCIC at a lube oil temperature of ≥ 230°F may be acceptable. **(Open Item: Perform an analysis to determine long term temperature profiles of the RCIC room for habitability and RCIC operation) (Open Item: Implement a design change to RCIC based on recommendations from the BWROG (Reference 15) to support continued RCIC operation with elevated wet well temperatures)**

Maintain Core Cooling

BWR Installed Equipment Phase 1

With the current strategy for load shedding, the Division I safety related 125 VDC battery (heaviest loaded divisional DC bus after a loss of all AC) is calculated to be available for 6.9 hours (References 11 and 17). It is reasonable to conclude that with further load shedding and/or plant modifications; the installed battery coping time can achieve ≥ 8 hours. **(Open Item: Perform an analysis to identify necessary modifications or programmatic actions to maximize battery coping time)**

The current SBO study (Reference 11) and preliminary NMP2 MAAP analysis (Reference 19) assume a reactor coolant inventory loss of 61 gallons per minute (gpm). This leakage is the sum of 18 gpm per reactor recirculation pump seal (2 pumps; total 36 gpm) and 25 gpm technical specification allowable leakage. Preliminary NMP2 MAAP analysis (Reference 19) and the GEH report (Reference 21) indicate RCIC flow is adequate to supply decay heat removal makeup after shutdown. The RCIC system provides up to 600 gpm makeup capacity and is designed to be capable of maintaining coverage of the core without any operator action (Reference 1).

Cold Shutdown and Refueling

The overall strategy for core cooling for Cold Shutdown and Refueling conditions are, in general, similar to those for Power Operation, Startup, and Hot Shutdown. If an ELAP occurs during Cold Shutdown, water in the reactor vessel will heat up. When temperature reaches 212°F (Hot Shutdown), the RPV will begin to pressurize. Reactor level will lower and EOP procedure entry conditions will occur on RPV low level. EOPs direct stabilization of pressure and operators will open SRVs preventing RPV re-pressurization. During this time, portable injection pumps can be connected to the available Residual Heat Removal system connection to provide injection capability. The portable FLEX pump would be the primary strategy for Cold Shutdown.

In the event of an ELAP during Refueling, there are no installed plant systems to provide makeup water to cool the core. The deployment of Phase 2 equipment will begin immediately. To accommodate the activities of vessel disassembly and refueling, water levels in the RPV and the reactor cavity are often changed. The most limiting condition is typically the case in which the reactor head is removed and water level in the RPV is at or below the reactor vessel flange prior to flooding the reactor cavity. If an ELAP/LUHS occurs in this condition, extra personnel would be available to expedite actions. The high risk contingency plan for flood up from the most recent refueling outage calculated the time to boil in the reactor in 2.25 hours, assuming initial reactor coolant temperature of 110°F. **(Open Item: Evaluate and implement procedures that direct immediate deployment of Phase 2 equipment during Refueling conditions)**

Pre-staging of FLEX equipment can be credited for some predictable hazards, but cannot be credited for all hazards per the guideline of NEI 12-06 (Reference 3). Deployment of portable FLEX pumps to supply injection flow must commence immediately from the time the event is realized. This is plausible because more personnel are on site during outages to provide the necessary resources. NMP2 will provide administrative guidance to ensure that sufficient area is

Maintain Core Cooling

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available for deployment and that haul paths remain accessible without interference from outage equipment during outages. **(Open Item: Develop and implement a program and/or procedures to keep FLEX equipment deployment pathways clear or identify actions to clear the pathways)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06 (Reference 3). These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs. **(Open Item: Develop procedures/guidelines to address the criteria in NEI 12-06 to support existing symptom based strategies in the EOP's)**

Identify modifications	*List modifications:*

- Implement a design change to support RCIC system operation at elevated Suppression Pool temperature.
- Implement a design change or programmatic actions to maximize battery coping time.
- Implement a design change to install a Hardened Containment Vent System (HCVS) in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents.

Key Reactor Parameters	*List instrumentation credited for this coping evaluation.*

Reactor Vessel Essential Instrumentation	**Safety Function**
RPV Level 2ISC*LR1623A (B) / B22-R623A (B) 2ISC*LT11C/B22 N081C 2ISC*LI13A / B22 N044A 2ISC*LR1615 from 2ISC*LT13B	Core cooling
RPV Pressure 2ISC*PT6A (B) / B22 N062A (B) 2ISC*PR1623A (B) / B22-R623A (B)	Core cooling
RCIC flow 2ICS*FI101	Core cooling
Containment Essential Instrumentation	**Safety Function**
Drywell Pressure 2CMS*PI2A, 2CMS*PR2B (PNL 898)	Containment integrity
Suppression Chamber Pressure	Containment integrity

Maintain Core Cooling

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2CMS*PI7A, 2CMS*PR7B (PNL898)	
Drywell Temperature 2CMS*TRX130 (140)	Containment integrity
Suppression Pool Temperature 2CMS*TI174 (175)	Containment integrity
Suppression Pool Level 2CMS*LI9A, 2CMS*LR9B (PNL989) 2CMS*LI11A (B)	Containment integrity

Notes:

Identify analyses or actions:

- Revise current EOPs to implement EOP actions necessary to support the strategy to terminate emergency depressurization to preserve RCIC operation.
- Perform an analysis to verify assumptions related to an adequate nitrogen supply during ELAP conditions and revise or provide ELAP procedures that optimize SRV control during an ELAP condition.
- Perform an analysis to determine long term temperature profiles of the RCIC room for habitability and RCIC operation.
- Implement a design change to RCIC based on recommendations from the BWROG (Reference 15) to support continued RCIC operation with elevated wet well temperatures.
- Perform an analysis to identify necessary modifications or programmatic actions to maximize battery coping time.
- Evaluate and implement procedures that direct immediate deployment of Phase 2 equipment during Refueling conditions.
- Develop and implement a program and/or procedures to keep FLEX equipment deployment pathways clear or identify actions to clear the pathways.
- Develop procedures/guidelines to address the criteria in NEI 12-06 to support existing symptom based strategies in the EOP's.

Maintain Core Cooling

BWR Portable Equipment Phase 2

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (RCIC/HPCI/IC) and strategy (ies) utilized to achieve this coping time.

Primary Strategy

During Phase 2, reactor core cooling is maintained using RCIC injection with suction from the Suppression Pool. Reactor pressure is controlled by manual operation of SRVs as described in Phase 1. Reactor pressure will be maintained at the appropriate pressure to maintain RCIC operation, i.e. pressure will not be intentionally lowered to a pressure that would remove RCIC from service if it is the only source of injection. Before Suppression Pool water temperature exceeds the maximum allowable for RCIC operation, the HCVS installed as required by NRC Order EA-12-050 will be utilized to maintain containment parameters (this is discussed in the "Maintain Containment" section response). **(Open Item: Revise EOPs to support ELAP implementing strategy to stop lowering reactor pressure in order to preserve RCIC operation)**

A FLEX portable diesel driven generator will be connected in ≤ 8 hours to re-energize a safety related 600 VAC bus (Division I - 2EJS*US1 or alternate Division II - 2EJS*US3). This will enable powering the Division I battery charger and the battery bus as well as small loads (e.g., Motor Operated Valves in order to align RHR for alternate injection strategy as described below). **(Open Item: Perform an analysis to verify the capability of the portable diesel generator to power all expected loads)** This arrangement will allow continued power to essential instrumentation and continued RCIC and SRV operation. RCIC operation will be maintained as long as decay heat is sufficient to generate enough heat/steam to operate the system. Preliminary NMP2 MAAP analysis (Reference 19) for ELAP indicates that there is sufficient decay heat to provide for RCIC operation for at least 72 hours. NEDC 33771P R1C - GEH Evaluation of FLEX Implementation Guidelines (Reference 21) decay heat estimates and RCIC steam flow estimates (Reference 23) support these preliminary MAAP analyses.

A FLEX portable diesel generator will repower the safety related 600 VAC bus. Upon restoration, power can be restored to the Solenoid Operated Valves (SOV) to allow opening and refill of ADS SRV accumulators. **(Open Item: Develop and implement procedures to provide direction for re-energizing the SOVs and ensuring long term pneumatic supply during an ELAP)**

Replenishing makeup tanks for ADS SRVs is possible through external connections in a missile protected room outside the Reactor Building. If the normal makeup is available following the event, it will operate in automatic (no power or other action is necessary) to provide makeup. Otherwise, replenishment from a truck or nitrogen bottles is possible using existing station operating procedure (Reference 28).

Before RCIC becomes unavailable, a FLEX portable diesel pump will be connected to inject through connections external to the Reactor Building and into the 'A' (alternate 'B') Residual Heat Removal System (RHR), (Attachment 3B). The FLEX pump will take suction from the service water forebay

Maintain Core Cooling

BWR Portable Equipment Phase 2

through portable hose connected to a seismically qualified and protected dry hydrant specifically installed to supply water for FLEX equipment (Attachment 3D). The portable pump will discharge into the connection specifically installed to provide the FLEX pump external connection into the combined header of the Division 1 (alternate Division II) RHR system. This arrangement, combined with the power restoration capability detailed above, will allow for RHR to be used for makeup to a diverse number of places, with reactor injection as the priority (depending on RCIC status). This arrangement also provides for the capability to provide makeup water to the Suppression Pool (see Attachment 3B for simple piping arrangement of FLEX pump to RHR). Total required makeup flow is estimated to be ≤ 300 gpm. This includes RPV makeup rate for decay heat at 8.3 hours of 238 gpm (Reference 21) and 61 gpm reactor coolant leakage (previously discussed). Preliminary calculations identify that the FLEX pump will be able to deliver adequate flow to the RPV for core cooling. **(Open Item: Perform an analysis to validate the FLEX equipment ability to deliver sufficient flow under all expected conditions. Flow requirements from the dry hydrants will consider Phase 2 and Phase 3 requirements)**

In summary, with power available to the 600 VAC bus to enable operation of RHR system valves, a portable pump is connected to take suction from the lake (dry hydrants in the service water forebay) and discharge to the RHR system distribution header. RHR can be re-aligned for reactor injection to satisfy the core cooling requirements (see Attachment 3A and Attachment 3B).

Alternative Strategy

An alternative to powering Division I from the portable FLEX generator will be the ability to power Division II in the same manner. If for some reason it is required to energize Division II equipment (e.g., Division I unavailable), RCIC operations can be maintained in manual as described in current station procedures (Reference 16).

Refueling Phase 2 strategies for makeup water include deployment of a FLEX pump to take suction from the dry hydrant in the service water forebay (lake) and discharge connecting to either RHR division as described in the Power Operation, Startup, and Hot Shutdown descriptions. If spent fuel pool refueling gates are removed, the FLEX portable pump connected to spent fuel pool cooling system (see Maintain Spent Fuel Pool Cooling Phase 2 description) is able to provide makeup to the SFP and reactor cavity.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06 (Reference 3). These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Maintain Core Cooling

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Identify modifications	*List modifications.*

- Implement a design change to install connections for FLEX portable pumps to RHR for both RHR 'A' and 'B'.
- Implement a design change to install permanent dry hydrants in the intake structure for FLEX portable pump suction.
- Implement a design change to install portable generator connections for 600 VAC primary (2EJS*US1) and alternate (2EJS*US3) busses.

Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Same as instruments listed in above section, Maintain Core Cooling, Phase 1.

Phase 2 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

Storage / Protection of Equipment :

Describe storage / protection plan or schedule to determine storage requirements

Seismic	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.

Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.

Severe Storms with High Winds	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.

Maintain Core Cooling

BWR Portable Equipment Phase 2

Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.

High Temperatures	*List how equipment is protected or schedule to protect.*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.

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*
The storage structure(s) and location(s) have not yet been determined. Deployment routes and strategies will be identified after the storage location(s) are defined.	Implement staging area for the FLEX pumps to connect to the dry hydrants when the final designs are established.	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles, and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

Notes:

All Open Items associated with the installation and design of the HCVS in accordance with the requirements of NRC Order EA-12-050 are remanded to the Integrated Plan specifically written as required by that order and due to be delivered to the NRC by 2/28/13.

The Dry Hydrants constructed for similar purposes at Nine Mile Point Unit 1 (NMP1) are also available for the portable pumps at NMP2. Other sources of water include the potential for taking suction from the Circulating Water Cooling Tower basin or directly from Lake Ontario (this option may be limited by weather).

Identify analyses or actions:

- Revise EOPs to support ELAP implementing strategy to stop lowering reactor pressure in order to preserve RCIC operation.
- Perform an analysis to verify the capability of the portable diesel generator to power all expected loads.

Maintain Core Cooling
BWR Portable Equipment Phase 2
• Develop and implement procedures to provide direction for re-energizing the SOVs and ensuring long term pneumatic supply during an ELAP. • Perform an analysis to validate the FLEX equipment ability to deliver sufficient flow under all expected conditions. Flow requirements from the dry hydrants will consider Phase 2 and Phase 3 requirements. • Develop procedures/guidelines to address the criteria in NEI 12-06 to support existing symptom based strategies in the EOP's.

Maintain Core Cooling

BWR 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 (RCIC/HPCI/IC) and strategy (ies) utilized to achieve this coping time.

Primary Strategy

For Phase 3, the reactor core cooling strategy is to restore service water cooling flow through the normal plant system with RRC pump(s) and place one loop of RHR into the Shutdown Cooling (SDC) mode. This will be accomplished by powering a Division I or II RHR pump from the emergency 4160 VAC bus utilizing one of the two 4160 VAC Regional Response Center (RRC) FLEX portable DGs requested and supplying the RHR Heat Exchanger with lake water with a large portable RRC FLEX pump via the service water system piping. **(Open Item: Implement a design change to provide the ability for RRC 4160 VAC DGs to connect to the safety related divisional switchgear. Consider the potential for two DGs to supply one switchgear) (Open Item: Implement a design change to receive large capacity RRC pumps to supply the service water distribution header).** Although not assumed in the FLEX strategy, if an installed service water pump is available to be restarted when the 4160 VAC bus is re-energized with the RRC DG, it would be used instead of the RRC FLEX pump to supply the service water system. At this point the conditions in the Suppression Pool are elevated (temperature approximately 230°F). RHR pumps are operated under similar conditions when started in the SDC mode of operation, but with cooling water provided to the motors, room unit coolers and seals. **(Open Item: Perform an analysis to determine the limiting conditions for an RHR to be restarted (e.g., RHR room, seals and fluid temperatures) and adjust this strategy based on the results of the analysis)**

One 2000 KW 4160 VAC RRC FLEX diesel generator will be capable of carrying the loads on the emergency 4160 VAC bus necessary to support the Phase 3 FLEX strategies identified above. This includes an RHR pump and its support equipment (i.e., MOVs, etc.). The RRC FLEX pump will be sized to provide sufficient flow to the RHR heat exchanger to support shutdown cooling (SDC) or Suppression Pool cooling modes of RHR. Other loads to be considered from the RRC 4160 VAC DG include the installed service water pump if available (described above), the SFP pump and smaller loads on the safety related distribution system such as ventilation and cooling. **(Open Item: Perform a load distribution analysis for safety related equipment restoration utilizing either two RRC DGs paralleled on one 4160 VAC bus or one RRC DG on each safety related bus (i.e. one on Division 1 and one on Division 2) (Open Item: Perform an analysis to determine the cooling water flow needed to accommodate all expected cooling loads and resulting RRC pump size requirement)**

NMP1 and NMP2 emergency diesel generator fuel oil storage tanks hold over 140,000 gallons combined. Preliminary calculations conclude that this is enough fuel oil to continue operating Phase 2 FLEX portable equipment through the 72 hour time frame and beyond. Strategies for distribution of this fuel to portable equipment are contained in the Safety Function section. **(Open Item: Perform calculations and validate assumptions of fuel consumption and replenishment rate to**

Maintain Core Cooling

BWR Portable Equipment Phase 3

ascertain the time before off-site replenishment is required)

Small amounts of leakage are expected to occur into safety related areas where preservation or resistance to internal flooding is desired (e.g., Service Water Pump bays). RRC dewatering equipment will be used to maintain or clear submerged equipment as needed. Priority is to regain or ensure service water pump bay dewatering capability.

Alternative Strategy
An alternate means of core cooling can be provided by connecting to and using the opposite division of RHR and service water as that used for the primary function.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06 (Reference 3). These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications*

- Implement a design change to install permanent 4160 VAC busses connection points to be able to connect to the RRC supplied DG, including paralleling capability, as required to connect more than one DG to an electrical bus.
- Implement a design change to install service water supply connections for RRC large capacity pump(s).

Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Same as instruments listed in above section, Maintain Core Cooling, Phase 1.

Phase 3 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

Maintain Core Cooling		
BWR Portable Equipment Phase 3		
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*
Phase 3 equipment will be provided by RRC. Initially, the RRC equipment will be transported to an interim staging area at least 25 miles from the Nine Mile Point site location. When delivered to the staging area, it will be prepared for operation and transported to the point of use area on site. NMP2 will evaluate and identify the staging area and deployment paths to move equipment from the staging area to the site point of use.	Implement a design change to install permanent DG connection point(s) to the 4160 VAC busses to connect to the RRC supplied DG. Implement a design change to install permanent connection point(s) to the Service Water supply connections for RRC pump(s).	Connection points for RRC equipment will be located in a structure protected against flooding, tornado missiles and seismic events. RRC connections will be installed to meet station and procedure requirements.

Notes:

Identify analyses or actions:

- Implement a design change to provide the ability for RRC 4160 VAC DGs to connect to the safety related divisional switchgear. Consider the potential for two DGs to supply one switchgear.
- Implement a design change to receive large capacity RRC pumps to supply the service water distribution header.
- Perform an analysis to determine the limiting conditions for an RHR to be restarted (e.g., RHR room, seals and fluid temperatures) and adjust this strategy based on the results of this the analysis.
- Perform a load distribution analysis for safety related equipment restoration utilizing either two RRC DGs paralleled on one 4160 VAC bus or one RRC DG on each safety related bus (i.e. one on Division 1 and one on Division 2).
- Perform an analysis to determine the cooling water flow needed to accommodate all expected cooling loads and resulting RRC pump size requirement.
- Perform calculations and validate assumptions of fuel consumption and replenishment rate to ascertain the time before off-site replenishment is required.

Maintain Containment Integrity

STRATEGIES

With an ELAP, containment cooling is lost and over an extended period of time containment temperature and pressure can be expected to slowly increase. An analysis will be performed to determine the containment pressure profile during an ELAP / LUHS event and to justify that the instrumentation and controls in containment which are relied upon by the operators are sufficient to perform their intended functions. Acceptance criteria will be defined and justified. The results of this analysis will be used to develop an appropriate mitigating strategy, including any necessary modifications. **(Open Item: Perform an analysis to determine the containment pressure profile during an ELAP / LUHS event and verify the instrumentation and controls in containment which are relied upon by the operators are sufficient to perform their intended function)**

Heat addition to the containment during Phase 1 is directly related to use of RCIC to maintain core cooling, SRV actuations to control pressure, reactor pressure boundary leakage and radiative heat. The strategy is to maintain containment pressure (and temperature) by removing energy through the HCVS. **(Open item: Perform an analysis to validate HCVS vent sizing to maintain Suppression Pool parameters to support RCIC capability)**

Phase 2 requires the 600 VAC FLEX generator power for MOV power and instrumentation to monitor containment parameters. Removing heat from the Suppression Pool through HCVS will lower level. Makeup will be required to maintain Suppression Pool level and Net Positive Suction Head (NPSH) to RCIC. Makeup to the Suppression Pool will be performed by connecting a portable FLEX pump to a water source in the service water forebay (same as discussed in the Maintain Core Cooling section). The same connection to a division of RHR will serve as the source for Suppression Pool makeup, since the RHR system has the capability of being aligned for reactor injection as well as Suppression Pool makeup.

Phase 2 Strategies will continue into Phase 3. When shutdown cooling is restored to a RHR pump as discussed in core cooling Phase 3, the amount of energy being released into the containment will be greatly reduced. SDC should be able to reduce the reactor temperatures low enough to alleviate all heat addition to the containment and allow containment parameters to lower such that the primary containment venting is no longer required. **(Open item: Perform an analysis to validate when ambient losses will reduce containment parameters such that the primary containment venting will no longer be required)**

OBJECTIVES

Maintain containment parameters within design and provide adequate control of containment cooling capability in order to prevent any challenge to the containment structure or function.

ACCEPTANCE CRITERIA

Containment pressure and temperature are monitored and installed systems are utilized to maintain parameters and mitigate any challenges to the containment.

Maintain Containment

BWR Installed Equipment Phase 1

Determine Baseline coping capability with installed coping[2] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06 (Reference 3):

- **Containment Venting or Alternate Heat Removal**
- **Hydrogen Igniters (Mark III containments only)**

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain core cooling. Identify methods (containment vent or alternative / Hydrogen Igniters) and strategy (ies) utilized to achieve this coping time.

During Phase 1, containment integrity is maintained by normal design features of the containment, such as the containment isolation system and HCVS. In accordance with NEI 12-06 (Reference 3), it is assumed that the containment isolation actions delineated in current SBO coping capabilities is sufficient.

As the Suppression Pool heats up, the containment will begin to heat up and pressurize. Additionally, the Suppression Pool water level rises due to the transfer of inventory from the CST to the Suppression Pool (via RCIC and SRVs). Preliminary analysis with the GEH Evaluation of FLEX Implementation (Reference 21) indicate that the volume of water transferred to the containment from the CSTs should RCIC operation begin with suction from the CSTs will not be problematic with regard to containment limitations. **(Open Item: Perform additional plant specific analysis to verify acceptable containment levels during a long term operation of RCIC beginning with suction from the CSTs)** The HCVS will be used to control containment pressure and temperature at the values deemed acceptable through analysis for RCIC operations (Reference 15). As identified and discussed in Phase 1 Maintain Core Cooling section, the Suppression Pool as the RCIC suction source will be maintained at approximately 230°F. Based on preliminary MAAP analysis, the HCVS will be opened at 8.3 hours into the event (Reference 19).

RCIC exhaust, reactor recirculation system leakage and SRV exhaust will add energy to the containment. The resulting Suppression Pool temperature is calculated to rise above present Suppression Pool structural design limit of 212°F (Reference 1 and 19). **(Open Item: Perform an evaluation of containment structures to identify necessary actions to enable implementation of the strategy with running RCIC with elevated temperatures)** When venting of the suppression chamber to control pressure and temperature commences, Suppression Pool level begins to lower. Since the containment vents are not opened until 8.3 hours have elapsed, lowering Suppression Pool level is not a concern in Phase 1. **(Open Item: Perform an analysis to verify acceptable parameters (e.g., NPSH requirements) for RCIC operation with the higher temperatures and anticipated changes in Suppression Pool level)**

[2] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increased operating time on battery powered equipment

Maintain Containment

BWR Installed Equipment Phase 1

NMP2 containment design pressure is 45 psig (Reference 1). Containment pressure limits are not expected to be reached during the event as indicated by preliminary MAAP analysis (Reference 19), because the HCVS will be opened prior to exceeding any containment pressure limits. Monitoring of containment (drywell) pressure and temperature will be available in the Control Room via installed plant instrumentation powered by the safety related batteries and safety related uninterruptable power supplies (UPS).

Containment integrity is maintained throughout the duration of the event and no non-permanently installed equipment is required to maintain containment integrity. An alternative strategy for containment during Phase 1 is not provided because containment integrity is maintained by the plant's design with the exception of containment structural temperature limits. (**Open Item: Implement an alternative Containment Cooling strategy, if required, when the analysis of structural temperatures are complete)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06 (Reference 3). These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications*

NMP2 will implement a design change to install Hardened Containment Vent system (HCVS) in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents.

Key Containment Parameters	*List instrumentation credited for this coping evaluation.*

Containment Essential Instrumentation	**Safety Function**
Drywell Pressure 2CMS*PI2A 2CMS*PR2B (PNL 898)	Containment integrity
Suppression Chamber Pressure 2CMS*PI7A 2CMS*PR7B (PNL898)	Containment integrity

Maintain Containment

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Drywell Temperature 2CMS*TRX130 (140)	Containment integrity
Suppression Pool Temperature 2CMS*TI174 (175)	Containment integrity
Suppression Pool Level 2CMS*LI9A 2CMS*LR9B (PNL989) 2CMS*LI11A (B)	Containment integrity
HCVS Rad Monitor (Component No. TBD)	HCVS effluent radioactivity
HCVS system valve position indication (Component No. TBD)	HCVS functionality
HCVS system pressure indication (Component No. TBD)	HCVS functionality
HCVS system power status (Component No. TBD)	HCVS functionality
Nitrogen system supply status (Component No. TBD)	HCVS functionality
HCVS effluent temperature (Component No. TBD)	HCVS functionality

Notes:

All Open Items associated with the installation and design of the Hardened Containment Vent System (HCVS) in accordance with the requirements of NRC Order EA-12-050 are remanded to the Integrated Plan specifically written as required by that order and due to be delivered to the NRC by 2/28/13.

Identify analyses or actions:

- Perform an analysis to determine the containment pressure profile during an ELAP / LUHS event and verify the instrumentation and controls in containment which are relied upon by the operators are sufficient to perform their intended function.
- Perform an analysis to validate HCVS vent sizing to maintain Suppression Pool parameters to support RCIC capability.
- Perform an analysis to validate when ambient losses will reduce containment parameters such that the primary containment venting will no longer be required.
- Perform additional plant specific analysis to verify acceptable containment levels during a long term operation of RCIC beginning with suction from the CSTs.
- Perform an evaluation of containment structures to identify necessary actions to enable implementation of the strategy with running RCIC with elevated temperatures.
- Perform an analysis to verify acceptable parameters (e.g., NPSH requirements) for RCIC operation with the higher temperatures and anticipated changes in Suppression Pool level.
- Implement an alternative Containment Cooling strategy, if required, when the analysis of structural temperatures are complete.

Maintain Containment

BWR Portable Equipment Phase 2

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (containment vent or alternative / Hydrogen Igniters) and strategy (ies) utilized to achieve this coping time.

In Phase 2, containment integrity is maintained by normal design features of the containment, such as the containment isolation valves and HCVS by venting the suppression chamber as discussed in Phase 1. Suppression pool temperature will be limited by controlling suppression chamber pressure. With the suppression pool and chamber at saturated conditions lowering pressure will lower temperature.

Makeup water to the core through the RHR loop will not be required until there is insufficient decay heat to operate RCIC such that it can no longer provide makeup. Preliminary NMP2 MAAP analysis (Reference 19) identified that enough decay heat to run RCIC will exist for at least 72 hours. In the interim, the FLEX portable pump connected to RHR piping can be used to provide suppression pool makeup as necessary. In evaluating suppression pool makeup requirements, it would be beneficial to maintain the suppression pool temperature elements submerged for accurate bulk temperature indication. In order to do this, suppression pool level must be kept above 197' (Reference 6). Higher levels will also maximize NPSH to RCIC.

Preliminary MAAP analyses performed for NMP2 indicate it will take approximately 8 hours for suppression pool temperature to reach 230°F, at which time the HCVS valves will be opened and mass loss from the suppression pool will begin. Make up rate to the Suppression Pool will be approximately 240 gpm at this time (Table 4.5.2-5, Reference 21). NMP2 suppression pool contains approximately 47,000 gallons per foot of elevation. Assuming the suppression pool level was at the minimum technical specification required level of 199.5' and discounting any makeup from the CSTs, NMP2 preliminary MAAP analysis (Reference 19) estimates make up will be required in ≥ 16 hours from the initiation of the ELAP (8 hours to reach 230°F and an additional 8 hours to lower Suppression Pool level 2.5 feet).

Maintain Containment

BWR Portable Equipment Phase 2

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06 (Reference 3). These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications*

- Implement a design change to install connections for FLEX portable pumps to RHR for both RHR 'A' and 'B'.
- Implement a design change to install permanent dry hydrants in the intake structure for FLEX portable pump suction.
- Implement a design change to install portable Generator connections for 600 VAC primary (2EJS*US1) and alternate (2EJS*US3) busses.
- Implement a design change to install Hardened Containment Vent system (HCVS) in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents.

Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation*

Phase 2 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

Containment Essential Instrumentation	Safety Function
Drywell Pressure 2CMS*PI2A 2CMS*PR2B (PNL 898)	Containment integrity
Suppression Chamber Pressure 2CMS*PI7A 2CMS*PR7B (PNL898)	Containment integrity
Drywell Temperature 2CMS*TRX130 (140)	Containment integrity
Suppression Pool Temperature 2CMS*TI174 (175)	Containment integrity
Suppression Pool Level 2CMS*LI9A 2CMS*LR9B (PNL989) 2CMS*LI11A (B)	Containment integrity
HCVS Rad Monitor (Component No. TBD)	HCVS effluent radioactivity

Maintain Containment	
BWR Portable Equipment Phase 2	
HCVS system valve position indication (Component No. TBD)	HCVS functionality
HCVS system pressure indication (Component No. TBD)	HCVS functionality
HCVS system power status (Component No. TBD)	HCVS functionality
Nitrogen system supply status (Component No. TBD)	HCVS functionality
HCVS effluent temperature (Component No. TBD)	HCVS functionality

Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.	

Maintain Containment		
BWR Portable Equipment Phase 2		
High Temperatures	*List how equipment is protected or schedule to protect*	
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.		
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*
The storage structure(s) and location(s) have not yet been determined. Deployment routes and strategies will be identified after the storage location(s) are defined.	Implement staging area for the FLEX pumps to connect to the dry hydrants when the final designs are established.	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles, and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.
Notes: None		

Maintain Containment

BWR 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 (containment vent or alternative / Hydrogen Igniters) and strategy (ies) utilized to achieve this coping time.

Containment integrity during Phase 3 will be maintained in accordance with the strategy defined for Phase 2. Once core cooling is on a Division of RHR in SDC the decay heat from the reactor will no longer be added to the containment. Ambient losses from containment should overcome radiant and convective heat input to containment and the containment will cool. **(Open Item: Perform an analysis to determine when ambient heat losses will be enough to cool the containment with RHR in a Phase 3 mode of shutdown cooling)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06 (Reference 3). These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications*

Implement a design change to install permanent 4160 VAC busses connection points to be able to connect to the RRC supplied DG, including paralleling capability, as required to connect more than one DG to an electrical bus.

Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*

See instrumentation list in Phase 1 section.

Phase 3 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

Maintain Containment		
BWR Portable Equipment Phase 3		
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*
RRC equipment will be provided by a RRC. Initially, the RRC equipment will be transported to an interim staging area at least 25 miles from the Nine Mile Point site location. When delivered to the staging area, it will be prepared for operation and transported to the point of use area on site. NMP2 will evaluate and identify the staging area and deployment paths to move equipment from the staging area to the site point of use.	Implement a design change to install permanent DG connection point(s) to the 4160 VAC busses to connect to the RRC supplied DG(s).	Connection points for RRC equipment will be located in a structure protected against flooding, tornado missiles and seismic events. RRC connections will be installed to meet station and procedure requirements.
Notes: **Identify analyses or actions:** • Perform an analysis to determine when ambient heat losses will be enough to cool the containment with RHR in a Phase 3 mode of shutdown cooling.		

Spent Fuel Pool Cooling

STRATEGIES

During an ELAP / LUHS event, SFP cooling capability is lost which, in the long term, can result in SFP boiling and loss of adequate SFP water level for protection of the spent fuel, as well as for maintenance of sufficient radiation shielding if no operator action is taken. Following a loss of SFP cooling, the SFP will heat up to a bulk temperature of 212^{0}F, at which time heat removal from the SFP will be due to boiling of the water. In these circumstances, a minimum water level of 10 feet above the top of the fuel has been determined to provide adequate short term shielding (Reference NEI 12-02).

The basic FLEX strategy for maintaining SFP cooling is to monitor SFP water level and provide makeup water capability to the SFP sufficient to recover and maintain SFP water level at or near normal.

The FLEX strategy during Phase 1 of an ELAP / LUHS event for SFP cooling is to utilize the SFP water level instrumentation installed in response to NRC Order EA-12-051 (Reference 32) to continuously monitor the SFP water level. Within the first 16 hours, stage a portable diesel driven pump for the addition of makeup water to the SFP as it is needed to restore and maintain the normal level in Phase 2. In Phase 3 (using off-site RRC supplied equipment), portable equipment will be used to restart normal installed SFP cooling systems if available. Note that the strategy in Phase 2 can be maintained indefinitely.

OBJECTIVES

Makeup to the SFP from portable injection sources must be provided. The various baseline capabilities must include:

- Provide adequate makeup via external connection to SFP cooling piping or other alternate location that provides a means to supply SFP makeup without accessing the interior of any building.
- Provide adequate makeup to the SFP via hoses on the refueling floor.
- Ensure a vent pathway for steam and condensate from SFP or provide analysis to justify the need does not exist.
- A minimum of 200 gpm to the SFP, or 250 gpm if overspray occurs, consistent with 10 CFR 50.54(hh)(2) will be provided.

ACCEPTANCE CRITERIA

No SFP fuel damage will occur. Coping times will be calculated such that they preclude fuel damage, including maintaining water level above the top of the active fuel.

Maintain Spent Fuel Pool Cooling	
BWR Installed Equipment Phase 1	
Determine Baseline coping capability with installed coping[3] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06 (Reference 3): • **Makeup with Portable Injection Source**	
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 with portable injection source)and strategy (ies) utilized to achieve this coping time Phase 1 strategy is to monitor SFP level to ensure expected level is maintained. A modification to install a new level indication with integral backup power supply, in accordance with the requirements of NRC Order EA-12-051, will allow for remote monitoring. Preliminary analysis indicate that Spent Fuel Pool temperature will reach 212°F in approximately 8 hours and that water makeup to maintain level during this time is 73 gpm (Reference 27). Therefore, water addition is not required before the end of Phase 1. Fuel in the SFP is cooled by the design water level at the onset of the event, which is approximately 23' over the top of the fuel (Reference 1). Since design temperature of the SFC system is 150°F, an analysis is required to ensure there is a vent pathway for steam and condensate from the SFP or justification that the need does not exist. **(Open Item: Evaluate a strategy to provide a pathway for steam and condensate or justify why it is not needed)** The design temperature of the NMP2 spent fuel pool is 150°F. **(Open Item: Perform an evaluation to determine the effects and required actions for Spent Fuel Pool temperatures expected above design of 150°F during an ELAP)**	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.	
Identify any equipment modifications	*List modifications*
Design and install reliable wide range SFP water level instrumentation in accordance with the	

[3] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increased operating time on battery powered equipment.

Maintain Spent Fuel Pool Cooling	
BWR Installed Equipment Phase 1	
requirements of NRC Order EA-12-051 (Reference 32).	
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.*
Spent Fuel Pool Instrumentation	**Safety Function**
Wide Range SFP Water Level (Component # TBD)	Maintain SFP Water Level

Notes:
All Open Items associated with the installation and design of the Spent Fuel Pool level instrumentation in accordance with the requirements of NRC Order EA-12-051 are remanded to the Integrated Plan specifically written as required by that order and due to be delivered to the NRC by 2/28/13.

Identify analyses or actions:

- Evaluate a strategy to provide a pathway for steam and condensate or justify why it is not needed.
- Perform an evaluation to determine the effects and required actions for Spent Fuel Pool temperatures expected above design of 150^{0}F during an ELAP.

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 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 with portable injection source) and strategy (ies) utilized to achieve this coping time.

The normal SFP water level at the event initiation is approximately 23' feet over the top of the stored spent fuel (Reference 1). NEI 12-06 requires consideration of design heat load for responding to an ELAP. However, maintaining the SFP full at all times during the ELAP event is not required; the requirement is to maintain adequate level to protect the stored spent fuel and limit exposure to personnel on-site and off-site. This is conservatively identified as Level 2 in NEI 12-02 *Industry Guidance for Compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation"* and is specified as at least 10 feet above the fuel seated in the spent fuel racks.

Using the design basis maximum heat load (Reference 27), the SFP water inventory will heat up from 140°F to 212°F in 5.4 hours and the required makeup to maintain the SPV full during this time is 73 gpm. There are approximately 10,800 gallons per foot of level in the SFP. Using the makeup rate identified above, preliminary calculations identify that SFP water level will lower approximately 1 foot every 2.5 hours. At 23 feet above the fuel seated in the spent fuel racks, it will take approximately 32 hours to reach a level 10 feet above the spent fuel (the level assumed to prohibit access to the refuel floor from a radiological perspective). Thus, the transition from Phase 1 to Phase 2 for SFP cooling function is conservatively established to occur in Phase 2 within 24 hours of the onset of the ELAP event. **(Open Item: Perform analysis to verify SFP temperature and level after an ELAP event and adequate level for maintaining radiological access to the refuel floor)**

With the plant operating with the initial conditions of NEI 12-06 (100% for 100 days) the SFP cannot realistically achieve the heat load identified above. Current mode 1 conditions for SFP heat loads predict that the time to reach 200°F in the SFP is currently 66 hours (Reference 24). This is performed daily in accordance with plant surveillance procedure N2-OSP-LOG-D001. In conclusion, it is expected that normal pool inventory would be sufficient to last at least 72 hours.

Makeup to the SFP will be provided by one of two baseline capabilities.

<u>Primary Strategy</u>
NMP2 will implement a design change to install a permanent connection point for a FLEX diesel driven portable pump to supply lake water to the SFP. **(Open Item: Design and implement a modification that provides for connection of a FLEX portable pump to makeup to the SFP).** The pump will take suction from a dry hydrant to supply water from the intake as described in the Maintain Core Cooling Phase 2 section with a discharge connection point on the outside of the north side of the Reactor Building to existing piping from the emergency service water makeup to the

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 2

spent fuel pool (see Attachment 3C concept drawing). The connection points from the dry hydrant and for the discharge on the outside of the Reactor Building will be protected from external hazards consistent with the requirements in NEI 12-06.

Alternate Strategy

The alternate injection method to provide water to SFP is to run a fire hose from the FLEX diesel driven portable pump to the refuel floor and inject to the SFP. The pump will take suction from the dry hydrant discussed above. The discharge of the pump can be simply inserted into the SFP from the refuel floor or alternatively the discharge hose from the portable pump can be attached to a spray nozzle stored on the refuel floor (for B.5.b). The oscillating spray nozzle can be used to provide spray flow over the SFP. A variable to the alternate strategy includes the use of the existing B.5.b pump to satisfy the makeup water requirements. **(Open Item: Develop procedures to implement the connection of a FLEX portable pump to makeup water to the SFP during an ELAP event to include both Primary and Alternate strategies)**

Schedule:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI, and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

Identify modifications	*List modifications*

- Design and implement a modification to install an external emergency fill connection for SFP inventory makeup.
- Design and implement a modification to install SFP Wide Range Level indication addressing NRC Order EA-12-051.

Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.*
Spent Fuel Pool Instrumentation	**Safety Function**
Wide Range SFP Water Level (Component # TBD)	Maintain SFP Water Level

<table>
<tr><th colspan="2">Maintain Spent Fuel Pool Cooling</th></tr>
<tr><th colspan="2">BWR Portable Equipment Phase 2</th></tr>
<tr><th colspan="2">Storage / Protection of Equipment :
Describe storage / protection plan or schedule to determine storage requirements</th></tr>
<tr><td>Seismic</td><td>List how equipment is protected or schedule to protect</td></tr>
<tr><td colspan="2">Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.</td></tr>
<tr><td>Flooding
Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.</td><td>List how equipment is protected or schedule to protect</td></tr>
<tr><td colspan="2">Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.</td></tr>
<tr><td>Severe Storms with High Winds</td><td>List how equipment is protected or schedule to protect</td></tr>
<tr><td colspan="2">Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.</td></tr>
<tr><td>Snow, Ice, and Extreme Cold</td><td>List how equipment is protected or schedule to protect</td></tr>
<tr><td colspan="2">Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.</td></tr>
<tr><td>High Temperatures</td><td>List how equipment is protected or schedule to protect</td></tr>
<tr><td colspan="2">Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 (Reference 3) Section 11. The schedule to construct the structures is still to be determined.</td></tr>
</table>

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 2

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*
The storage structure(s) and location(s) have not yet been determined. Deployment routes and strategies will be identified after the storage location(s) are defined. The spray nozzle and fire hoses needed to provide spray or makeup to the SFP will be kept at an accessible and protected location.	Implement a modification to install an external emergency fill connection for SFP inventory makeup. Implement a modification to install SFP Wide Range Level indication addressing NRC Order EA-12-051 Implement a staging area for the FLEX pumps to connect to the dry hydrants when the final designs are established.	Connection points for FLEX equipment connections will be located in a structure protected against flooding, tornado missiles, and seismic events. New FLEX connections will be installed to meet station and FLEX protection requirements.

Notes:
All Open Items associated with the installation and design of the SFP water level instrumentation in accordance with the requirements of NRC Order EA-12-051 are remanded to the Integrated Plan specifically written as required by that order and due to be delivered to the NRC by 2/28/13.

Dry hydrants to be constructed for similar purposes at NMP1 (i.e., portable pump suction from the intake or fore bay) are also available for the portable pumps at NMP2. Other sources of water include the potential for taking suction from the NMP2 Circulating Water Cooling Tower basin or directly from Lake Ontario (this option may be limited by weather).

Identify analyses or actions:

Perform analysis to verify SFP temperature and level after an ELAP event and adequate level for maintaining radiological access to the refuel floor.

- Design and implement a modification that provides for connection of a FLEX portable pump to makeup to the SFP.
- Develop procedures to implement the connection of a FLEX portable pump to makeup water to the SFP during an ELAP event to include both Primary and Alternate strategies.

Maintain Spent Fuel Pool Cooling

BWR 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 with portable injection source) and strategy (ies) utilized to achieve this coping time.

For Phase 3, fuel pool cooling will continue as in Phase 2, fuel submergence and efforts to restore normal installed system capabilities will begin.

Primary Strategy

For Phase 3, the SFP cooling strategy is to place one loop of SFP cooling in service and to utilize the service water flow established in Maintain Core Cooling Phase 3 with a portable pump from the RRC. This will be accomplished by restoration of power to Division I switchgear by utilizing a 4160 VAC diesel generator from RRC. **(Open Item: Perform an analysis of spent fuel pool cooling system capability for restoration activities considering expected elevated pool temperatures).** If conditions of the SFP do not support the operation of the SFP cooling pump or system, the RHR system can be lined up in the SFP cooling assist mode in order to provide cooling to the system to the point where normal operation of SFP cooling can be restored. Current station procedures support operation of RHR in SFP cooling assist mode.

To supply the cooling water to SFP cooling, a portable diesel pump from the RRC may take suction from the lake and connect the discharge to the Service Water System as described in the Maintain Core Cooling section for Phase 3. The normal cooling water supply for the SFP cooling system is the Reactor Building Closed Loop Cooling system (RBCLC) and so re-configuration to valve out RBCLC and valve in service water will be required. The capability to accomplish this configuration change is restored by the power restoration to the 600 VAC busses described in Maintain Core Cooling Phase 2 (they are safety related 600 VAC motor operated valves). **(Open Item: Develop and implement procedures that provide direction for restoration of SFP cooling during ELAP conditions)**

Alternate Strategy

Alternate means of SFP cooling can be provided by restoration of power to Division II 4160VAC switchgear and using the opposite SFP cooling pump and service water line up that are used for the primary strategy.

Schedule:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06 (Reference 3). These procedures and/or guidelines will support the existing symptom based

Maintain Spent Fuel Pool Cooling		
BWR Portable Equipment Phase 3		
command and control strategies in the EOPs.		
Identify modifications	*List modifications*	
• Implement modifications to the 4160 VAC busses for installation of RRC FLEX generators, including phase rotation indication capability as required. • Implement modifications to the Service water supply connections for RRC large capacity pump(s).		
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation*	
<u>Spent Fuel Pool Instrumentation</u>	**<u>Safety Function</u>**	
Wide Range SFP Water Level (Component # TBD)	Maintain SFP Water Level	
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*
Phase 3 equipment will be provided by the Regional Response Center (RRC. Equipment to be transported to the site will be initially at an interim staging area at least 25 miles from the Nine Mile Point site location. When delivered to the staging area, it will be prepared for operation and transported to the point of use area on site. NMP2 will evaluate and identify the staging area and deployment paths to move equipment from the staging area to the site point of use.	Implement design to install permanent generator connection point(s) to the 4160 VAC busses to accept the RRC DB(s). NMP2 will design and implement modifications to the Service Water supply connections for RRC large capacity pump(s).	Connection points at the exterior of the Screenhouse for Service Water capability from RRC FLEX pump(s) will be designed to withstand the hazards as required in NEI 12-06 (Reference 3)

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 3

Notes:

All Open Items associated with the installation and design of the Spent Fuel Pool level instrumentation in accordance with the requirements of NRC Order EA-12-051 are remanded to the Integrated Plan specifically written as required by that order and due to be delivered to the NRC by 2/28/13.

Identify analyses or actions:

- Perform an analysis of spent fuel pool cooling system capability for restoration activities considering expected elevated pool temperatures.
- Develop and implement procedures that provide direction for restoration of SFP cooling during ELAP conditions.

Safety Functions Support

BWR Installed Equipment Phase 1

Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications.

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 strategy (ies) utilized to achieve coping times.

Main Control Room Habitability

Under current SBO conditions with no mitigating actions taken, existing analysis (Reference 14) projects the Control Room to stabilize at < 100°F. This temperature remains below the NUMARC 87-00 temperature of 110°F, the assumed temperature for efficient human performance (Reference 4). **(Open Item: Perform an analysis to evaluate long term temperature profiles in the NMP2 MCR under ELAP condition)**

RCIC Room Habitability

The RCIC room temperature calculation for SBO (Reference 12) identifies that the RCIC room temperature stabilizes at 146°F if RCIC room doors are opened per Procedure N2-SOP-01 (Reference 8). **(Open Item: Perform an analysis to determine the long term temperature profile in the RCIC room with the higher Suppression Pool temperatures during ELAP conditions)**

Station Lighting

The essential lighting system receives power from the Station normal UPS systems (2VBB-UPS1B, 2VBB-UPS1C, and 2VBB-UPS1D). The essential lighting system provides partial illumination for certain critical areas of the Station requiring continuous lighting such as the Control Room and for passageways to and from areas where safety-related equipment is located, with the exception of those passageways where 8-hr battery-pack lighting is provided to meet the requirements of 10CFR50 Appendix R.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.*

NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.

[4] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increased operating time on battery powered equipment.

Safety Functions Support	
BWR Installed Equipment Phase 1	
Identify modifications	*List modifications and describe how they support coping time.*
None	
Key Parameters	*List instrumentation credited for this coping evaluation phase.*
MCR temperature is available on local 2HVC-TIC118 and it requires no power to provide local indication of the MCR temperature. Additionally, several battery operated portable temperature instruments are available if necessary from the Meter and Test Equipment (M & TE) issue.	
Notes: **Identify analyses or actions:** • Perform an analysis to evaluate long term temperature profiles in the NMP2 MCR under an ELAP condition. • Perform an analysis to determine the long term temperature profile in the RCIC room with the higher Suppression Pool temperatures during ELAP conditions.	

Safety Functions Support

BWR 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 strategy (ies) utilized to achieve coping times.

Main Control Room Habitability
(Open Item: Perform an analysis to evaluate long term temperature profiles in the NMP2 MCR under ELAP condition)

Battery Room Ventilation
It is assumed that, at a minimum, hydrogen production when the battery charger is restored will begin. During an ELAP, hydrogen gas will migrate out of the battery room through the exhaust ductwork in the Control Building. NMP2 will need to perform an evaluation for mitigation strategy of hydrogen hazard from charging the batteries without ventilation. **(Open Item: Perform an analysis for long term environmental conditions in the NMP2 Battery Rooms during an ELAP and evaluate any actions to mitigate the impact of this hydrogen production as required)**

Spent Fuel Pool Area
Per the NEI 12-06 guidance (see Table C-3), a baseline capability for the SFP may be required to provide a vent pathway for steam and condensate from the SFP. **(Open Item: Perform an analysis of Refuel Floor/SFP area for long term environmental conditions) (Open Item: Evaluate the ELAP/FLEX strategy to cope with the potential pressurization of the refueling floor and to prevent buildup of steam and condensation if required)**

Debris Removal
(Open Item: Evaluate requirements and options and develop strategies related to the storage and transport of the on-site FLEX portable equipment) (Open Item: Purchase and maintain the required equipment to ensure debris removal capability to re-establish deployment routes during all modes of operation) This deployment strategy will be included within an administrative program in order to keep pathways clear or actions to clear the pathways.

Transportation Equipment
(Open Item: Evaluate requirements and options and develop strategies related to the storage and transport of the on-site FLEX portable equipment) (Open Item: Purchase and maintain the required equipment to ensure the ability to transport FLEX portable equipment during all modes of operation)

Fuel Management (for portable equipment)
Nine Mile Point currently has 2 fuel trucks on site. Each truck has a capacity of approximately 1500 gallons of diesel fuel. The fuel trucks will be used to refuel the FLEX portable equipment. Fuel oil replenishment for the portable diesel equipment will be accomplished using the fuel oil transfer trucks referenced above. The fuel oil trucks will be re-filled from on-site safety related diesel fuel storage tanks utilizing portable fuel oil transfer pumps. The underground fuel oil storage tanks at

Safety Functions Support

BWR Portable Equipment Phase 2

NMP1 are maintained at > 23,300 gallons (Reference 29) and at NMP2 the storage tanks are maintained at > 118,813 gallons (Reference 13 and 34). Total fuel availability following an event is > 141,000 gallons. Procedures have been established that provide guidance for the ability to pump fuel from storage tanks to the fuel oil trucks (Reference 35). This provides well over 7 days of fuel for all FLEX portable equipment including NMP1. **(Open Item: Perform an evaluation to validate assumptions of fuel consumption and determine when off-site replenishment will be required)**

Procedures have been put in place to provide specific direction to utilize portable gasoline fueled transfer pumps to fill the fuel trucks from the on-site storage tanks (Reference 35).

Gasoline for operation of the small portable generators and the fuel oil transfer pumps will be provided in fire-proof storage cabinets. **(Open Item: Provide the necessary storage facilities in order to provide fuel to the transfer pumps during an ELAP event)**

<u>Communications</u>
Backup power for the fixed satellite telephones:

- Power for the fixed satellite telephones in use at the plants will be from a high power UPS or similar modification providing backup power. **(Open Item: Perform an evaluation of the UPS strategy and design and implement as required)**
- As an alternative, use of the six (6) small FLEX portable generators may be considered in lieu of the high power UPS.

Power for the radio repeaters will be from a high powered UPS or similar modification providing battery backup for at least 24 hours. **(Open Item: Perform an evaluation of the redundant power strategy and design and implement as required)**

Six (6) 1 kW gas generators are to be used to power communications and are to be accompanied by 5 gallons of gas in long term storage cans and lockers. These will be used to charge portable communication devices at the NMP1 and NMP2 MCRs and emergency response facilities. **(Open Item: Verify plans for the FLEX storage facilities in accordance with NEI 12-06 requirements also accommodate the storage and availability of fuel for the small gas generators).**

A supply of portable satellite telephone batteries will be provided at each of these locations to provide a minimum of 24 hours of operation.

Sound powered capabilities exist through the Maintenance Communications system. **(Open Item: Perform an analysis for feasibility of utilizing this sound powered communications for on-site communications for FLEX strategies)**

Safety Functions Support	
BWR Portable Equipment Phase 2	
Emergency Lighting The emergency lighting system provides adequate illumination in areas required for operating the safety-related equipment during emergency conditions. The emergency lighting system normally receives power from Division I, II, and III 600VAC emergency buses. Emergency buses feed Class 1E main lighting distribution panels. Portions of this lighting can be restored when 2EJS*US1 (or 2EJS*US3) is repowered. **(Open Item: Evaluate the strategy for repower of select Emergency Lighting loads when the FLEX portable DG reenergizes the 600 VAC bus)** Battery-powered portable hand lights have been provided for use by the Fire Brigade and other operations personnel required to achieve safe plant shutdown (Reference 1, Section 9.5.3). A supply of flashlights, headlights, batteries and other lighting tools are routinely used by operators and additional supplies will be provided in strategic storage locations throughout the site, including the FLEX protected storage locations. Dewatering **(Open Item: Perform an analysis of the need for dewatering based on leak rates and flood response capabilities)**. At a minimum, it is anticipated that four small pumps will be required to remove water from the service water pump bays to prevent flooding the pump motors with an expected capability of at least 30 gpm. Separate generators may be required if electric submersible types are used. Educator types may also be considered. Water from dewatering may require processing or storage, depending on contaminants. Note that this is not a required strategy for core, containment or spent fuel pool cooling but for the long term consideration of normalization of plant systems. Consumables (Food, Water, Toiletries, Sleeping Bags, etc.) **(Open Item: Evaluate required consumables and options for storage and availability during an ELAP and implement programmatic controls to ensure required inventory is maintained)**	
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.*
NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.	
Identify modifications	*List modifications necessary for phase 2*
• Implement modifications as necessary to ensure power for the fixed satellite telephones in use at the plants is from a high power UPS or similar modification providing backup power.	

Safety Functions Support	
BWR Portable Equipment Phase 2	
• Implement modifications as necessary to ensure power for the radio repeaters will be from a high powered UPS or similar modification providing battery backup for at least 24 hours.	
Key Parameters	*List instrumentation credited or recovered for this coping evaluation*
Phase 2 FLEX Safety Function Support equipment, if required, will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.	
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be installed seismically or protected in structures that are seismically qualified. FLEX equipment will be stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be installed seismically or protected in structures that are seismically qualified. FLEX equipment will be stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be installed seismically or protected in structures that are seismically qualified. FLEX equipment will be stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be installed seismically or protected in structures that are seismically qualified. FLEX equipment will be stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
High Temperatures	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be installed seismically or protected in structures that are seismically qualified. FLEX equipment will be stored in storage structures	

Safety Functions Support

BWR Portable Equipment Phase 2

designed and constructed to meet the requirements of NEI 12-06.

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*
Deployment routes and strategies will be established once the decisions associated with the storage location and the required changes are identified through the analysis and evaluations above.	The results of the analysis and evaluation identified to be performed in the Safety Functions Support Portable Equipment Phase 2 section above may require additional modifications. Power for the fixed satellite telephones in use at the plants will be from a high power UPS or similar modification providing backup power. Power for the radio repeaters will be from a high powered UPS or similar modification providing battery backup for at least 24 hours. NMP perform an evaluation of the redundant power strategy and design and implement as required.	If required, connections will be designed to withstand the hazards as required in NEI 12-06.

Notes:

Identify analyses or actions:

- Perform an analysis to evaluate long term temperature profiles in the NMP2 MCR under ELAP condition.
- Perform an analysis for long term environmental conditions in NMP2 Battery Rooms during an ELAP and evaluate any actions to mitigate the impact of this hydrogen production as required.
- Perform an analysis of Refuel Floor/SFP area for long term environmental conditions.
- Evaluate the ELAP/FLEX strategy to cope with the potential pressurization of the refueling floor and to prevent buildup of steam and condensation if required.
- Evaluate requirements and options and develop strategies related to the storage and transport of the on-site FLEX portable equipment.

Safety Functions Support
BWR Portable Equipment Phase 2
• Purchase and maintain the required equipment to ensure debris removal capability to re-establish deployment routes, during all modes of operation. • Evaluate requirements and options and develop strategies related to the storage and transport of the on-site FLEX portable equipment. • Purchase and maintain the required equipment to ensure debris removal capability to re-establish deployment routes, during all modes of operation. • Evaluate requirements and options and develop strategies related to the storage and transport of the on-site FLEX portable equipment. • Purchase and maintain the required equipment to ensure the ability to transport FLEX portable equipment during all modes of operation. • Perform an evaluation to validate assumptions of fuel consumption and determine when off-site replenishment will be required. • Provide the necessary storage facilities in order to provide fuel to the transfer pumps during an ELAP event. • Perform an evaluation of the UPS strategy and design and implement as required. • Perform an evaluation of the redundant power strategy and design and implement as required • Verify plans for the FLEX storage facilities in accordance with NEI 12-06 requirements also accommodate the storage and availability of fuel for the small gas generators. • Perform an analysis for feasibility of utilizing this sound powered communications for on-site communications for FLEX strategies. • Evaluate the strategy for repower of select Emergency Lighting loads when the FLEX portable DG reenergizes the 600 VAC bus. • Perform an analysis of the need for dewatering based on leak rates and flood response capabilities. • Evaluate required consumables and options for storage and availability during an ELAP and implement programmatic controls to ensure required inventory is maintained.

Safety Functions Support	
BWR 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 strategy (ies) utilized to achieve coping times. When RRC distribution sites are finalized, NMP2 will work with state and local agencies to insure pathways to the site are recognized. Phase 3 strategy will be to transition from a Phase 2 FLEX pumps to permanently installed RHR system in shutdown cooling mode, SFP cooling pump in SFP cooling and other various installed plant equipment that support the maintenance of key safety functions. The emergency lighting system provides adequate illumination in areas required for operating the safety-related equipment during emergency conditions. The emergency lighting system normally receives power from the off-site power sources via Class 1E 4.16-kV switchgears, and 600-V emergency buses. Emergency buses feed Class 1E main lighting distribution panels. The essential lighting system is connectable to emergency diesel generators except during a LOCA condition (Reference 1, section 9.5.3). **(Open Item: Perform an analysis of the light coverage during ELAP conditions and determine if the lighting loads should be re-energized from the non-safety related buses by the RRC FLEX generator)**	
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.*
NMP2 will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the EOPs.	
Identify modifications	*List modifications necessary for phase 3*
Implement a design change to install permanent generator connection point(s) to the 4160 VAC busses to accept the RRC DG.	

Safety Functions Support		
BWR Portable Equipment Phase 3		
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.*	
Phase 3 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.		
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*
Deployment routes and strategies will be established once the decisions associated with the storage location and the required changes are identified through the analysis and evaluations above.	Implement a design change to install permanent generator connection point(s) to the 4160 VAC busses to accept the RRC DG. The results of the analysis and evaluation identified to be performed in the Safety Functions Support Portable Equipment Phase 2 section above may require additional modifications.	Connections will be designed to withstand the hazards as required in NEI 12-06.

Notes:

Identify analyses or actions:

- Perform an analysis of the lights coverage during ELAP conditions and determine if the lighting loads should be re-energized from the non-safety related buses by the RRC FLEX generator.

References

References used in this integrated plan and listed here are available for audit.

1) Nine Mile Point Unit 2 Updated Safety Analysis Report, Revision 20, October 2012
2) Not used
3) NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, August 2012
4) NUMARC 87-00, Station Blackout, Revision 1, August 1991
5) NEI 12-01, Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities, Revision 0, April 2012
6) NER-2M-039, NMP2 Emergency Operating Procedures and Severe Accident Procedures (EOP/SAP) Basis Document, Revision 8, January 2013
7) NMP2SBO, NMP2 Station Blackout Bases Document, Revision 4, November 2007
8) N2-SOP-01, Station Blackout, Revision 01102, May 2010
9) N2-SOP-02, Station Blackout Support Procedure, Revision 0701, November 2012
10) GAI-OPS-20, Transient Mitigation Guidelines, Revision 06, December 2011
11) NSS017455000- GENE-770-04-1290, Nine Mile Point Unit 2 Station Blackout Study, Revision 02, September 1993
12) ES-268, SBO RCIC pump turbine room calculation, Revision 0, May 1993
13) NMP2-TSPEC, Nine Mile Point Nuclear Station Unit 2 Improved Technical Specifications Volumes 2 and 3 Bases, Revision 37, May 2012
14) ES-198, Control Building station blackout calculation, Revision 1, November 1985
15) GEH 000-0155-1545, BWROG RCIC Pump and Turbine Durability Evaluation – Pinch Point Study, Revision 0, February 2013
16) N2-DRP-OPS-001, Operations Damage Repair Procedure, Revision 06, July 2012
17) EC-129, Plant emergency battery calculation during SBO, Revision 4, July 2010
18) ENGDOC-09-000013, List of Time Critical Manual Operator Actions and Engineering Bases for NMP SOP's and EOP's, Revision 1, October 2009
19) PRAER N2-2013-001, NMP2 ELAP MAAP results, Revision Draft, January 2013
20) N2-EOP-RPV, Emergency Operating Procedure, Reactor Pressure Vessel Control, Revision 14, May 2012
21) NEDC 33771P R1C - GEH Evaluation of FLEX Implementation Guidelines, Revision 1, January 2013
22) BWROG Emergency Procedure and Severe Accident Guidelines, Revision 3, February 2013
23) ES-266, Station Blackout- Reactor Vessel and Primary Containment Response calculation, Revision 2, August 2006
24) A10.1-GOTHIC-SFP001, SFC time to reach 200^{0}F calculation, Revision 0, January 2012
25) CNG-CM-4.01, Configuration Management, Revision 0, February 2009

26) CNG-TR-1.01-1000, Conduct of Training, Revision 000900, February 2013
27) A10.1-J-045, Core Off-Load Starting 48 Hours After Reactor Shutdown – Refueling Outages & Emergency Full Core, Revision 1, May 2012
28) N2-OP-34, Nuclear Boiler, Automatic Depressurization and Safety Relief Valves, Revision 9, April 2012
29) Nine Mile Point Unit 1 Technical Specifications
30) 10 CFR Section 50.63, Loss of all alternating current power
31) NRC Order 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
32) NRC Order EA-12-051, Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, March 12, 2012
33) NRC Interim Staff Guidance (ISG) JLD-ISG-2012-01, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, August 29, 2012
34) DCD-115, Design Criteria Document, Revision 1
35) S-DRP-OPS-004, Refueling Diesel Portable Equipment, Revision 0000, January 2013

BWR Portable Equipment Phase 2							
Use and (potential / Flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Five (5) 3419MX self-prime, diesel driven pumps (site total)	X	X	X			770 gpm, 365 psi	Will follow EPRI template requirements
Three (3) 600 VAC diesel driven, generators (site total)				X	X	500 kW [1]	Will follow EPRI template requirements
Two (2) B.5.b 3HA self-prime, diesel driven pumps (site total)						850 gpm, 165 psi	Will follow EPRI template requirements
Six (6) 1kW, 120 VAC, gas generators (site total)						1kW, 120 VAC	
Two (2) gas driven fuel oil transfer pumps (site total)	X	X	X	X		30-156 gpm, lift 10-25 feet,	
Two (2) diesel driven air compressors						375 cfm, 150 psig	

BWR Portable Equipment Phase 2							
Use and (potential / Flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Four (4) dewatering pumps					X	To be determined	
Five (5) enclosed 14' trailers (site total)	X		X			Means to store and transport hoses, strainers, cables, and miscellaneous equipment	Will follow EPRI template requirements

1. Preliminary estimate of 500 kW, actual capacity will be verified when load calculations are completed (Open Item identified in body of plan)
2. Current portable generators are 480 VAC and will be rewired or 600 VAC generators will be purchased. This compatibility is recognized as resolute in the design process.

BWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Ten (10) submersible dewatering pumps				X	X	100 gpm	Self-powered, electric or air discharge to ground level or temporary tanks
Ten (10) small capacity generators				X	X	6 kVA	Power for Electric dewatering
Two (2) 4160 VAC generators	X		X	X	X	2 MW	Portable 4160 VAC generator will power one installed SDC train
Six (6) portable exterior lighting					X	6 kW	Self-powered diesel, 30" mast
One (1) medium capacity generator						250 kVA 600 VAC	Power for TSC and OSC
Two (2) SFP makeup pumps			X			500 gpm 500 psig	Self-powered, Low pressure pump (1 per unit)
Two (2) RCS inventory/cooling pumps	X					500 gpm 500 psig	Self-powered, Low pressure pump (1 per unit)
Two (2) containment cooling pumps		X				2500 gpm 300 psig	Function for containment spray if required (1 per unit)

Phase 3 Response Equipment/Commodities	
Item	**Notes**
Radiation Protection Equipment • Survey instruments • Dosimetry • Off-site monitoring/sampling	
Commodities • Food • Potable water	
Fuel Requirements • Number 2 fuel oil • Gasoline	
Heavy Equipment • Transportation equipment • Debris clearing equipment	

Attachment 1A Sequence of Events Timeline

Action item	Elapsed Time	Action	Time Constraint Y/N*	Remarks / Applicability
0	0	Event Starts	N	Plant @ 100% power
1	2 min.	RCIC starts	N	
2	< 5 min	Operator maintains pressure in 500 - 1000 psig band using sustained SRV openings	N	Current EOP action (References 6 and 10)
3	< 15min	Operators bypass high RCIC room temp isolations in the Control Room	Y	Current SBO action (References 7, 8 and 9)
4	< 30 min	Operator open control and relay room doors	Y	Current SBO action (References 7, 8 and 9)
5	< 1 hr	• Plant process computer shutdown for MCR habitability. • Essential lighting loads stripped for Control Room habitability and DC conservation. • ELAP diagnosis/decision made, enter FSG's. • First team dispatched for temporary diesel generator to initiate setup of portable AC supply to Division I or Division II	Y	Current SBO action (References 7, 8 and 9) Procedures changes will be required to support new FLEX strategy and portable equipment deployment

Attachment 1A
Sequence of Events Timeline (cont'd)

Action item	Elapsed Time	Action	Time Constraint Y/N*	Remarks / Applicability
6	1 hr	Operator lowers Reactor pressure band to 200-400 psig	Y	Reduce coolant leakage and stay within the Heat Capacity Temperature Limit (HCTL)
7	<2 hrs	• Loads stripped to maximize battery life. • Operators open RCIC room door. • Remove DC generator seal oil pump (procedure revision required) • Remove DC turbine bearing oil pump	Y	Current SBO action (References 7, 8 and 9). Procedure changes will be required to support removing generator hydrogen
8	8 hrs	• Complete FLEX portable generator powering 600 VAC bus and battery charger • Begin FLEX pump deployment to connect to RHR	Y	Current battery calculations and load shedding support 6.9 hr voltage profile. Further calculations are necessary to identify those actions necessary to achieve a coping time for divisional battery coping time > 8 hours
9	8 hrs	SFP temperature reaches 212� F. Monitor level for boil off and leakage	N	Boil-off rate is slow with a large volume of water in SFP
10	8.3 hrs	Venting to occur at 230°F Suppression Pool temperature	Y	Will control suppression chamber pressure approximately 6-9 psig and preserve RCIC operation. Estimated time per MAAP analysis. Procedure changes necessary per BWROG EPG/SAG Rev 3

Attachment 1A
Sequence of Events Timeline (cont'd)

Action item	Elapsed Time	Action	Time Constraint Y/N*	Remarks / Applicability
11	10 hrs	Begin fuel oil consumption monitoring and replenishment actions	N	Approximately 12 to 14 run time on portable generator
12	16 hrs	Complete FLEX connection of portable pump to the RHR external connection (provides reactor and/or Suppression Pool makeup)	Y	Once venting has commenced, makeup to the pool should commence before level goes below 197' and uncovers temperature elements. If at an initial level of 199.5' makeup should commence to keep elements for Suppression Pool temperature accurate and maximize NPSH for RCIC
13	16 hrs	Diesel driven pump connected for SFP Makeup	N**	Boil-off rate is slow with a large volume of water in SFP
14	> 24 hrs	Shutdown RCIC , inject to RX via RHR and FLEX pump	N	With portable pumps in place and the capability to vent the containment and to inject to the reactor and to makeup water to the Suppression Pool, the only limitation is enough decay heat to produce adequate steam for operation. MAAP analysis indicates RCIC will be available beyond 72 hours

Notes:
*Provide justification if No or NA is selected in the remark column
If yes, include technical basis discussion as requires by NEI 12-06 (Reference 3) Section 3.2.1.7

** The maximum heat load in the spent fuel pool is limited by the heat exchanger removal capabilities. To meet the design heat load of the system and have the gates installed per the initial conditions of the NEI 12-06 (Reference 3), the plant would have to be over 8 days into an outage requiring an emergency core off load. In this worst case, no fuel in the reactor would eliminate the need to be concerned with core cooling or containment cooling. Following outages the highest heat loads in the pools would not require makeup until Phase 3 based on daily estimation performed for time to reach 200°F.

Attachment 1B Analysis Deviation Table

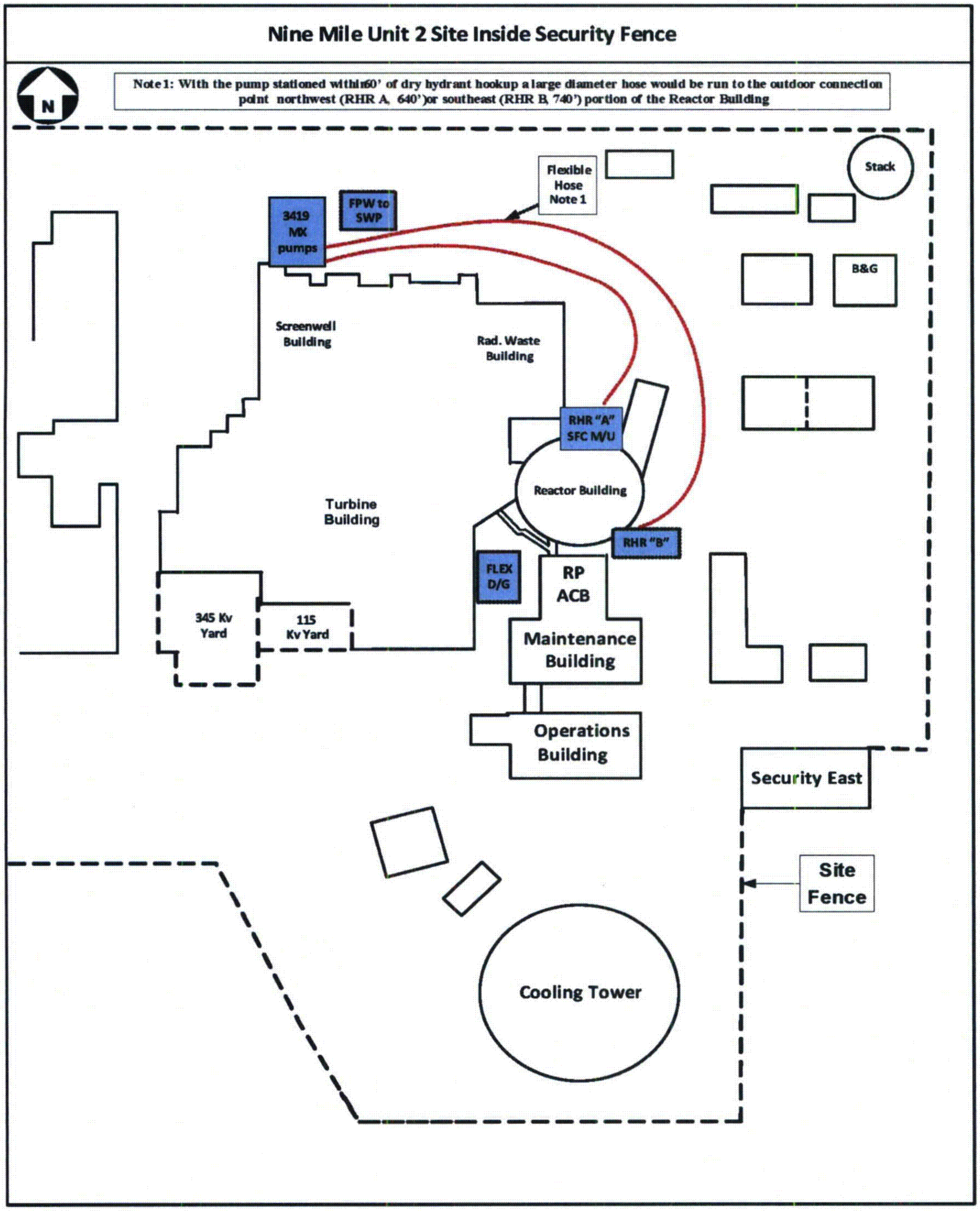
Item	Parameter of interest	Analysis value	Page	Plant applied value	Gap and discussion
	None				

Attachment 2 Milestone Schedule

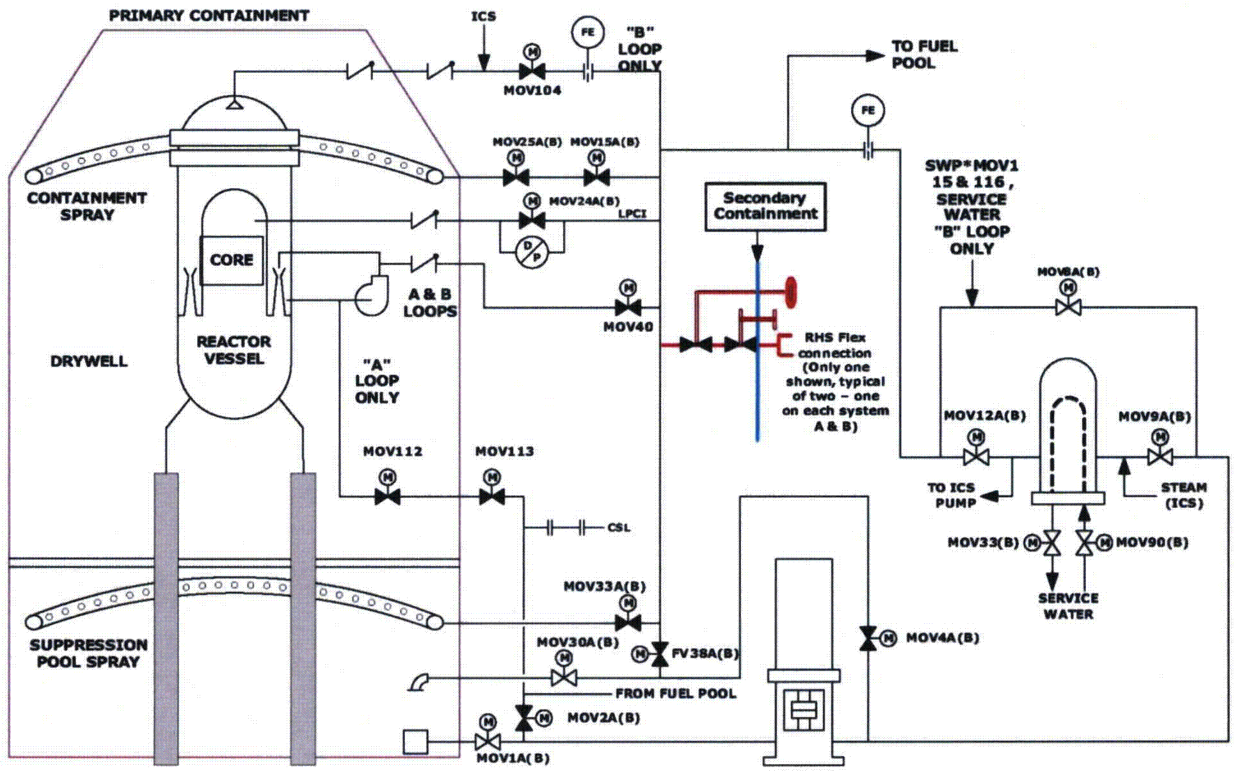
The following milestone schedule is provided. The dates are planning dates subject to change as design and implementation details are developed. Any changes to the following target dates will be reflected in the subsequent 6 month status reports.

Original Target Date	**Activity**	**Status (Include Date Changes in this Column)**
October 2012	Submit 60 Day Status Report	Complete
February 2013	Submit Overall Integrated Implementation Plan	
August 2013	Submit 6 Month Status Report	
January 2014	Equipment storage facility design	
February 2014	Submit 6 Month Status Report	
April 2014	Refueling outage	
August 2014	Submit 6 Month Status Report	
November 2014	Engineering and Design Completion - Portable Equipment Connections	
February 2015	Submit 6 Month Status Report	
June 2015	Equipment Storage facility installation	
August 2015	Submit 6 Month Status Report	
January 2016	Non Outage installation – portable equipment connections	
February 2016	Submit 6 Month Status Report	
March 2016	Portable Equipment procedure changes	
March 2016	Flex Training	
April 2016	Refueling Outage	
May 2016	Portable equipment connection outage installation	
July 2016	Final NRC Flex Implementation submittal	

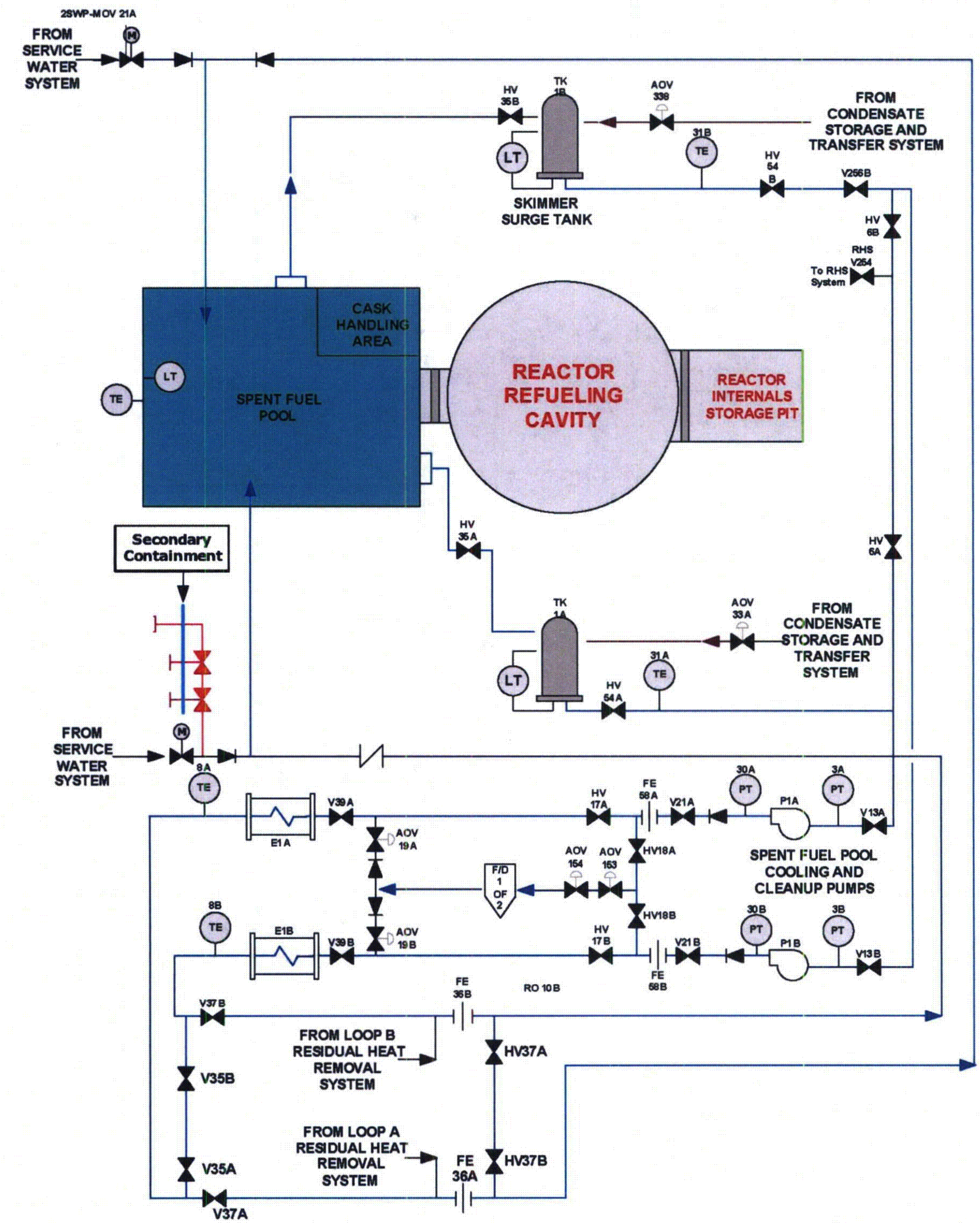
Attachment 3A Deployment Sites Concept



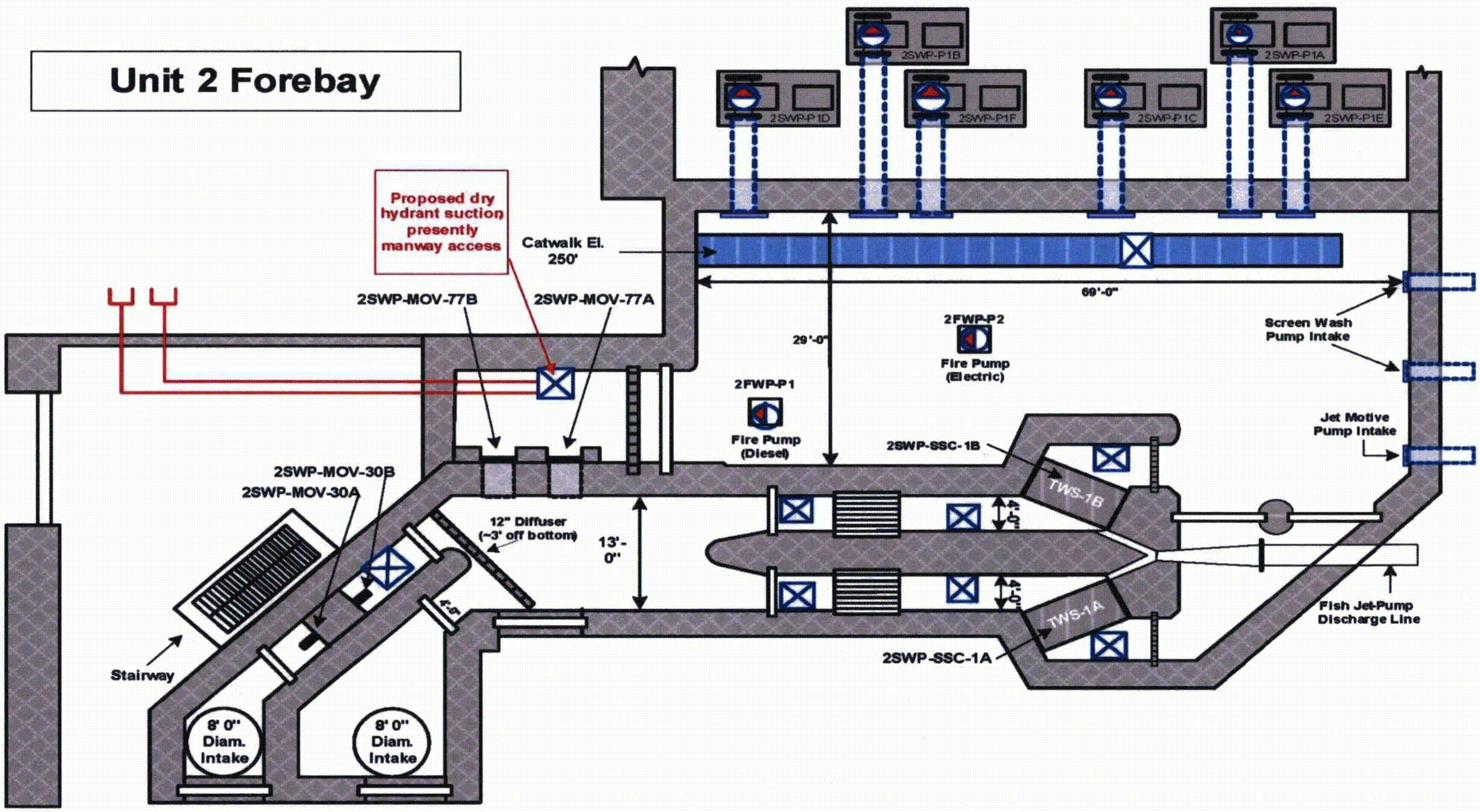
Attachment 3B RHR FLEX Concept



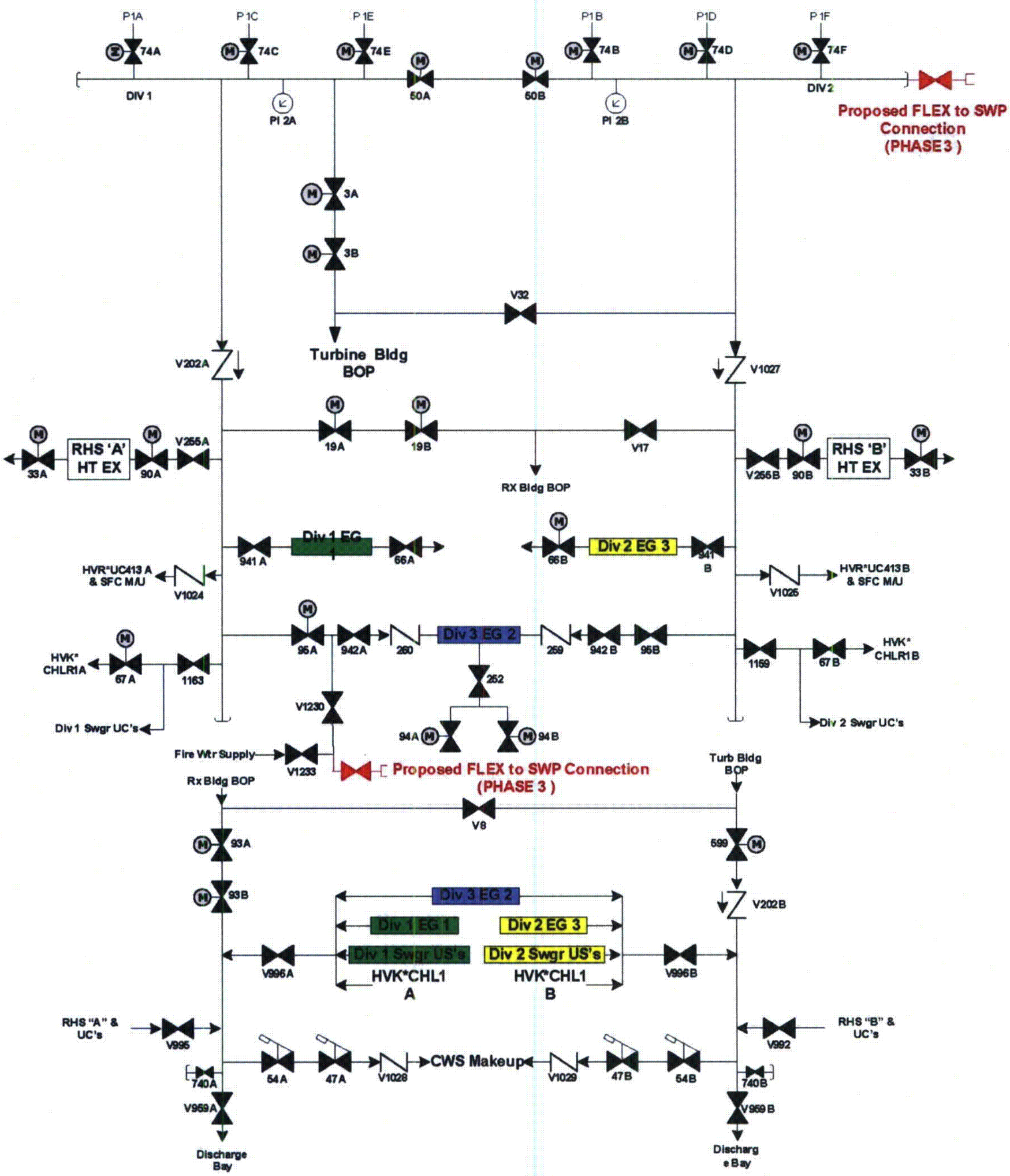
Attachment 3C SFC FLEX Concept



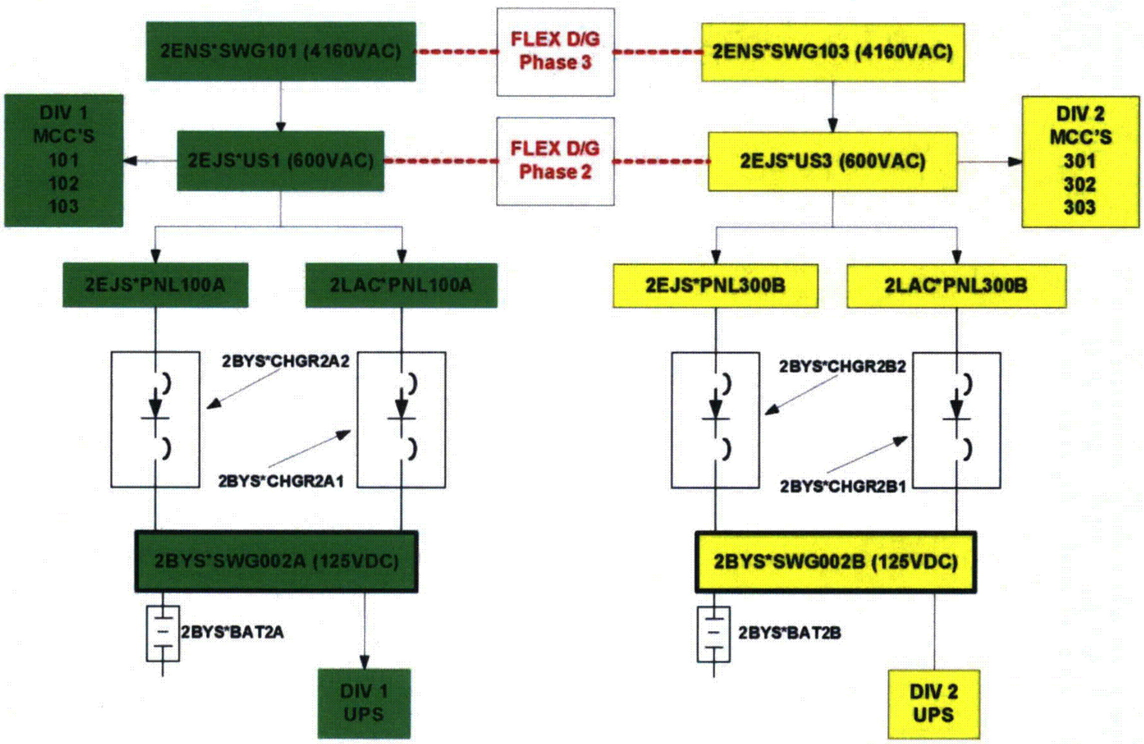
Attachment 3D Service Water FLEX Suction Concept



Attachment 3E Service Water Phase 3 FLEX Concept



Attachment 3F Electrical FLEX Concept



ATTACHMENT (4)

CALVERT CLIFFS INTEGRATED PLAN FOR MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS

Constellation Energy Nuclear Group, LLC
February 28, 2013

Table of Contents

Introduction

This integrated plan provides the Calvert Cliffs Nuclear Power Plant (CCNPP) approach for complying with Order EA-12-049 using the methods described in NRC JLD-ISG-2012-01. The current revision of the CCNPP Integrated Plan is based on our conceptual design information and will be revised as we proceed with detailed design engineering. Consistent with the requirements of Order EA-12-049 and the guidance in NEI 12-06, six-month reports will delineate progress made, including an update of milestones accomplished since the last report, any proposed changes in compliance methods, updates to the schedule, and if needed, requests for relief and the basis.

Implementation Capability Requirements Overview

The primary mitigation strategies (FLEX) objective is to develop the capability for coping with a simultaneous extended loss of alternating current (AC) power ELAP and loss of normal access to the UHS (LUHS) event for an indefinite period through a combination of installed plant equipment, portable on-site equipment, and off-site resources. The baseline assumptions have been established on the presumption that other than the loss of normal and alternate AC power sources, and normal access to the UHS, installed equipment that is designed to be robust with respect to design basis external events is assumed to be fully available. Installed equipment that is not robust is assumed to be unavailable. Permanent plant equipment, cooling and makeup water inventories, and fuel for FLEX equipment contained in systems or structures with designs that are robust with respect to seismic events, floods, high winds and associated missiles are available. Other equipment, such as portable ac power sources, portable back up dc power supplies, spare batteries, and equipment for 10 CFR 50.54(hh)(2), may be used provided it is reasonably protected from the applicable external hazards and has predetermined hookup strategies with appropriate procedures/guidance and the equipment is stored in a relative close vicinity of the site. Installed electrical distribution system, including inverters and battery chargers, remain available provided they are protected consistent with current station design.

The FLEX strategy relies upon the following principles:

- Initially cope by relying on installed plant equipment (Phase 1)
- Transition from installed plant equipment to on-site FLEX equipment (Phase 2)
- Obtain additional capability and redundancy from off-site resources until power, water, and coolant injection systems are restored or commissioned. (Phase 3)
- Response actions will be prioritized based on available equipment, resources, and time constraints. The initial coping response actions can be performed by available site personnel post-event.
- Transition from installed plant equipment to on-site FLEX equipment may involve on-site, off-site, or recalled personnel as justified by evaluation.
- Strategies that have a time constraint to be successful are identified and a basis provided that the time can reasonably be met.

An element of a set of strategies to maintain or restore core and SFP cooling and containment functions includes knowledge of the time that CCNPP can cope with the challenges to these key safety functions using installed equipment during a beyond-design-basis external event (BDBEE). This knowledge provides an input to decisions on storage locations and conditions of readiness of the FLEX equipment required for the follow-on phases. This duration is related to, but distinct from the specified duration for the requirements of 10 CFR 50.63, *Loss of all alternating current power*, (Reference 6) paragraph (a), because it represents our current capabilities rather than a required capability. As such CCNPP will 1) account for the SFP cooling function, which is not addressed by 10 CFR 50.63(a); and 2) assume the non-availability of alternate AC sources, which may be included in meeting the specified durations of 10 CFR 50.63(a). This is implicit in the FLEX principles described in Section 3.2.1.7, Paragraph (6) and Section 3.2.2, Paragraph (1) of NEI 12-06. Maintenance of the guidance and strategies addressing estimate of capability will be kept current to reflect plant conditions following facility changes such as modifications or equipment outages. We recognize that changes to the facility can impact the duration for which the initial response phase can be accomplished, the required initiation times for the transition phase, and the required delivery and initiating times for the final phase.

Implementation Plan

Capabilities for responding to ELAP and LUHS scenarios caused by BDBEEs are described in the following sections.

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Calvert Cliffs Nuclear Power Plant Units 1 and 2	
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.*

Constellation Energy's Calvert Cliffs Nuclear Power Plant (CCNPP or Calvert) site is located on the western shore of the Chesapeake Bay near the town of Lusby in Calvert County in the state of Maryland. The plant's nuclear steam supply system (NSSS) is a pressurized water reactor originally designed by Combustion Engineering (CE), now part of Westinghouse Electric Company, LLC. The containment structure and balance of plant were designed by Bechtel Power Corporation.

The applicable extreme external hazards for CCNPP are seismic, external flooding, high winds (including tornadoes), snow, ice, extreme cold and high temperatures as detailed below:

<u>Seismic Hazard Assessment</u>:

CCNPP was originally designed to a Housner shaped Safe Shutdown Earthquake (SSE) with a 0.15g Peak Ground Acceleration (PGA). CCNPP was classified as a focused scope plant in accordance with NUREG 1407 and performed A Seismic Probabilistic Risk Assessment using the seismic hazard data from NUREG 1488. The Review Level Earthquake (RLE) was 0.4g median shape 10,000-yr. uniform hazard spectrum shape for the fragility analyses. (Reference 23)

Per the CCNPP Units 1 and 2 Updated Final Safety Analysis Reports (UFSAR) (Reference 1) Section 2.6.5.4, the seismic criteria for CCNPP include two design basis earthquake response spectra: Operating Basis Earthquake (OBE) and the Design Basis Earthquake (DBE) (SSE). The horizontal DBE and the OBE are 0.15g and 0.08g, respectively; these values constitute the design basis of CCNPP. Per NEI 12-06 (Reference 2), Table 4-2, Considerations in Assessing Applicability of External Hazards, all sites will consider seismic events.

The CCNPP Units 1 and 2 UFSAR was reviewed to determine the potential for soil liquefaction under design earthquake conditions at the site.

Per CCNPP Units 1 and 2 UFSAR Section 2.7.6.3, Liquefaction Potential, data were used from the dynamic triaxial testing, standard penetration resistances from the borings, in-place density determinations and geological origin of the sedimentary soils at the site. All of these data showed that the soil at the site was not of a liquefaction potential. The dynamic tests showed exceptional strength under constant cyclic stress. Therefore, the likelihood of liquefaction at the site for a DBE event with a maximum horizontal acceleration equal to 0.15g appears to be low based on the information presented in the CCNPP Units 1 and 2 UFSAR.

Thus CCNPP screens in for an assessment for seismic hazard except for liquefaction.

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External Flood Hazard Assessment:

The Design Basis Flood Level (DBFL) for CCNPP is 27.1 feet. Per CCNPP Units 1 and 2 UFSAR Section 2.8.3 the Probable Maximum Hurricane (PMH) will produce a calculated wave run-up to Elevation 27.1 ft. mean seal level (MSL). The principal structure of concern is the Intake Structure. The Intake Structure is a Category 1 structure designed for seismic, tornado, and hurricane conditions. The CCNPP Intake Structure houses the saltwater cooling pumps, which are essential for safe shutdown of the plant. The Intake Structure has a roof elevation of 28.5 ft. MSL and an open deck at Elevation 10.0 ft. MSL on the Chesapeake Bay side. The deck is about 50 ft. wide and has openings for the trash rakes and racks, stop logs, and traveling screens. Behind the open deck is the pump house that houses the circulating water pumps and the saltwater cooling pumps. Therefore, per NEI 12-06, Section 6.2.1, CCNPP is not a "dry" site because portions of the plant are below the design basis flood level (DFBL). Per NEI 12-06, Table 6-1, Flooding Warning and Persistence Conditions, the warning time would be days and the persistence of the event would be hours.

Thus CCNPP screens in for an assessment for external flooding.

High Wind Hazard Assessment:

CCNPP is located at 38°25'55" N latitude and 76°26'32" W longitude. This location is approximately 10-1/2 miles southeast of the town of Prince Frederick, Maryland (Reference 1, Section 2.2.2). Per NEI 12-06, Figure 7-1, Contours of Peak-Gust Wind Speeds at 10-m Height in Flat Open Terrain, Annual Exceedance Probability of 10-6, CCNPP has a 1 in 1 million chance per year of a hurricane induced peak-gust wind speed of 150 – 160 miles per hour.

Per NEI 12-06, Figure 7-2, Recommended Tornado Design Wind Speeds for the 10-6/yr Probability Level, CCNPP has a 1 in 1 million chance of tornado wind speeds of 166 miles per hour. As this is greater than the NEI 12-06 threshold of 130 mph, the site will address tornado hazards impacting FLEX deployment.

Thus CCNPP screens in for an assessment for High Wind Hazard.

Snow and Extreme Cold Hazard Assessment:

The guidelines provided in NEI 12-06 include the need to consider extreme snowfall and low temperatures at plant sites in the United States above the 35th parallel. CCNPP is located above the 35th parallel (Reference 2, Section 8.2.1) and thus the capability to address hindrances caused by extreme snowfall with snow removal equipment needs be provided. Per CCNPP Units 1 and 2 UFSAR Section 2.3.9.2, Snow Storms, the snowfall total of 59 inches for the combined months of January and February, was chosen to represent the 100-year snow pack on the ground. Per Section 5A.4, Loadings Common to All Structures, for ice or snow loading, a uniformly distributed live load of 30 psf on all roofs provides for any anticipated snow and/or ice loading. The historical low temperature recorded at Lusby, MD, located approximately 3 miles to the south of the site was (-) 9°F in February 1996. Per CCNPP UFSAR Section 9.8, Plant Ventilation Systems, the plant is designed for outside air temperatures ranging from 0°F to 95°F.

The Chesapeake Bay last experienced area-wide freezing during the winter of 1976 – 1977, when for a three week period starting December 25, 1976 large portions of the Chesapeake Bay were frozen over and Coast Guard cutter/ice breakers had to be used to keep shipping channels open. The average

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temperature for Baltimore, MD for January was 22.9°F, 10 degrees below normal.

Thus CCNPP screens in for an assessment for Snow and Extreme Cold Hazard.

Ice Hazard Assessment:

CCNPP is located within the region characterized by EPRI as ice severity level 4 (Reference 2, Figure 8-2, Maximum Ice Storm Severity). Per CCNPP Units 1 and 2 UFSAR Section 2.3.2.3, Freezing Precipitation, the Patuxent Naval Air Training Center (NATC) records (1949-1964) list 910 hours of snow and 265 hours of frozen or freezing precipitation, other than snow, for a total of 1175 hours (or 70,500 minutes) in 15 years. Interpolating for a 10-year span yields 47,000 minutes of freezing precipitation. Per UFSAR Section 5A.4, Loadings Common to All Structures, for ice or snow loading, a uniformly distributed live load of 30 psf on all roofs provides for any anticipated snow and/or ice loading. As such, CCNPP is subject to severe icing conditions that could also cause catastrophic destruction to electrical transmission lines.

Thus CCNPP screens in for an assessment for Ice Hazard.

Extreme High Temperature Hazard Assessment:

Per NEI 12-06 Section 9.2, all sites will address high temperatures. In the Chesapeake Bay western shore region of Maryland summers are warm and humid, with rare periods of extremely hot weather over 100°F. The historical high temperature recorded at Lusby, MD, located approximately 3 miles to the south of the site was 103°F in July 1980. Per CCNPP UFSAR Section 9.8, Plant Ventilation Systems, the plant is designed for outside air temperatures ranging from 0°F to 95°F. Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.

Thus CCNPP screens in for an assessment for extreme High Temperature.

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:* • *Flood and seismic re-evaluations pursuant to the NRC 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes.* • *Exceptions for the site security plan or other (license/site specific) requirements of 10CFR may be required.* • *Deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours.* • *Certain Technical Specifications cannot be complied with during FLEX implementation.*

Key assumptions associated with implementation of FLEX Strategies for CCNPP are described below:

- Flood and seismic re-evaluations pursuant to the NRC 10 CFR 50.54(f) letter of March 12, 2012

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are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action program and addressed.

- Staffing re-evaluations pursuant to NRC 10 CFR 50.54(f) letter of March 12, 2012have not been completed and will be performed under the NTTF recommendation for staffing
- The following conditions exist for the baseline case:
  - Seismically designed direct current (DC) battery banks are available.
  - Seismically designed alternating (AC) and DC distribution systems are available.
  - Plant initial response is the same as Station Blackout (SBO).
  - Entry into Extended Loss of AC Power (ELAP) will occur by the one hour point.
  - Best estimate of the decay heat load analysis and decay heat is used to establish operator action time.
  - One System, Subsystem, Component (SSC) single failure is assumed. Per NEI 12-06 Section 3.2 (Reference 2) all installed emergency and SBO AC sources are not available, which constitutes the single failure. Therefore, Turbine-Driven Auxiliary Feedwater (TDAFW) System and other non-AC power source safety-related equipment on both Units 1 and 2 will function as designed.
- **(Open Item: Add margin to design FLEX components and hard connection points to address future requirements as re-evaluation warrants. Portable FLEX components will be procured commercially.)**
- The designed hardened connections will be protected against eternal hazards. **(Open Item: Implement a design change to install permanent protected FLEX equipment connection points).**
- **(Open Item: Evaluate deployment strategies and deployment routes to ensure they are assessed for and address applicable hazards impact.)**
- Phase 2 FLEX components will be stored at the site in a location or locations such that they are reasonably protected and that no one external event can reasonably fail the site FLEX capability. Provision will be made for multiple sets of portable on-site equipment stored in diverse locations or through storage in structures designed to reasonably protect from applicable external events.
- Additional staff resources are expected to begin arriving at 6 hours and the site will be fully staffed 24 hours after the event.
- Maximum environmental room temperatures for habitability or equipment availability is based on NUMARC 87-00 (Attachment 3-1, Reference 3) guidance if other design basis information or industry guidance is not available.
- **(Open Item: Develop a process for implementation of exceptions for the site security plan or other (license/site specific – 10CFR50.54.X) requirements of a nature requiring NRC approval will be communicated in a future 6 month update following identification.)**

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• FLEX equipment storage location(s) have not been selected. **(Open Item: Define implementation routes upon finalizing a location or locations for FLEX equipment storage location(s).) (Open Item: Evaluate requirements, options, and develop strategies to provide reasonably protected storage on site for the FLEX portable equipment.) (Open Item: Design and build a protected storage location or locations for the FLEX equipment. Ensure the design meets the requirements of NEI 12-06.)**

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.*
CCNPP has no known deviations to the guidelines in JLD-ISG-2012-01 and NEI 12-06. If deviations are identified, they will be communicated in a future 6 month update following identification.	

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 walkthrough of deployment).* *Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment 1A* *See attached sequence of events timeline (Attachment 1A).* *Technical Basis Support information, see attached NSSS Significant Reference Analysis Deviation Table (Attachment 1B)*

Sequence of events provided in Attachment 1-1A.

- ≤ 30 minutes, Plant Computer and its associated inverter, 1/2Y05A and 1INV1T11 (Unit 1 only. Mk VI Turbine Controls Inverter) are load shed (Att. 1A, Item 5). Per EOP-7, Station Blackout, the Plant Computer and its associated inverter, 1/2Y05A and 1INV1T11 (Unit 1 only, MK VI Turbine Controls Inverter) must be load shed from the DC buses Technical Basis: EOP-7, Station Blackout Technical Basis (Reference 6).
- ≤ 30 minutes, remove Control Room front lower panel covers (Att. 1A, Item 6). Per EOP-7, Station Blackout, Control Room front lower panel covers are removed in less than thirty (30) minutes to establish natural circulation cooling to the instrumentation. Technical Basis: EOP-7, Station Blackout Technical Basis (Reference 6).
- ≤1 hour, entry into ELAP (Att. 1A, Item 7). Time critical at a time greater than 1 hour. Time

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period of one (1) hr is selected conservatively to ensure that ELAP entry conditions can be verified by control room staff and it is validated that emergency diesel generators (EDG) are not available. One hour is a reasonable assumption for system operators to perform initial evaluation of the condition of the EDGs. Entry into ELAP provides guidance to operators to perform ELAP actions. Control room staff will direct deployment of the portable diesel-driven alternate AFW pump and initiation of non-vital 125 VDC load shedding. Technical Basis: WCAP-17601-p and NEI 12-06.

- 2 hours, commence Reactor Coolant System (RCS) cooldown (Att. 1A, Item 9). Commence plant cooldown at 75°F per hour to RCS cold leg temperature of > 350°F. Technical Basis: WCAP-17601-P.
- 2 hours, DC Load shed complete (Att. 1A, Item 10) - DC buses are readily available in the Cable Spreading Room located one level below the Control Room for operator access and breakers will be appropriately identified to show which are required to be opened to effect a deep load shed (Reference 4). From the time that ELAP conditions are declared, it is reasonable that operators can complete the DC bus load shed in approximately 60 minutes. DC load shedding must be completed within two (2) hours of event initiation to extend CCNPP station vital 125 VDC battery coping to > 11 hrs for maintenance of essential instrumentation. Technical Basis: CCN0012-17-STUDY-001(Reference 7).
- 2 hours, portable diesel-driven alternate AFW pump deployed (Att. 1A, Item 11). Portable pump ready to provide backup for TDAFW pump and is deployed such that final connection and startup can be completed in < 1hour. Technical Basis: WCAP-17601-P.
- 6 hours, RCS cooldown completed (Att. 1A, Item 13). The RCS cooldown is terminated and RCS cold leg temperature is stabilized at > 350°F for Safety Injection Tank (SIT) injection of borated water into the RCS. Technical Basis: WCAP-17601-P.
- 7 hours, direction given to deploy and connect 12 Condensate Storage Tank (CST) makeup strategy equipment and hoses (Att. 1A, Item 14). 12 CST makeup strategy should be connected ready for use in < 3 hours. Resources permitting, this equipment should be deployed and connected as soon as possible. Technical Basis: CCNPP FLEX Strategy Table Top.
- 7 hours, direction given to deploy and connect 675 KVA 480 VAC portable diesel generator (DG) to 1 vital 480 VAC Load Center on each unit (Att. 1A, Item 15). The portable DG should be connected and ready for use in < 4 hours. Resources permitting, this equipment should be deployed and connected during as soon as possible. Technical Basis: CCNPP LFEX Strategy Table Top.
- 10 hours, commence makeup to 12 CST (Att. 1A, Item 16). Makeup to 12 CST is commenced prior to depleting the available water volume. CCNPP Technical Specification minimum water volume per unit is 150,000 gallons. Technical Basis: CCNPP Calculation CA03767, EOP-7 Station Blackout, and EOP Attachments – Att. 9 (Attachment 3-1, References 5 and 6).
- 11 hours, energize one vital 480 VAC load center on each unit (Att. 1A, Item 17). Startup associated battery chargers. Technical Basis: CCN0012-17-STUDY-001 (Reference 7).

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Technical Basis Support information

1. The mitigating strategies in this integrated plan rely upon existing CCNPP-specific technical basis information or will rely upon CCNPP technical basis support information that will be developed. Relevant information from design documents is summarized herein with the design document reference provided. **(Open Item: Identify analysis needed to develop or support mitigating strategies.)**

2. On behalf of the Pressurized Water Reactor Owners Group (PWROG), Westinghouse Electric Company LLC (W) developed a document WCAP-17601-P, *Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering, and Babcox & Wilcox NSSS Designs* (Reference 8) to supplement the guidance in NEI 12-06 by providing additional PWR-specific information regarding the individual plant response to the Extended Loss of AC Power (ELAP) and loss of Ultimate Heat Sink (UHS) events. The document includes identification of the generic event scenario and expected plant response, the associated analytical bases and recommended actions for performance of a site-specific gap analysis.

3. Also on behalf of the PWROG, Westinghouse Electric Company, LLC developed PA-PSC-0965, *PWROG Core Cooling Position Paper* (Reference 36), provides an overview of each NSSS generic approach followed by discussions associated with Secondary Cooling, Subcriticality, and Primary Inventory. Gaps identified between the NSSS generic approach/generic analyses provided in WCAP-17601, and plant specific characteristics/considerations/parameters are identified in the applicable sections. Recommendations are also provided in the applicable sections in an effort to provide consistency of method, to the extent possible, for maintaining core cooling across all PWR NSSS vendors. The purpose of PA-PSC-0965, *PWROG Core Cooling Position Paper*, is to assist utilities with development of site specific FLEX strategies which are aligned with the requirements contained in NEI 12-06.

4. Environmental conditions within the station areas were evaluated utilizing methods and tools in NUMARC 87-00 (Reference 3).

5. Per the guidance in 10 CFR 50.63, Regulatory Guide 1.155, and CCNPP UFSAR Section 1.8.2, CCNPP is an alternate AC, 1 hr coping plant for Station Blackout (SBO) considerations. Prior to the 1995 installation of the Station Blackout DG, CCNPP was a 4 hour coping plant. Applicable portions of supporting analysis have been used in ELAP evaluations (CCNPP Units 1 and 2 UFSAR, Section 1.8.2, Reference 13, and CCNPP Station Blackout Analysis).

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.*

Deployment routes shown in Attachments 5-1 and 5-2 are expected to be utilized to transport FLEX equipment to the deployment locations. The identified paths and deployment areas will be accessible during all modes of operation. This deployment strategy will be included within an administrative program to ensure the pathways remain clear and actions to clear the pathways if necessary. **(Open Item: Provide an administrative program governing the FLEX deployment strategy, marking of setup locations, including primary and alternate pathways, maintaining the pathways clear, and clearing the pathways.)**

Provide a milestone schedule. This schedule should include:
• **Modifications timeline**
  o **Phase 1 Modifications**
  o **Phase 2 Modifications**
  o **Phase 3 Modifications**
• **Procedure guidance development complete**
  o **Strategies**
  o **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 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 milestone schedule Attachment 2

See attached milestone schedule in Attachment 2. The schedule for when Regional Response Centers will be fully operational is still to be determined. **(Open Item: Determine schedule for when Regional Response Centers will be fully operational.)**

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, Section 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.*

CCNPP will establish a system designation for emergency portable equipment and will manage this system in a manner consistent with medium-risk plant systems per CENG procedure CNG-OP-4.01-1000, Integrated Risk Management. All elements of the program described in NEI 12-06 Section 11, including recommended "should" items will be included in the station program. A system engineer will be assigned the responsibility for configuration, maintenance and testing. The equipment for FLEX will have unique identification numbers. Installed structures, systems and components pursuant to 10CFR50.63 (a) will continue to meet the augmented quality guidelines of Regulatory

Guide 1.155, Station Blackout. Preventive maintenance procedures (PMs) will be established for all components and testing procedures will be developed with frequencies established based on type of equipment will be developed with frequencies established based on type of equipment, OEM recommendations and considerations made within EPRI guidelines.

Describe training plan	*List training plans for affected organizations or describe the plan for training development*

CCNPP will implement training of station staff prior to the second refueling outage after February 28, 2013. These programs and controls will be implemented in accordance with the Systematic Approach to Training (SAT).

Describe Regional Response Center plan	*Discussion in this section may include the following information and will be further developed as the Regional Response Center development is completed.* ▪ *Site-specific RRC plan* ▪ *Identification of the primary and secondary RRC sites* ▪ *Identification of any alternate equipment sites (i.e. another nearby site with compatible equipment that can be deployed)* ▪ *Describe how delivery to the site is acceptable* ▪ *Describe how all requirements in NEI 12-06 are identified*

CENG has signed contracts and issued purchase orders to Pooled Inventory Management (PIM) for all five CENG units for participation in the establishment and support of two (2) Regional Response Centers (RRCs) through the Strategic Alliance for FLEX Emergency Response (SAFER). 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 two RRCs are located in Phoenix Arizona and Memphis Tennessee. There are no designated alternate equipment sites; however, each site has agreed to enter portable FLEX equipment inventory into the Rapid Parts Mart which is an internet based search capability currently used for other spare part needs. This capability provides a diverse network of potential alternate equipment sites for portable FLEX equipment.

SAFER will provide requested portable FLEX equipment to a local staging area within 24 hours of a request for deployment, at which time the equipment will be serviced (e.g., fuel and lubricating oil) and made ready for transport to the site. The criteria for the local staging area will be defined by June 2013. The staging area must be outside the 25 mile radius of the site, because the FLEX strategy evaluations assume that there will be significant damage and no power or communications within the 25 mile radius. If an individual site provides qualified power and communications to a staging area within the 25 mile radius, then that staging area will be considered acceptable. **(Open Item: Define criteria for the local staging area by June 2013.) (Open Item: Establish a suitable local staging area for portable FLEX equipment to be delivered from the RRC to the site) (Open Item: Determine the location of the CCNPP local staging area, primary and alternate delivery routes, and delivery methods to the proposed onsite laydown areas.)**

Each CENG site will develop a playbook which will provide the detail necessary to ensure the successful delivery of the portable FLEX equipment from the RRC to the local staging area and from the local staging area to the site. Pilot playbooks are to be developed and ready for use by each site as a template by June 2013. **(Open Item: Develop site specific playbook for delivery of portable FLEX equipment from the RRC to the site.)**

Notes:

Identify analyses or actions:

- Add margin to design FLEX components and hard connection points to address future requirements as re-evaluation warrants. Portable FLEX components will be procured commercially.
- Implement a design change to install permanent protected FLEX equipment connection points.
- Evaluate deployment strategies and deployment routes to ensure they are assessed for and address applicable hazards impact.
- Develop a process for implementation of exceptions for the site security plan or other (license/site specific – 10CFR50.54.X) requirements of a nature requiring NRC approval.
- Define implementation routes upon finalizing a location or locations for FLEX equipment storage location(s).
- Evaluate requirements, options, and develop strategies to provide reasonably protected storage on site for the FLEX portable equipment.
- Design and build a protected storage location or locations for the FLEX equipment. Ensure the design meets the requirements of NEI 12-06.
- Identify analysis needed to develop or support mitigating strategies.
- Provide an administrative program governing the FLEX deployment strategy, marking of setup locations, including primary and alternate pathways, maintaining the pathways clear, and clearing the pathways.
- Determine the location of the CCNPP local staging area, primary and alternate delivery routes, and delivery methods to the proposed onsite laydown areas.
- Determine schedule for when Regional Response Centers will be fully operational.
- Define criteria for the local staging area by June 2013.
- Establish a suitable local staging area for portable FLEX equipment to be delivered from the RRC to the site.
- Develop site specific playbook for delivery of portable FLEX equipment from the RRC to the site.

Maintain Core Cooling

Power Operation and Startup (Modes 1 and 2)

STRATEGY

The Phase 1 strategy for Maintain Core Cooling from initial operation in Modes 1 or 2 is to maintain heat removal using the steam generators (S/G) via Turbine-Driven Auxiliary Feedwater (TDAFW) and steaming to atmosphere via the Atmospheric Dump Valves (ADV). The suction source for TDAFW is from the fully protected Condensate Storage Tank (CST). Core cooling and core inventory coping will be extended by performing a plant cooldown. Essential instrumentation will be maintained by the Station Batteries. Station Battery coping will be extended by performing non-vital DC load shedding.

OBJECTIVES

Maintain Core Cooling requires heat removal via the S/G and sufficient makeup to maintain or restore S/G level to provide core cooling. Baseline capabilities include the use of installed equipment and FLEX equipment for Phase 1 and Phase 2 coping strategies.

Performance attributes include, if needed to backup TDAFW, depressurizing the S/Gs for makeup with portable injection sources utilizing primary and alternate injection points to inject through separate divisions/ trains, i.e., should not have both connections in one division/train. Analysis should demonstrate that the guidance and equipment for combined S/G depressurization and makeup capability supports continued core cooling. Sustained sources of water are available and sufficient to supply water indefinitely.

ACCEPTANCE CRITERIA

Core damage is prevented. Coping times will be calculated such that they preclude core damage. Analysis used will ensure no core damage occurs including maintaining saturation conditions in the core region, keeping peak clad temperature below core melt limits, preventing clad rupture and maintaining two-phase water level above the top of the active fuel.

Maintain Core Cooling

Determine Baseline coping capability with installed coping[1] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06:

- **AFW/EFW**
- **Depressurize SG for Makeup with Portable Injection Source**
- **Sustained Source of Water**

PWR Installed Equipment Phase 1:

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

Power Operation and Startup (Modes 1 and 2)

The Loss of Offsite Power (LOOP) will initiate an automatic turbine trip on loss of electrical load which will then result in a Reactor Protective System (RPS) Loss of Load trip of the reactor.

At the initiation of the turbine/reactor trip the Control Room Operators will enter Emergency Operating Procedure (EOP)-0 "Post Trip Immediate Actions" (Reference 4). During EOP-0 control room operators will stabilize the units in hot standby by directing local manual operation of the atmospheric dump valves (ADVs) to lower S/G pressure and RCS temperature to establish natural circulation reactor coolant flow, and either manual or automatic initiation of auxiliary feedwater (AFW) to provide feedwater to the S/Gs. One of two TDAFW pumps will be operated from the control room, taking suction from the fully protected 12 CST and provide AFW flow to the S/Gs.

Multi-discipline table top review of the ELAP scenario revealed information from Mechanical Maintenance that local manual operation of the ADVs would likely require more than one operator per unit. Research by Systems Engineering determined that the wheel on the valve chain operator should be 3 ft. in diameter vice the current 1 ft. **(Open Item: Implement a design change to replace the 1 ft. diameter wheel with a 3 ft. wheel on each ADV chain operator.)**

The EOP-7, Station Blackout procedure will be entered as determined via the EOP-0 Diagnostic Flow Chart for single event diagnosis – Station Blackout, when the station's emergency diesel generators are confirmed unavailable and off-site power cannot be promptly restored and that the delay in restoration is confirmed via contact with the Transmission System Operator (TSO) or via visual verification of physical damage to related infrastructure at the site. Per EOP-7, Operators will continue to maintain hot standby conditions until ELAP is declared. EOP-7 directed actions will be taken to protect the main condenser from over pressurization and minimize S/G inventory loss, minimize RCS inventory loss, establish an RCS heat sink using TDAFW and ADVs, verify emergency 250V DC pumps are running, and protect electronic equipment from overheating.

CCNPP Units 1 and 2 are CE designed plants. Currently under a station blackout event, the units are

[1] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain Core Cooling

maintained in a Hot Standby (Mode 3) condition using ADVs and TDAFW. EOP-7 directs an RCS cooldown at less than 100°F to restore and maintain subcooling between 30°F and 50°F using ADVs. This ensures that single phase natural circulation will be maintained as long as possible. Adequate shutdown margin is ensured by maintaining RCS cold leg temperature greater than the Minimum Allowed RCS Temperature to Ensure 1% delta-ρ Shutdown vs. Burnup (Reference 34). A depressurization of the RCS is not performed. With the implementation of the extended loss of all AC power Beyond Design Basis (BDB) event, strategies will be developed to a perform a plant cooldown and depressurization, as well as direction on maintaining adequate shutdown margin.

Following declaration of ELAP by time one (1) hour, Operators will enter the FLEX Strategy Guidelines (FSG), and direct deployment of the portable diesel-driven alternate AFW pump, initiate DC load shedding, and then prepare for RCS cooldown. See Att. 5-2 for FLEX Pump deployment locations.

Core Inventory

Per WCAP-17601-P Section 3.2 (Reference 8) recommendations for CE plants, a remotely operated RCP CBO return line isolation valve will be evaluated as a possible modification to reduce the probability of RCP seal stage failure. **(Open Item: Evaluate the feasibility of the WCAP-17601-P recommendation to install a remotely operated RCP CBO return line isolation valve.)**

Also, per the WCAP-17601-P recommendations, an early and extensive RCS cooldown will be initiated at approximately two (2) hours into the event. The cooldown will significantly increase coping time by reducing the probability of RCP seal failure. The depressurization of the RCS which accompanies the cooldown, reduces the RCS inventory loss from any leak and measurably increases the coping time of an ELAP event. The CENTS analysis performed demonstrated that the onset of core uncovery can be extended from about 67 hours out to approximately 10.6 days by performing an early RCS cooldown. Per the WCAP, for CE plants, plant depressurization also allows SIT injection to add boron to the RCS, helping to maintain shutdown margin. **(Open Item: Develop a procedure or FSG to perform an early cooldown and depressurization as recommended by WCAP-17601-P.)**

In addition, WCAP-17601-P described the effect of RCS cooldown on SDM and that it is highly advantageous that the cooldown be completed within the first 24 hours of the ELAP to capitalize on the negative reactivity added by xenon buildup, during this time frame. The added negative xenon reactivity complements the rod insertion reactivity such that the core remains subcritical during the cooldown until the Safety Injection Tanks (SIT) begin to inject boron into the RCS. This boron reactivity is crucial to maintaining shutdown margin after 24 hours as the xenon concentration decays over the next 2 to 3 days. **(Open Item: Perform engineering analyses to confirm that CCNPP maintains an adequate level of SDM for an RCS cooldown to 350°F cover a period of at least 72 hours.)**

At time two (2) hours, operators will initiate a plant cooldown by directing local manual operation of the ADVs to lower S/G pressure and RCS temperature to establish a natural circulation flow RCS cooldown to just > 350°F. TDAFW will be controlled to maintain S/G level between (-) 24 – (+) 30 inches (normal S/G water level band) via manual operation of TDAFW.

The TDAFW pumps can operate reliably provided there is > 50 psig steam pressure in one of the S/Gs. Operators will use the manual function of the turbine governor for controlling turbine speed in the TDAFW

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Pump Room.

The AFW flow control valve (FCV) air accumulators provide a sufficient volume of pressurized air for regulating AFW flow to the S/Gs for at least two (2) hours following a complete loss of AC power. (Reference 1, Section 10.3). The control air system also has nitrogen (N2) backup capability that can provide pressurized N2 for several days. Operators would then manually regulate the system.

The plant cooldown will be conducted beginning at an initial rate of approximately 75°F/hour and then be gradually reduced due to the limitations of ADV capacity. Simulator validation has demonstrated that the cooldown to an RCS cold leg temperature just > 350°F and S/G pressure of 120 psia can be accomplished in approximately 3.75 hours. The cooldown was terminated when RCS pressure was slightly above the 215 – 225 psig N2 pressure in the SITs. By lowering RCS pressure slightly SIT injection into the RCS will begin. Key to this strategy is the ability to monitor SIT level and N2 pressure in the control room. To prevent N2 entry into the RCS, the ability to isolate SIT injection or vent off the N2 in the SIT is also key to this strategy. Per current plant design, the SIT level and pressure indicators are powered from a non-vital 120 VAC instrument bus. The SITs have remotely operated from the control room outlet isolation motor operated valves (MOV), however, during the ELAP they will be de-energized. The SITs have remotely operated from the control room vent solenoid valves (SV), however due to SV leak-by concerns, during power operations the vent line outlets have pipe caps installed. **(Open Item: Implement a design change to re-power the SIT level and pressure indicators from a vital 120 VAC instrument bus.) (Open Item: Implement a design change to install new leak tight SIT vent SVs that will allow the vent line pipe caps to remain off.)**

In parallel with the above actions, additional on-site staff will be deploying two (one for each unit) portable diesel-driven alternate AFW pump and attendant support trailers from the FLEX storage location to their designated setup locations. The pumps and associated hoses will be setup and layed out such that final suction and discharge connection and startup can be accomplished in ≤ 1 hour from the time of loss of the TDAFW pump, if it were to occur. Dedicated, protected hose connections on the exterior of the Auxiliary Building 45 ft. el. and piping to the AFW System will be installed for this strategy. **(Open Item: Implement design changes to install "plug and play" protected hose connections for the portable alternate AFW pump to AFW on the exterior of the Auxiliary Building west wall with piping run to the 27 ft. East Penetration Rooms to connect to the AFW to S/G headers.)** (Primary strategy) (Att.- 11-1 and 11-2)

<u>Water Source:</u>
Per CCNPP Units 1 and 2 UFSAR (Reference 1, Section 10.3.2), the TDAFW pumps take suction from the 350,000 gallon 12 CST which is protected against tornadoes and tornado generated missiles. Tornado protection for the tank consists of a seismic Category 1 concrete structure of sufficient thickness to stop tornado-generated missiles and to resist tornado wind pressures. Bursting pressure is relieved by baffled, missile-proof vents. In addition to the enclosure for 12 CST, there is an enclosure for the piping header from the CSTs to the AFW pump suctions. This Category 1 reinforced concrete enclosure is located in the Tank Farm adjacent to 11 and 21 CSTs. This enclosure protects the Category 1 AFW header, connecting piping, and associated valves from the same natural phenomenon.

The fully protected 12 CST has a normal volume of approximately 327,000 gallons. At the low level alarm

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point, 12 CST provides 300,000 usable gallons (Technical Specification minimum level for both units) of water for decay heat removal and cooldown of both units. The contained water volume limit includes an allowance for water not useable because of tank discharge line location or other physical differences. By adjusting AFW flow for the permissible cooldown rate, decay heat removal and cooldown of both units can be accomplished in approximately six (6) hours with sufficient remaining volume to maintain hot standby conditions for > 6 hours. 12 CST level will be monitored in the Control Room via redundant level indication channels. Local level monitoring had been possible until a design change retired in place the local level indicator. **(Open Item: Implement a design change to install reliable local level indicators the on 11, 12 and 21 CSTs, 11 DWST, and 11 and 12 PWSTs.)**

Per EOP-7, TDAFW suction is shifted to either 11 or 21 CSTs prior to the depletion of 12 CST. However, 11 and 21 CSTs are not protected from tornado missiles.

Vital 125 VDC and 120 VAC Instrumentation Power
Per current CCNPP design and the SBO Analysis, the four (4) Class 1E 125 VDC station batteries are designed to cope in an SBO event for four (4) hours. Per CCNPP E-93-016, Revision 1 (Attachment 3, Reference 14), using a minimum voltage of 105 VDC, the 4 station batteries can supply their respective SBO loads from 259 minutes to 305 minutes depending on the battery. DC load shedding is needed to extend this coping time out beyond six (6) hours. **(Open Item: Perform an analysis to determine the necessary scope of the DC load shedding strategy.)**

For DC Buses 12 and 22, the calculation assumed that the plant computer inverters remained energized for the duration of the scenario but in reality, these inverters are secured within 30 minutes of the event initiation as directed from EOP-7.

Following declaration of ELAP at time one (1) hour, operators will be directed to perform non-vital DC load shedding of loads supplied from the four (4) vital 125 VDC buses and their associated DC power panels. The DC buses and power panels are located in the Unit 1 and 2 Cable Spreading Rooms that are located on the 27 ft. el. below the Control Room. The designated DC load breakers will be marked or labeled for ease of identification. **(Open Item: Implement a design change to clearly identify the set of DC load breakers that will either be left energized or load shed by identifying the selected breakers by their unique numbers and load title.)**

Operators will be provided a FSG specific to DC load shedding that will identify the selected breakers by their unique numbers and load title. **(Open Item: Implement a procedure or FSG to perform the DC load shedding.)**

It is expected that the DC load shedding can be completed in one (1) hour. **(Open Item: Complete a time-motion study to validate that DC load shedding can be accomplished on each unit in one (1) hour. See Att. 6-1 for vital 125 VDC distribution system configuration.)**

Maintain Core Cooling

Hot Standby, Hot Shutdown, Cold Shutdown, and Refueling (Modes 3 – 6)

STRATEGY

The Phase 1 strategy for Maintain Core Cooling from initial operation in Modes 3 through 6 is determined by 1) the method of RCS heat removal, either S/Gs or Shutdown Cooling (SDC) in service at the onset of the event, and 2), if the unit was on SDC, the capability of the RCS to be pressurized, or refueling pool (RFP) available as a heat sink, or RCS open and RFP not available.

If the RCS is capable of being pressurized and a S/G is available or can be made available for heat removal, the strategy will be to maintain heat removal using the S/Gs via Turbine-Driven Auxiliary Feedwater (TDAFW) and steaming to atmosphere via the Atmospheric Dump Valves (ADV). The suction source for TDAFW is from the fully protected Condensate Storage Tank (CST). Essential instrumentation will be maintained by the Station Batteries. Station Battery coping will be extended by performing non-vital DC load shedding.

OBJECTIVES

Maintain Core Cooling in lower modes requires heat removal via either the S/G (if available), via the RFP, or via Containment. Sufficient makeup water will be required to maintain or restore S/G level, or fill the RFP, or provide for gravity feed or injection into the RCS with flow out any RCS opening to provide core cooling. Baseline capabilities include the use of installed equipment and FLEX equipment for Phase 1 and Phase 2 coping strategies.

ACCEPTANCE CRITERIA

No core damage will occur. Coping times will be calculated such that they preclude core damage. Analysis used will ensure no core damage occurs including maintaining saturation conditions in the core region, keeping peak clad temperature below core melt limits, preventing clad rupture and maintaining two-phase water level above the top of the active fuel.

Maintain Core Cooling

Hot Standby, Hot Shutdown, Cold Shutdown, and Refueling (Modes 3 – 6)

Control Room operators will implement Abnormal Operating Procedure (AOP)-6F, Loss of Offsite Power While in Modes 3, 4, 5 or 6 for the Loss of Offsite Power (LOOP) (Reference 15). AOP-6F, Block Step D will direct implementation of EOP-7, Station Blackout if the A-Train and B-Train DGs are not available and the Unit is not on Shutdown Cooling (SDC). After the transition to EOP-7, the response to the ELAP is similar to that described previously for Modes 1 and 2. Deployment of FLEX pump and Non-vital DC load shedding on the affected unit will be implemented following the declaration of ELAP.

If the A-Train and B-Train DGs are not available, and the Unit is on SDC, then the operators are directed to implement AOP-3B, Abnormal Shutdown Cooling Conditions (Reference 11). AOP-3B, Section IX address loss of vital 4160 VAC power, with the capability of the RCS to be pressurized, or refueling pool available as a heat sink, or RCS open and refueling pool not available.

In the cold shutdown condition, prior to the event and depending on the time after shutdown, either one or two SDC loops will be in operation providing core cooling. The ELAP will result in loss of power for the Low Pressure Safety Injection (LPSI) pumps providing core cooling flow and the loss of the Component Cooling Water (CCW) pumps providing cooling flow to the SDC heat exchangers. In addition, the Saltwater (SW) pumps that providing cooling water flow from the Ultimate Heat Sink (UHS)(Chesapeake Bay) to the CCW heat exchangers will lose power.

Personnel will be evacuated from containment and containment closure will be established.

If fuel handling is in progress, then any fuel assembly being handled will be placed in a safe condition. The fuel transfer carriage will be returned to the Spent Fuel Pool (SFP) and the fuel transfer tube gate will be closed. Because of the loss of power the Fuel Transfer System will have to operated in manual per Operating Instruction (OI) – 25E, Fuel Transfer System, Section 6.5, Manual Operation (Reference 35).

If the RCS is in a lowered or reduced inventory condition, and openings other than the Pressurizer manway removed exist in the RCS, then action is initiated to close those openings per existing procedure guidance.

If the reactor vessel head is removed and the refueling pool (RFP) is or can be filled, then decay heat is removed via the RFP. Per AOP-3B, if RFP level is < 57 ft., then a gravity fill line-up is established to gravity fill the RFP from the RWT. The RWTs are 420,000 gallon stainless steel seismic Category 1 water storage tanks. However, the RWTs are not protected from wind-driven missiles. Per AOP-3B, Attachment 9 (Attachment 3, Reference 25) for the RFP at 57 ft., with the RCS temperature at 100°F, one (1) day after shutdown the Time To Boil (TTB) is approximately 27 minutes. At normal RFP level of 65 ft. the TTB is 31 minutes.

If the RCS can be pressurized and at least one S/G is or can be made available for heat removal, then the Control Room Operators will monitor RCS heat-up and S/G pressurization. Per AOP-3B, during certain low temperature, low pressure conditions, the RCS may heat-up for several hours, until S/G pressure is high enough to remove heat. Once steam pressure has built-up in the S/G(s) to 65 psia, then the ADVs can be opened locally to steam from the S/G(s), maintain RCS temperature, and establish natural circulation RCS flow in at least one loop. When S/G pressure is > 65 psia, then sufficient pressure is available for operation of a TDAFW pump. TDAFW pump suction will be from the fully protected 12 CST. TDAFW will be operated to restore and maintain S/G level (-) 40 inches – (+) 30 inches.

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If the RFP is not or cannot be filled and S/Gs are not or cannot be made available, then decay heat is removed via gravity feed and RCS boil-off. AOP-3B directs either gravity fill from the RWT or, if cold leg openings exist, to an attachment to gravity fill from the RWT at a flow rate to match boiling and maintain RCS level at the middle of the hot leg.

During lower modes of operation RCS level is monitored via wide range compensated and uncompensated pressurizer level indication channels, Reactor Level Monitoring System (RVLMS), and/or the Mansell Level Monitoring System. The Mansell RCS Level Monitoring System has a back-up power UPS, however it is only designed for 30 minutes of backup power. **(Open Item: Implement a design change to install a 24 hour UPS on the Mansell RCS Level Monitoring System.)**

Several variables determine the time to core uncovery and therefore the minimum time for implementation of RCS make-up. Those variables include; number of days after shutdown, initial RCS level, the number and size of any RCS openings, S/G nozzle dams installed, and the availability of the RWT as a water source. For example, with the RCS water level at the reactor vessel flange elevation of 44 ft., pressurizer manway removed, and S/G nozzle dams installed, the time to core uncovery could be as short as approximately 70 minutes. **(Open Item: Perform engineering analyses and develop strategies for providing RCS make-up and core cooling while in Modes 5 and 6, for all possible RCS conditions, following an ELAP. The analysis should determine the FLEX pump capacity needed to provide adequate flow in all RCS conditions.)**

Pre-staging of FLEX equipment can be credited for certain hazards as described in NEI 12-06, but cannot be credited for all hazards. Deploying and operation of the portable FLEX pumps to supply RCS makeup or injection flow must commence expeditiously following the onset of the event. This should be achievable given that additional personnel are on site around the clock during outages to provide the necessary resources. Guidance will be provided to ensure that designated deployment areas identified and that deployment paths remain accessible without interference from outage equipment during refueling outages.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

CCNPP will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

EOP-0-1/2, Standard Post Trip Actions

EOP-7-1(2), Station Blackout

AOP-3B-1(2), Abnormal Shutdown Cooling Conditions

AOP-6F-1(2), Loss of Offsite Power While in Modes 3, 4, 5 or 6 for the Loss of Offsite Power (LOOP)

Identify modifications	*List modifications*

- Install a larger 3 ft. chain operator wheel on ADVs to allow one operator to operate the valve.
- Install "plug and play" protected hose connections for the portable alternate AFW pump to AFW on the exterior of the Auxiliary Building west wall with piping run to the 27 ft. East Penetration Rooms

Maintain Core Cooling

to connect to the AFW to S/G headers.

- Change power supply of safety injection tank (SIT) level and pressure instrumentation for each SIT from non-vital to vital 120 VAC instrument bus.
- Install reliable leak-tight vent SVs on each SIT.
- Install a 24 hour UPS on the Mansell RCS Level Monitoring System for lower mode RCS level monitoring.
- Install local level indicators on 11, 12 and 21 CSTs, 11 DWST, and 11 and 12 PWSTs.
- Implement a design change to clearly identify the set of DC load breakers that will either be left energized or load shed by identifying the selected breakers by their unique numbers and load title

Key Reactor Parameters	*List instrumentation credited for this coping evaluation.*

Essential Instrumentation	**Safety Function**
Steam Generator safety channel pressure PI-1013/1023A – D at C03	Core and RCS heat removal
Steam Generator wide range level LI-1114/1124A-D at C04. LIs-1114D/1124D and PAM A display	Core and RCS heat removal
Subcooled Margin from PAMS A & B displays at C05	Core and RCS heat removal
CETs from PAMS A & B displays at C05	Core and RCS heat removal
Hot Leg temperature TI-112H/122H at C06	Core and RCS heat removal
Cold Leg temperature TI-112C/122C at C06	Core and RCS heat removal
12 CST Level LIA-5610 and 5611 at C04	Core and RCS heat removal
Steam Generator Steam Train AFW Flow FIC-4511 and FIC-4512 at C04	Core and RCS heat removal
TDAFW Pp Steam Supply Pressure (local) PI-3986, 3988	Core and RCS heat removal
TDAFW Pp Discharge Pressure (local) PI-4501, 4502	Core and RCS heat removal
Pressurizer Level LI-110X-1 and 110Y-1 at C06	Core Inventory
Pressurizer Level LI-103-1 at C06	Core Inventory (Lower Mode)
Reactor Vessel Level Monitor System via PAMs A & B displays at C05	Core Inventory
Pressurizer wide range pressure PI-105 and 105A at C06	Core Inventory
Safety Injection Tank (SIT) WR Level LI-311, 321, 331, 341	Core Inventory/Reactivity Control
Safety Injection Tank WR Pressure PI-311, 321, 331, 341	Core Inventory/Reactivity Control
WR Log power channels A-D at C05 JI-001, 002, 003, 004	Reactivity Control
Avg RCS Level Channel I 0LI4146 at 0C184	Core Inventory (Lower Mode)
Avg RCS Level Channel II 0LI4147 at 0C184	Core Inventory (Lower Mode)
Containment Wide Range Water Level LI4146	Core Inventory (Lower Mode)
Containment Wide Range Water Level LI4147	Core Inventory (Lower Mode)
11, 12, 21, 22 Vital DC Bus voltage at 1C24	Essential Instrumentation Power

Maintain Core Cooling
Notes: **Identify analyses or actions:** • Implement a design change to replace the 1 ft. diameter wheel with a 3 ft. wheel on each ADV chain operator. • Evaluate the feasibility of the WCAP-17601-P recommendation to install a remotely operated RCP CBO return line isolation valve. • Develop a procedure or FSG to perform an early cooldown and depressurization as recommended by WCAP-17601-P. • Perform engineering analyses to confirm that CCNPP maintains an adequate level of SDM for an RCS cooldown to 350°F, cover a period of at least 72 hours. • Implement a design change to re-power the SIT level and pressure indicators from a vital 120 VAC instrument bus. • Implement a design change to install new leak-tight SIT vent SVs that will allow the vent line pipe caps to remain off. • Implement design changes to install "plug and play" protected hose connections for the portable alternate AFW pump to AFW on the exterior of the Auxiliary Building west wall with piping run to the 27 ft. East penetration Rooms to connect to the AFW to S/G headers. . • Implement a design change to install reliable local level indicators on all of the water storage tanks located in the on 11, 12 and 21 CSTs, 11 DWST, and 11 and 12 PWSTs. • Perform an analysis to determine the necessary scope of the DC load shedding strategy. • Implement a design change to clearly identify the set of DC load breakers that will either be left energized or load shed by identifying the selected breakers by their unique numbers and load title. • Implement a procedure or FSG to perform the DC load shedding. • Complete a time-motion study to validate that DC load shedding can be accomplished on each unit in one (1) hour. • Implement a design change to install a 24 hour UPS on the Mansell RCS Level Monitoring System. • Perform engineering analyses and develop strategies for providing RCS make-up and core cooling while in Modes 5 and 6, for all possible RCS conditions, following an ELAP. The analysis should determine the FLEX pump capacity needed to provide adequate flow in all RCS conditions.

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PWR Portable Equipment Phase 2:

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (RCIC/HPCI/IC) and strategy(ies) utilized to achieve this coping time.

Primary Strategy

During Phase 2, as in Phase 1, core cooling is maintained by steaming from the S/Gs via local manual operation of the ADV and feeding S/Gs using TDAFW with suction from the fully protected 12 CST. The Unit 1 and 2 TDAFW pumps have a common suction from the fully protected 12 CST. Per EOP-7, TDAFW suction is shifted to either 11 or 21 CSTs prior to the depletion of 12 CST. However, 11 and 21 CSTs are not protected from tornado missiles.

At the transition from Phase 1 to Phase 2 (Time 6 hours) it is anticipated that the RCS cooldown to just > 350°F will be concluding. Simulator validation has demonstrated that the cooldown to an RCS cold leg temperature just > 350°F and S/G pressure of 120 psia can be accomplished in approximately 3.75 hours from a start time of two hours into the event. The TDAFW pumps can operate reliably provided there is > 65 psia steam pressure in one of the S/Gs. It is estimated that these conditions can be maintained for > 24 hours. A CCNPP Engineering Calculation has been requested to confirm this assumption. **(Open Item: Perform an analysis to determine that there is sufficient decay heat generated for TDAFW operation 36 hours after shutdown.)**

Phase 2 strategies for makeup water include deploying of a FLEX pump to take suction from the fully protected 12 CST, the four (4) fully protected Reactor Coolant Waste Tanks or any other surviving water storage tank (11 or 21 CST, 11 DWST, 11 or 12 PTWST, 11 or 21 RWT) or utilizing a FLEX pump taking a suction from the Chesapeake Bay at the Circulating Water Discharge Structure. For the lower mode strategies where RCS make-up will be needed, the FLEX pump will discharge to dedicated hose connections on the Safety Injection System as shown on Att. 7-1, RCS Injection Mod Connection. **(Open Item: Implement a design change to provide dedicated hose connections and piping to the Safety Injection System.)**

Alternate Strategies

The backup to the existing TDAFW pumps is the alternate AFW FLEX pump. This pump is designed to deliver a minimum of 300 gpm to the S/Gs at pressures of 300 psia. This flow rate will be sufficient to provide adequate core cooling to remove decay heat. The pump discharge will be connected to dedicated, unit specific, "plug and play" 4 inch hose connections on the 45 ft. el. west side exterior wall of the Auxiliary Building. The Auxiliary Building is a fully protected seismic Class 1 structure. This connection will be placed above flood height and have a cover provided for wind-driven missile protection. This alternate AFW pump line will be seismically mounted and run over to the 45 ft. el. East Electrical Penetration Room to a Tee, isolation valves, and then separate lines for each S/G. The lines will then penetrate the room floor into the 27 ft. el. East Piping Penetration Room and then connect to the individual AFW headers for the S/Gs at locations on the headers near the penetrations into the containment building. See Att. 11-1 and 11-2 for the proposed pipe routing and connection to the AFW System (Note – only one S/G flow path is shown).

The CENG fleet standard FLEX pump is a Power Prime Systems unit engineered by Rain for Rent and driven

Maintain Core Cooling

PWR Portable Equipment Phase 2:

by a John Deer diesel engine. See Att. 4-1 for a detailed description of pump performance. The pumps are trailer mounted and will be towed, along with their hose trailers to setup locations near the Tank Farm. The fleet standard FLEX pumps are currently stored in interim storage containers located outside of the Protected Area (PA) near the Preassembly Facility (PAF). See Att. 5-1 for a view of the interim storage location and travel paths into the PA. See Att. 5-2 for a view of the proposed permanent storage location and travel paths inside the PA.

The alternate connection strategy will employ the lineup and connections similar to that which is described in Emergency Response Plan Implementing Procedure (ERPIP-611), Severe Accident Management Restorative Actions, Attachment 1, Alternate Water Sources. This line-up employs the fleet standard pump in the same setup location near the Tank Farm and discharge hose run to the 45 ft. el. west side of the Auxiliary Building, and into the Auxiliary Building via any available personnel door or roll-up door. The hose is then run down to the 5 ft. el. via stairway AB-2, east through the 5 ft. el. hallway, and into the 5 ft. el. Auxiliary Building Exhaust Ventilation Fan Room. The hose is then run into the Service Water Pump (SRW) Room from the 5 ft. fan room via a watertight door to the designated connection point on the discharge of 13 (23) motor-driven AFW pump. The automatic recirculation (ARC) valve is removed and a special hose connection spool is installed. See Att. 11-1, 16-1, and 16-2 for a view of this line-up. **(Open Item: Develop a procedure or FSG to mimic the AFW makeup strategy described in ERPIP-611, Attachment 1.)**

A second alternate lineup is available with the discharge hose from the fleet standard FLEX pump run as above but terminating at a hose connection at the TDAFW pumps. This lineup is also similar to the lineup described in ERPIP-611, Att. 1. Once inside of the 5 ft. fan room the hose will have to run through the ventilation tunnel into the TDAFW Pump Room.

Water Sources:
Per CCNPP Units 1 and 2 UFSAR (Reference 1, Section 10.3.2), the TDAFW pumps take suction from the 350,000 gallon 12 CST which is protected against tornadoes and tornado generated missiles. 12 CST has a normal volume of approximately 327,000 gallons. At the low level alarm point, 12 CST provides 300,000 usable gallons (Technical Specification minimum level for both units) of water for decay heat removal and cooldown of both units. The contained water volume limit includes an allowance for water not useable because of tank discharge line location or other physical differences. By adjusting AFW flow for the permissible cooldown rate, decay heat removal and cooldown of both units can be accomplished in approximately four (4) hours with sufficient remaining volume to maintain hot standby conditions for > 6 hours. Per EOP Attachments, Attachment 9, Makeup Water Required for RCS Cooldown, using a water consumption rate over 6 hours of 164 gpm per unit, 12 CST will have a useable volume for approximately 10 hours. The normal make-up method from the Demineralized (DI) Water System to 12 CST will not be available due to the loss of power to the DI Transfer Pumps. 12 CST does not have hose connections for external makeup. **(Open Item: Install a design change to add makeup and pump suction hose connections for FLEX pump connection to 12 CST.)**

Additional water storage tanks:
11 and 21 CSTs each have a capacity of 350,000 gallons. 11 and 21 CSTs have a 5 foot standpipe for protection of the main condensers. The CSTs are vertical, cylindrical stainless steel tanks that are seismically qualified under the CCNPP Seismic Verification Program.

Maintain Core Cooling

PWR Portable Equipment Phase 2:

11 Demineralized Water Storage Tank (DWST) also has a capacity of 350,000 gallons. The DWST is a vertical, cylindrical stainless steel tank that is seismically qualified under the CCNPP Seismic Verification Program.

11 and 12 Pretreated Water Storage Tanks (PWST) each have a capacity of 500,000 gallons. Each tank is a Seismic Class II vertical, cylindrical carbon steel tank.

Each of the five tanks described above currently have external 2-1/2 hose connections, however, this will not be adequate for the suction hose to the FLEX pump. **(Open Item: Install a design change to replace the 2-1/2 inch hose connections with 4 inch hose connections at 11 and 21 CSTs, 11 DWST, and 11 and 12 PWSTs.)**

11 and 21 Refueling Water Storage Tanks (RWT) each have a capacity of 420,000 gallons. Technical Specification minimum volume per unit is 400,000 gallons for Modes 1 – 3. The RWTs are vertical, cylindrical, Seismic Class 1, stainless steel tanks. The RWTs do not have hose connections for external makeup. **(Open Item: Install a design change to add hose connections at 12 CST and 11 and 21 RWTs for makeup and suction for the FLEX pumps.)**

If any of the above tanks survive the event they will be used for the cooling water source for TDAFW. EOP-7 will direct shifting TDAFW suction to 11 or 21 CST when 12 CST reaches an indicated level of 5 ft. EOP Attachments, Attachment 7, Maintain AFW Pump Suction Supply and CST Inventory has steps for aligning 11 CST, 21 CST, or Fire System to AFW suction. Additionally there are steps to gravity feed from 11 DWST to 11 or 21 CSTs and emergency fill of 11 or 21 CSTs from the Fire System. See Att. 8-1, Available Water sources for water storage tank locations.

11 and 12 Reactor Coolant Waste Receiver Tanks (RCWRT) and 11 and 12 Reactor Coolant Waste Monitor Tanks (RCWMT) each have a design capacity of 90,000 gallons each. All four (4) tanks are located inside of the seismic Class 1 Auxiliary Building. Hose connections will be added to the tank common outlet headers to allow connection of a FLEX pump. **(Open Item: Install design change to add 4" hose connections to the RCWRTs and RCWMTs.)**

There are three (3) 640 ft. deep wells located on the site that feed into the Well Water System that is located in the Well Water House that is adjacent to the Tank Farm. One well is located in the 500 KV Switchyard, one is near the Warehouse Complex, and one is adjacent to the Tank Farm. **(Open Item: Perform an analysis to determine the seismic survivability of the wells as a long-term source of make-up water. Analysis should include any modifications needed to improve the survivability of the associated Well Water System piping and to provide 480 VAC power to the well pumps.)**

The UHS (Chesapeake Bay) can also be used as a limitless source of cooling water. One of the portable FLEX pumps can be setup adjacent to the Circulating Water discharge structure with suction hose placed into openings in the discharge structure (B.5.b pump setup location). The Circulating Water discharge structure is located at the (+) 10 ft. elevation just north of the Sewage Treatment Building. The FLEX pump will provide water to 12 CST via hoses run up to the 45 ft. elevation and to hose connections that will be installed on the CST.

Maintain Core Cooling

PWR Portable Equipment Phase 2:

Use of brackish water from the Chesapeake Bay (UHS) as a S/G feed source will be evaluated by Engineering. **(Open Item: Perform an analysis to determine the long-term affect on the S/Gs from use of water from the UHS as a cooling medium.)**

Vital 125 VDC and 120 VAC Instrumentation Power

The vital 125 VDC Station Batteries are expected to be available for up to 11 hours without recharging following DC load shedding (Att. 3-1, Reference 7). **(Open Item: Perform an analysis to determine station battery coping time with DC load shedding. Analysis should consider battery age, battery performance without battery room ventilation, and load and load duration prior to completion of DC load shedding.)**

Primary Strategies

Align the Reserve Battery to one (1) of the four (4) vital 125 VDC buses via bus work and disconnects that are currently being installed under an existing plant modification (ECP-11-000293 and -000294) (Reference 31). The Unit 1 portion of this modification will be completed during the Unit 1 2014 refueling outage (RFO) and on Unit 2 during the 2015 RFO. This action will extend the coping time for one (1) vital 125 VDC bus to > 20 hours. **(Open Item: Track the completion of ECP-11-000293 and -000294, the Reserve Battery distribution system modification that is currently in progress.)** The preferred line-up will be to align the Reserve Battery to 22 – 125 VDC Bus to maintain Control Room lighting, in addition to one channel of essential instrumentation. This action will be taken prior to the battery associated with the selected bus depleting. A FSG will be provided for establishing this line-up. **(Open Item: Develop and implement procedures to supply power to critical instrumentation using primary and alternate methods.)**

The FLEX 480 VAC, 675 KVA DG will be connected at approximately 10 hours and is sized to power two 125VDC Battery Chargers, a Charging Pump and a reactor Motor Control Center (MCC). Connection to either an A-Train or B-Train 480 VAC load center provides the ability to power the associated Battery Chargers to charge the connected station batteries supply power to DC bus. **(Open Item: Perform an analysis to determine that the assumed load capacity of this FLEX 480 VAC DG is sufficient to provide power to the selected loads.)**

Permanently installed cables will be routed via conduit from a point near the load centers in the 45 ft. and 27 ft. Switchgear Rooms (Att. 9-2) to dedicated connection points located in two of three diesel generator rooms on the west side of the Auxiliary Building (See Att. 9-1). The deployment area of the FLEX 480 VAC DG will be located near the roll-up doors to the Auxiliary Building (See Att. 5-2). Cables from the generators are run to the connection point in the diesel generator rooms (See Att. 9-1). **(Open Item: Implement a design change to install connection points, conduit, and cabling from the 45 ft. and 27 ft. Switchgear Rooms to the west side of the 45 ft Auxiliary Building to connect FLEX 480 VAC diesel generators to any of the A-Train or B-Train vital 480 VAC Load Centers to provide power to the battery chargers and critical AC components.)**

Maintain Core Cooling

PWR Portable Equipment Phase 2:

Alternate Strategies

Motor Control Center (MCC) Strategy

As an alternate strategy to powering the battery chargers from their 480 VAC load centers, one of two reactor vital 480 VAC MCCs per unit will have a connection point installed to allow repowering the MCC from a FLEX 480, 100 KW VAC DG. This will allow repowering vital 120 VAC instrument inverter via the inverter backup bus. The Unit 1 and Unit 2 reactor MCCs located inside the 45 ft. el. of the Auxiliary Building will be modified for this capability. See Att.16-6. These generators have been purchased and are located on site in interim storage containers. See Att. 4-2 for the ratings of the two (2) Cummins Power Generation DGs. See Att. 5-1 for interim storage location. **(Open Item: Implement a design change to install connection points, conduit, cabling, and transfer switches locally at the reactor MCCs to provide for direct connection from the FLEX 480 VAC DGs.)**

Direct to Battery Charger Strategy

As an alternate strategy to powering the battery chargers from their 480 VAC load centers, a welding receptacle type of connection point will be installed on each of the battery chargers. This will allow connection of power cables from two (2) FLEX 480 VAC, 100 KW DGs directly to two (2) battery chargers via the welding receptacles on the chargers (See Att. 10-1). These generators have been purchased and are located on site in interim storage containers. See Att. 4-2 for the ratings of the two (2) Cummins Power Generation DGs. See Att. 5-1 for interim storage location. **(Open Item: Implement a design change to install connection points, conduit, cabling, and transfer switches locally at battery chargers to provide for direct connection from the FLEX 480 VAC DGs.)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

CCNPP will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

Identify modifications	*List modifications*

(Note: Modifications listed are per unit)

- Install connection points, conduit, and cabling from the 45 ft. and 27 ft. Switchgear Rooms to the west side of the 45 ft Auxiliary Building to connect FLEX 480 VAC diesel generators to any of the A-Train or B-Train vital 480 VAC Load Centers to provide power to the battery chargers and critical AC components. (Primary strategy) (Att. 9-1 and 9-2).
- Install connection points, conduit, cabling, and transfer switches locally at battery chargers to provide for direct connection from the FLEX 480 VAC DGs. (Alternate strategy) (Att. 10-1).
- Install connection points, conduit, cabling, and transfer switches locally at the reactor MCCs to provide for direct connection from the FLEX 480 VAC DGs (Alternate strategy) (Att. 16-6).
- Install hose connections at 12 CST for makeup from and suction to a FLEX pump. (Primary strategy).

Maintain Core Cooling	
PWR Portable Equipment Phase 2:	
• Install hose connections at 11 and 21 RWTs for makeup from and suction to a FLEX pump. (Alternate strategy). • Replace 2-1/2 inch hose connections at 11 and 21 CSTs, 11 DWST, and 11 and 12 PWSTs with 4 inch hose connections for suction to a FLEX pump. (Alternate strategy). • Install hose connections on piping from 11 Reactor Coolant Waste Receiver Tank (RCWRT) and 11 Reactor Coolant Waste Monitor Tank (RCWMT) for suction to a FLEX pump. (Alternate strategy). • Install hose connections on piping from 12 Reactor Coolant Waste Receiver Tank (RCWRT) and 12 Reactor Coolant Waste Monitor Tank (RCWMT) for suction to a FLEX pump. (Alternate strategy). • Track the completion of ECP-11-000293 and -000294, the Reserve Battery distribution system modification that is currently in progress. • Install hose connections on Safety Injection System lines (high pressure or low pressure) in the 27 ft. East Penetration Rooms for RCS injection pump hose connection for RCS makeup and boration..	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same as those listed for Phase 1	
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • CCNPP procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • CCNPP procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP..	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • CCNPP procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP.	

Maintain Core Cooling		
PWR Portable Equipment Phase 2:		
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*	
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined. • CCNPP procedures and programs are being developed to address storage structures requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP.		
High Temperatures	*List how equipment is protected or schedule to protect*	
Storage structures will be ventilated to allow for equipment to function.. Active cooling systems are not required as normal room ventilation will be utilized per Reference 1 The schedule to construct structures is still to be determined. • CCNPP procedures and programs are being developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP.		
Deployment Conceptual Modification (Att. 5-1 and 5-2 contain 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*
Permanent storage location and structure have not yet been decided. See Att. 5-1 for the interim storage location and Att. 5-2 for the proposed permanent storage location. Att. 5-1 and 5-2 identify primary and alternate deployment pathways to transport FLEX equipment.	• Install hose routing penetrations/sleeves through the 12 CST enclosure building wall.	• Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically "rugged" structure. • Connection points on the exterior of the 12 CST for fill capability from the FLEX pumps will be protected by the building enclosure. • New FLEX piping shall be installed to meet necessary seismic requirements. • Electrical connection points for the FLEX 480 VAC DGs will be established at the Auxiliary Building west side inside the designated DG Rooms and designed to withstand the applicable hazards.

Notes:

Identify analyses or actions:

- Perform an analysis to determine that there is sufficient decay heat generated for TDAFW operation 36 hours after shutdown.
- Implement a design change to provide dedicated hose connections and piping to the Safety Injection System.
- Develop a procedure or FSG to mimic the AFW makeup strategy described in ERPIP-611, Attachment 1.
- Install a design change to add hose connections at 12 CST and 11 and 21 RWTs for makeup from and suction to a FLEX pump.
- Install a design change to replace the 2-1/2 inch hose connections with 4 inch hose connections at 11 and 21 CSTs, 11 DWST, and 11 and 12 PWSTs.
- Install design change to add 4 inch hose connections to the RCWRTs and RCWMTs.
- Track the completion of ECP-11-000293 and -000294, the Reserve Battery distribution system modification that is currently in progress.
- Perform an analysis to determine the seismic survivability of the wells as a long-term source of make-up water. Analysis should include any modifications needed to improve the survivability of the associated Well Water System piping and to provide 480 VAC power to the well pumps.
- Perform an analysis to determine the long-term affect on the S/Gs from use of water from the UHS as a cooling medium.
- Perform an analysis to determine station battery coping time with DC load shedding. Analysis should consider battery age, battery performance without battery room ventilation, and load and load duration prior to completion of DC load shedding.
- Track the completion of ECP-11-000293 and -000294, the Reserve Battery distribution system modification that is currently in progress.
- Develop and implement procedures to supply power to critical instrumentation using primary and alternate methods.
- Perform an analysis to determine that the assumed load capacity of this FLEX 480 VAC DG is sufficient to provide power to the selected loads.
- Implement a design change to install connection points, conduit, and cabling from the 45 ft. and 27 ft. Switchgear Rooms to the west side of the 45 ft Auxiliary Building to connect FLEX 480 VAC diesel generators to any of the A-Train or B-Train vital 480 VAC Load Centers to provide power to the battery chargers and critical AC components.
- Implement a design change to install connection points, conduit, cabling, and transfer switches locally at battery chargers to provide for direct connection from the FLEX 480 VAC DGs.
- Implement a design change to install connection points, conduit, cabling, and transfer switches locally at the reactor MCCs to provide for direct connection from the FLEX 480 VAC DGs.

Maintain Core Cooling

PWR 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 (RCIC/HPCI/IC) and strategy(ies) utilized to achieve this coping time.

The CCNPP Phase 3 strategy for Core Cooling is to initially transition to the FLEX portable alternate AFW pump when decay heat becomes insufficient to operate the TDAFW pump. Once at least one vital 4KV bus per Unit has been re-energized from a RRC 4KV DG, then Core Cooling will be transferred to Shutdown Cooling (SDC). Once on SDC a plant cooldown to Cold Shutdown (Mode 5) conditions can be performed.

Primary Strategy

For Phase 3, initially Core Cooling will continue as per the Phase 2 strategy using the TDAFW pump and local manual operation of the ADVs to discharge steam from the S/Gs. This will continue as long as possible based on sufficient decay heat to develop adequate steam pressure for TDAFW operation. A CCNPP Engineering Calculation will be performed to confirm this assumption as part of the Phase 2 actions.

If necessary, core cooling will be transferred from TDAFW to the FLEX portable alternate AFW pump when decay heat becomes insufficient. It may become necessary to perform "batch" feeding of the S/Gs. **(Open Item: Perform an analysis to determine the feasibility of the S/G "batch" feeding strategy.)**

When supported by a RRC 4KV DG, Core Cooling will be shifted over to one train of Shutdown Cooling (SDC) in service. This will be accomplished by powering up an A-Train or B-Train Low Pressure Safety Injection (LPSI) or Containment Spray (CS) Pump on each unit from the associated Class 1E 4160 V bus utilizing a 4160 VAC RRC FLEX portable diesel generator, supplying the SDC Heat Exchanger with a Component Cooling Water (CCW) pump powered from the associated vital 480 VAC Load Center, and a Salt Water (SW) pump from the 4160 VAC bus.

Two (2) 4160 V RRC FLEX diesel generators, one for each unit, will be capable of carrying approximately 2000 kW load which is sufficient to carry all of the loads on the A-Train or B-Train 4160 V bus necessary to support the Phase 3 FLEX strategies which includes a LPSI pump, CCW pump, SW pump, and support equipment (i.e., MOVs, ECCS Pump room coolers, etc.) for one train of SDC on each unit. **(Open Item: Implement a design change to install modifications for connection of a 4160 VAC RRC DG to either the A or B Train 1E 4160 VAC bus on each unit.) (Open Item: Develop procedures or FSGs for repower vital 4160 VAC Class 1E buses from RRC FLEX 4KV DGs.)**

Alternative Strategy

Alternate means of Core Cooling can be provided by providing power to a LPSI pump and SW pump for SDC operation via cable from the 4160 VAC RRC DG directly to the component by connecting either at the switchgear end of the component's power cable or locally at the pump end of the power cable. **(Open Item: Provide modified 4160 VAC breakers for direct RRC DG connection for use in place of the normal 4160 VAC breakers in service for LPSI Pump and SW Pump power supplies.)**

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
CCNPP will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
• Install modifications for connection of a 4160 VAC RRC DG to either the A or B Train 1E 4160 VAC bus on each unit. (Primary Strategy) • Provide modified 4160 VAC breakers for direct RRC DG connection for use in place of the normal 4160 VAC breakers in service for LPSI Pump and SW Pump power supplies. (Alternate Strategy)	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same as Phase 1 not including instrumentation to support portable equipment operation.	

Deployment Conceptual Modification (Att. 5-1, 5-2, and 12-1 contain 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*
Phase 3 equipment will be provided by the RRC. Equipment transported to the site will be either immediately staged at the point of use location (pumps and generators) or temporarily stored at the proposed lay down areas shown on Att. 12-1 until moved to the point of use area. Att. 5-1 and 5-2 identify primary and alternate deployment pathways to transport FLEX equipment.	Install modifications for connection of a 4160 VAC RRC DG to either the A or B Train 1E 4160 VAC bus on each unit. This will support 2 4160 VAC, 2000 KW DGs from the RRC.	No protection of connections have been identified for Phase 3 deployment.

Notes:

Identify analyses or actions:

- Perform an analysis to determine the feasibility of the S/G "batch" feeding strategy.
- Implement a design change to install modifications for connection of a 4160 VAC RRC DG to either the A or B Train 1E 4160 VAC bus on each unit.
- Develop procedures or FSGs for repower vital 4160 VAC Class 1E buses from RRC FLEX 4KV DGs.
- Provide modified 4160 VAC breakers for direct RRC DG connection for use in place of the normal 4160 VAC breakers in service for LPSI Pump and SW Pump power supplies.

Maintain Containment

STRATEGY

The Phase 1 through 3 strategy for Maintain Containment is to verify containment integrity and monitor containment parameters. No portable equipment is expected to be required to maintain containment in Phases 1 and 2.

OBJECTIVE

Provide redundant means of monitoring containment environment conditions as the containment heats up and pressure increases by provide the control room operators the reliable temperature instrumentation to monitor containment temperature. Provide a diverse means of initiating containment spray flow by installing an alternate FLEX pump hose connection point on the containment spray header.

ACCEPTANCE CRITERIA

Containment integrity is maintained. Containment design temperature and pressure limits are not challenged.

Maintain Containment

Determine Baseline coping capability with installed coping[2] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06:

- **Containment Venting or Alternate Heat Removal**
- **Hydrogen Igniters (Mark III containments only)**

PWR Installed Equipment Phase 1:

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain containment integrity. Identify methods (containment vent or alternative / Hydrogen Igniters)and strategy(ies) utilized to achieve this coping time.

During Phase 1, containment integrity is maintained by normal design features of the containment, such as the containment isolation valves. In accordance with NEI 12-06 (Att. 3-1, Reference 2), the containment is assumed to be isolated following the event. Per EOP-7, Station Blackout (Reference 5), Block Step N operators are directed to ensure containment integrity. The containment isolation valves are verified shut in order to ensure containment integrity. Per EOP-7 Technical Basis, containment integrity is verified to the extent required by NUREG 1.155. (Reference 6)

Due to the loss of power to the Containment Air Cooling (CAC) Units and loss of flow in the Service Water Cooling System (SRW) that supplies cooling water to the CAC heat exchangers, and loss of the UHS, the containment will begin to heat up and pressurize from sensible heat transferred from the Nuclear Steam Supply System components.

Containment narrow range and wide range pressure can be monitored in the Control Room at panel C09, however containment dome and reactor cavity temperatures cannot be monitored. These instruments are currently powered from a non-vital 120 VAC instrument bus. **(Open Item: Implement a design change to power containment dome and reactor cavity temperatures instrumentation from a vital 120 VAC instrument bus.)**

The containment concrete surface design temperature is 276°F (Reference 1, CCNPP UFSAR Sections 5.1.1 and 14.20). Per CCNPP Station Blackout Analysis (Reference 13), containment temperature is predicted to reach 185°F at four (4) hours into the event. Containment temperature is expected to rise from nominal summer temperature of 115°F and stabilize at a temperature well below 276°F. A CCNPP Engineering Calculation will be performed to confirm containment temperature response over the first 72 hours of the event. .

The containment design pressure is 50 psig (Reference 1, CCNPP Units 1 and 2 UFSAR Sections 5.1.1 and 14.20). Containment pressure limits are not expected to be approached during the event. A CCNPP Engineering Calculation will be performed to confirm containment pressure response over the first 72 hours of the event.

(Open Item: Perform an analysis to determine containment temperature and pressure response over a period of 72 hours. Perform analysis with and without RCS cooldown and with and without restoration of containment air cooling.)

[2] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain Containment

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

CCNPP EOP-7-1(2), Station Blackout directs operators to verify containment isolation to ensure containment integrity.

CCNPP will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

Identify modifications	*List modifications*

- Implement a design change to power containment dome and reactor cavity temperatures instrumentation from a vital 120 VAC instrument bus.

Key Containment Parameters	*List instrumentation credited for this coping evaluation.*

Containment Essential Instrumentation	**Safety Function**
Containment wide range pressure PI-5307 and 5310	Containment integrity
Containment Dome Temperature TI-5309	Containment integrity
Reactor Cavity Temperature TI-5311	Containment integrity

Notes:

Identify analyses or actions:

- Implement a design change to power containment dome and reactor cavity temperatures instrumentation from a vital 120 VAC instrument bus.
- Perform an analysis to determine containment temperature and pressure response over a period of 72 hours. Perform analysis with and without RCS cooldown and with and without restoration of containment air cooling.

Maintain Containment

PWR 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 integrity. Identify methods (containment vent or alternative / Hydrogen Igniters) and strategy(ies) utilized to achieve this coping time.

Phase 2 strategy for containment integrity is to continue monitor containment parameters. The RCS cooldown to a temperature of 350°F performed in Phase 1 for Core Cooling is assumed to have a positive effect on containment temperature and pressure.

Alternate Strategy

If needed containment spray can be initiated via a FLEX pump. A FLEX pump can be setup to take suction from any surviving water storage tank or the UHS and deliver water via hoses to one of two locations. The pump will be setup adjacent to the Tank Farm or on the waterfront (+) 10 ft. elevation near the CW Discharge Structure to take suction from the UHS (Chesapeake Bay). Hoses can be run from the pump through a roll-up door on the west side 45 ft. el. of the Auxiliary Building.

The hose can be run down stairway AB-2 to the (+) 5ft. el. to a dedicated hose connection located in the East Piping Penetration Rooms installed on the Containment Spray (CS) header (See Attachment 13-1). **(Open Item: Implement a design change to install a hose connection on the A-Train and B-Train CS headers in the Auxiliary Building.)**

Alternatively, the hose can be run down stairway AB-2 to the (-) 10 ft. el. and into one of the ECCS Pump Rooms on the (-) 15 ft. el. A special check valve bonnet is then installed in place of the Containment Spray (CS) Pump discharge check valve and the hose connected to the special bonnet (See Att. 13-1). This strategy is similar to that described in ERPIP – 611, Severe Accident Management Restorative Actions, Attachment 1, Alternate Water Sources (Att. 3, Reference 26). **(Open Item: Purchase additional special check valve bonnets and store them inside each ECCS Pump Room.)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
FSGs will need to be developed for the CS strategies described here.	
Identify modifications	*List modifications*
• Install a hose connection on the A-Train and B-Train CS headers in the Auxiliary Building.	
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Maintain Containment

PWR Portable Equipment Phase 2:

Containment Essential Instrumentation	Safety Function
Containment wide range pressure PI-5307 and 5310	Containment integrity
Containment Dome Temperature TI-5309	Containment integrity
Reactor Cavity Temperature TI-5311	Containment integrity

Storage / Protection of Equipment :
Describe storage / protection plan or schedule to determine storage requirements

Seismic	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined.

- CCNPP procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP.

Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined.

- CCNPP procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP.

Severe Storms with High Winds	*List how equipment is protected or schedule to protect*

Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined.

- CCNPP procedures and programs will be developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP.

Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*

Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required as normal room ventilation will be utilized per Reference 1 The schedule to construct structures is still to be determined.

- CCNPP procedures and programs are being developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP.

Maintain Containment		
PWR Portable Equipment Phase 2:		
High Temperatures	*List how equipment is protected or schedule to protect*	
Storage structures will be ventilated to allow for equipment to function. Active cooling systems are not required as normal room ventilation will be utilized per Reference 1 The schedule to construct structures is still to be determined. • CCNPP procedures and programs are being developed to address storage structure requirements, deployment path requirements, and FLEX equipment requirements relative to the hazards applicable to CCNPP.		
Deployment Conceptual Design (Att. 5-1and 5-2 contain 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*
Permanent storage location and structure have not yet been decided. See Att. 5-1 for the interim storage location and Att. 5-2 for the proposed permanent storage location. Att. 5-1 and 5-2 identify primary and alternate deployment pathways to transport FLEX equipment.	No deployment modifications have been identified.	• Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically ""rugged" structure. • New FLEX piping shall be installed to meet necessary seismic requirements.

Notes:

Identify analyses or actions:

- Implement a design change to install a hose connection on the A-Train and B-Train CS headers in the Auxiliary Building.
- Purchase additional special check valve bonnets and store them inside each ECCS Pump Room.

Maintain Containment

PWR Portable Equipment Phase 3:

Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain containment integrity. Identify methods (containment vent or alternative / Hydrogen Igniters) and strategy(ies) utilized to achieve this coping time.

The Phase 3 strategy for containment integrity will be to restore containment cooling either via a FLEX pump and a FLEX 480 VAC DG or via a RRC 4KV DG restoring one vital 4160 VAC bus on each Unit.

Primary Strategy
Restore at least one (1) Containment Air Cooling (CAC) Unit to service and support systems (SW and SRW) to operation with a RRC 4KV DG.

Alternate Strategy
Restore at least one (1) Containment Air Cooling (CAC) Unit to service. This will require a 480 VAC FLEX DG to repower a vital 480 VAC Load Center to supply power for a CAC Fan (See Phase 2 Core Cooling strategy for electrical power) and a modification to the Service Water (SRW) supply and return lines to the CACs for use of a FLEX pump to provide cooling water flow. These lines are located in the Auxiliary Building East and West 27 ft. el. Piping Penetration Rooms. A modification will be required to install hose connections on the SRW supply and return lines. **(Open Item: Perform an analysis to determine the feasibility of providing Containment cooling with CACs using an alternate cooling water strategy.). (Open Item: Install hose connections on the CAC SRW supply and return lines.)**

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

FSGs will need to be developed for the strategies described here.

Identify modifications	*List modifications*

- Install hose connections on the CAC SRW supply and return lines.

Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Containment Essential Instrumentation	Safety Function
Containment wide range pressure PI-5307 and 5310	Containment integrity
Containment Dome Temperature TI-5309	Containment integrity
Reactor Cavity Temperature TI-5311	Containment integrity

Deployment Conceptual Design (Att. 5-1, 5-2, and 12-1 contain 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*
Phase 3 equipment will be provided by the RRC. Equipment transported to the site will be either immediately staged at the point of use location (pumps and generators) or temporarily stored at the proposed lay down areas shown on Att. 12-1 until moved to the point of use area. Att. 5-1 and 5-2 identify primary and alternate deployment pathways to transport FLEX equipment.	No new deployment modifications have been identified.	• Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically "'rugged" structure. • New FLEX piping shall be installed to meet necessary seismic requirements.

Notes:

Identify analyses or actions:

- Perform an analysis to determine the feasibility of providing Containment cooling with CACs using an alternate cooling water strategy.
- Implement a design change to install hose connections on the CAC SRW supply and return lines.

Maintain Spent Fuel Pool Cooling

STRATEGY

The Spent Fuel Pool Cooling Phase 1 and Phase 2 strategies will be to monitor Spent Fuel Pool (SFP) level to ensure adequate water level remains over the fuel. At the onset of the ELAP, the operating SFP Cooling pump loses power, the SFP will begin to heat-up and over time reach a temperature at which bulk fluid boiling will occur. The time to 200°F immediately following a full core offload assuming a SFP water temperature of 120°F is 11.8 hours. Makeup to the SFP is not expected to be needed in Phase 1 The time to fuel uncovery in this condition is approximately 102 hours.

OBJECTIVE

In Phase 1 and 2, the objective is to maintain a minimum water level of 6 feet (50 ft. el.) above the top of the fuel storage racks to protect the stored spent fuel and limit radiation exposure to personnel onsite and offsite. Install a new wide range level indication with integral backup power supply per Order EA-12-051 to allow for remote monitoring SFP level.

In Phase 2, deploy and connect the SFP makeup FLEX pump ready to makeup to the SFP to maintain level ≥ 50 feet.Provide makeup to the SFP from portable injection sources via diverse means.

- Dedicated hose connection tied into the SFP Cooling System such that access to the SFP Area is not required.
- Hose to the Auxiliary Building 69 ft. el. SFP Area to the pool edge.
- Hose to an oscillating spray nozzle in the Auxiliary Building 69 ft. el. SFP Area for SFP spray.

Under Phase 3 (using off-site RRC supplied equipment), portable equipment and consumables will be used to reinforce and secure for an indefinite coping time the measures implemented during Phase 2.

ACCEPTANCE CRITERIA

No fuel damage will occur. Coping times will be calculated such that they preclude fuel damage, by maintaining water level at a predetermined level above the top of the active fuel.

Maintain Spent Fuel Pool Cooling	
Determine Baseline coping capability with installed coping[3] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06: • **Makeup with Portable Injection Source**	
PWR 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 with portable injection source)and strategy(ies) utilized to achieve this coping time The Spent Fuel Pool Cooling Phase 1 strategy will be to monitor Spent Fuel Pool (SFP) level to ensure adequate water level remains over the fuel. The modification to install a new wide range level indication with integral backup power supply to allow for remote monitoring. Makeup to the SFP is not needed in Phase 1.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
Per EOP-7, Station Blackout, Operators will be directed to implement AOP-6F, Spent Fuel Pool Cooling System Malfunctions, Section VIII for a sustained loss of SFP cooling. Actions include placing a portable battery powered digital thermocouple in the SFP for monitoring temperature from outside of the SFP area and use of an AOP attachment to monitor SFP level as referenced against the elevations of the New Fuel Elevator (interim action until Wide Range SFP level instrumentation is installed per Order EA-12-051)	
Identify modifications	*List modifications*
• **(Open Item: Implement a design change to install reliable wide range SFP fuel pool level instrumentation in accordance with NRC Order EA-12-051.)**	
Key SFP Parameters	*List instrumentation credited or recovered for this coping evaluation.*
• Wide Range SFP level instrumentation per Order EA-12-051 • SFP temperature	
Notes: To be consistent with the current CCNPP UFSAR, two sequences are defined: "normal" and "abnormal." Normal operation of the spent fuel pool means that there is extra fuel rack storage capacity for the offload of a complete core (at least 217 empty spaces in the racks) and the last fuel discharge is from a partial defueling during a normally scheduled refueling outage. Abnormal indicates the SFP fuel racks are filled to capacity, with the last 217 assemblies coming from a core offload. The abnormal case bounds a full core offload during a normally scheduled refueling outage.	

[3] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Maintain Spent Fuel Pool Cooling

PWR Portable Equipment Phase 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 with portable injection source) and strategy(ies) utilized to achieve this coping time.

The normal SFP water level at the event initiation is approximately 67.25 feet (CCNPP Technical Specification 3.7.8 requires > 21.5 feet of water over the top of the stored spent fuel). Per CCNPP UFSAR Section 9.4 (Reference 1), the Spent Fuel Pool Cooling System (SFPC) is designed to remove the maximum decay heat expected from 1613 fuel assemblies, not including a full core off-load. In the case of a total loss of SFPC with 1613 fuel assemblies in the pool, it would take more than 8 hours to raise the pool temperature from 155°F to 210°F.

Engineering Calculation CA06535, Spent Fuel Pool Decay Heat for 24-M VAP Core with Appendix K Power Uprate, developed a bounding spent fuel (SFP) pool decay heat load that considers 24-month low-leakage fuel cycles, a full core of Value Added Pellet (VAP) fuel, and an Appendix K power uprate to a core power level of 2738 MWt. The analysis of record for the current core power level of 2700 MWt (Reference 1) is summarized in UFSAR Section 9.4.1, and is based on the simplified ANS-5.1-1979 Decay Heat Standard. The ANS-5.1-1979 method has limited value for high burnup spent fuel due to the inability to accurately treat actinide formation and neutron capture effects. Therefore, this analysis utilizes the SAS2H/ORIGEN-S sequence of the SCALE 4.4 code system (Reference 6) to calculate decay heat loads.

To be consistent with the current UFSAR, two sequences are defined: "normal" and "abnormal." Normal operation of the spent fuel pool means that there is extra fuel rack storage capacity for the offload of a complete core (at least 217 empty spaces in the racks) and the last fuel discharge is from a partial defueling during a normally scheduled refueling outage. Abnormal indicates the SFP fuel racks are filled to capacity, with the last 217 assemblies coming from a core offload. The abnormal case bounds a full core offload during a normally scheduled refueling outage.

During normal operation, it is assumed that the SFP is cooled only by the Spent Fuel Pool Coolers (SFPHXs). Each of the two SFPHXs has a cooling capacity of 10.1×10^6 Btu/hr under design conditions; therefore, under normal operation, the SFP cooling system can remove 20.2×10^6 Btu/hr. During abnormal operation it is assumed the SFP cooling system is supplemented with one shutdown cooling heat exchanger from the offloaded unit. The heat removal capacity under these conditions is limited to 38.6×10^6 Btu/hr by the UFSAR (note that the maximum heat removal capacity in this configuration is actually reported in Reference 1 is 47.5×10^6 Btu/hr.

Per Engineering Evaluation ES200500540-000, if all SFP cooling is lost, the minimum time to boil is 6.19 hours. The minimum time to fuel uncovery from the time to boil is 46.87 hours, which gives the operators 53 hours to initiate compensatory measures from the loss of heat removal function. The maximum make-up rate to compensate for loss of SFP inventory due to bulk boiling is 139 gpm.

Full Core Offload Unit 2 2013 Refueling Outage

Engineering Calculation CA07900, CCNPP Spent Fuel Pool Decay Heat Load During the 2013 RFO, determined SFP decay heat load prior to 2013 RFO full core offload; SFP decay heat load during the 2013

Maintain Spent Fuel Pool Cooling

PWR Portable Equipment Phase 2:

refueling outage full core offload and onload; total decay heat in SFP and SFP temperature at different times during 2013 RFO; time for SFP to boil with loss of all SFP cooling; time for SFP to reach 200°F with loss of all SFP cooling for an entire year after 2013 RFO. This calculation concluded that the time to 200°F in the SFP for a full core offload is 11.86 hours, and the time to fuel uncovery is 102.11 hours. Therefore, the time to boiling of 6.19 hours and fuel uncovery of 46.87 hours from ES200500504-000 is bounding.

However, maintaining the SFP full at all times during the ELAP event is not required, the requirement is to maintain adequate level to protect the stored spent fuel and limit radiation exposure to personnel onsite and offsite. Interpolating from the Tables provided in CA07900 yields approximately 65 hours to reach a SFP level of 50 feet.

Primary Strategy

In Phase 2, as soon as manpower resources are available, and prioritized with Core Cooling strategies, a FLEX pump will be deployed and connected ready to provide SFP makeup before SFP level lowers to 50 feet. Using the most conservative bounding condition of heat load on the SFP described above, this level will be approached during Phase 3. The FLEX pump will be staged near and take suction from one of the RWTs or any of the below listed storage tanks that may survive the event. On each RWT a new 6" hose connection will be installed. **(Open Item: Implement a design change to provide a 6" hose connection to each RWT.**) The pump 5" discharge hose will connect to a new dedicated hose connection located inside the Auxiliary Building 45 ft. el. Truck Bay (See Att. 14-1). This new line will tie into the SFP cooling system on the makeup line from the RWTs (See Att. 14-1). **(Open Item: Implement a design change to provide dedicated hose connections to the SFP Cooling system.**) Operators will be provided FLEX guidelines for the proper valve lineup inside the SFP Cooling Heat Exchanger Room to establish the makeup flow path. **(Open Item: Develop and implement procedures or FSGs that include the SFP Cooling FLEX makeup flow path.)**

11 and 21 Refueling Water Tanks (RWT) are vertical, cylindrical, Seismic Class 1, stainless steel tanks. However, the tanks are not wind-driven missile protected. Each RWT has a maximum capacity of 420, 000 gallons of borated water. Technical Specification minimum volume is 400, 000 gallons.

Additional water storage tanks:

11 Demineralized Water Storage Tank (DWST) also has a capacity of 350,000 gallons. The DWST is a vertical, cylindrical stainless steel tank that is seismically qualified under the CCNPP Seismic Verification Program.

11 and 12 Pretreated Water Storage Tanks (PWST) each have a capacity of 500,000 gallons. Each tank is a Seismic Class II vertical, cylindrical carbon steel tank.

Maintain Spent Fuel Pool Cooling

PWR Portable Equipment Phase 2:

Alternate Strategy

The Chesapeake Bay can also be used as a limitless source of cooling water. One of the portable FLEX pumps can be setup adjacent to the Circulating Water discharge structure with suction hose placed into openings in the discharge structure (B.5.b pump setup location at the plant outfall). The Circulating Water discharge structure is located at the (+) 10 ft. waterfront elevation just north of the Sewage Treatment Building. (See Att. 5-2 and 8-1)

The FLEX pump 5" discharge hose will be run from the above location on the (+) 10 ft. waterfront elevation up to the west side of the Auxiliary Building, through roll-up door 419, across the 45 ft. Truck Bay, up Stairway AB-2 to the SFP Area, and then to the SFP pool edge via the dedicated hard pipes. A 5" to 2-1/2" Y-Adapter is used so both sides of the SFP can be filled simultaneously. (See Att. 15-1)

The above strategy is similar to that described in ERPIP – 612, Candidate High Level Actions SFP Uncovered, Attachment 4, Adding Makeup to the Spent Fuel Pool. (Reference 27)

Alternate Strategy

FLEX pump Circulating Water discharge structure as described above with same hose routing to the SFP Area. The backup portable Oscillating (Ozzie) Monitor is then setup in a designated location to provide spray to the SFP. The 5" FLEX pump discharge hose is connected to the Oscillating Monitor. (See Att. 15-1)

The above strategy is similar to that described in ERPIP – 612, Candidate High Level Actions SFP Uncovered, Attachment 5, Providing Local Spray to the Spent Fuel Pool. (Reference 28)

(Open Item: Develop procedures or FSGs that mimic the ERPIP-612 sections for SFP makeup and SFP spray.)

Schedule:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

CCNPP will utilize the industry developed Functional Support Guidelines from the B/PWROG, to develop site (unit) specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs Also list appropriate existing procedures.

Identify modifications	*List modifications*

- Implement a design change to provide dedicated hose connections to the SFP Cooling system.
- Implement a design change to provide a 6" hose connection to each RWT.

Key SFP Parameters	*List instrumentation credited or recovered for this coping evaluation.*

Wide Range Spent Fuel Pool level instrumentation to be installed to satisfy the NRC Order EA-12-051 is not yet identified. The instrument numbers will be provided upon detailed design completion.

Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
New piping and equipment used to provide flow to the SFP will be installed seismically and protected in structures that are seismically qualified. FLEX pumps will be stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
FLEX pumps will be stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
The piping used to provide makeup flow to the SFP is contained within buildings that are protected from storms and high winds. FLEX pumps are stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
The piping used to provide makeup flow to the SFP is contained within buildings that are protected from snow, ice, and extreme cold. FLEX pumps are stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
High Temperatures	*List how equipment is protected or schedule to protect*
The piping used to provide makeup flow to the SFP is contained within buildings that are protected from high temperatures. FLEX pumps are stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	

Deployment Conceptual Design **(Att. 14-1 and 15-1contain 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*
• The pumps used to provide the SFP cooling and makeup functions are the same style FLEX pumps described in the Core Cooling section. • The spray nozzle and hoses needed to spray and or makeup to the SFP will be	• See Phase 2 Core Cooling for discussion of modification necessary to deploy the FLEX pumps. • Piping modifications will be installed to provide flow from a storage tank or the UHS to a connection on the SFP	• Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically "rugged" structure. • Diverse connection points will be provided with at least one

kept at an accessible and protected location.	Cooling System.	protected from tornado missiles. • New FLEX piping shall be installed to meet necessary seismic requirements. • Connection points for the FLEX pump discharge will be designed to withstand the applicable hazards.

Notes:

Identify analyses or actions:

- Implement a design change to provide a 6" hose connection to each RWT.
- Implement a design change to provide a dedicated FLEX pump hose connections to the SFP Cooling system.
- Develop and implement procedures that include the SFP Cooling FLEX makeup flow path.
- Develop procedures or FSGs that mimic the ERPIP-612 sections for SFP makeup and SFP spray.
- Implement a design change to install reliable wide range SFP fuel pool level instrumentation in accordance with NRC Order EA-12-051.

Maintain Spent Fuel Pool Cooling	
PWR 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 with portable injection source) and strategy (ies) utilized to achieve this coping time. The same strategies employed in Phase 2 can be employed in Phase 3. Additionally, one of two 4160 VAC, 2000 KW diesel generators from the RRC could be employed to power 14 or 24 Class 1E 4160 VAC buses to power the 480 VAC buses that power 11 or 12 SFPC pumps. (Note – Open Item for modification and procedures previously described under Core Cooling Phase 3).	
Schedule:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
CCNPP will utilize the industry developed Functional Support Guidelines from the PWROG, to develop site (unit) specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
None	
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.*
None	

Deployment Conceptual Design
(Att. 5-1, 5-2, and 12-1 contain 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*
Phase 3 equipment will be provided by the RRC. Equipment transported to the site will be either immediately staged at the point of use location (pumps and generators) or temporarily stored at the proposed lay down areas shown on Att. 12-1 until moved to the point of use area. Att. 5-1 and 5-2 identify primary and alternate deployment pathways to transport	None	• Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically 'rugged' structure. • New FLEX piping shall be installed to meet necessary seismic requirements. • Connection points for the

Maintain Spent Fuel Pool Cooling		
PWR Portable Equipment Phase 3:		
FLEX equipment.		FLEX/RRC pump discharge will be designed to withstand the applicable hazards. • Electrical connection points for the RRC DGs will be designed to withstand the applicable hazards.

Notes:

Identify analyses or actions:

None.

Safety Functions Support

STRATEGY

The Phase 1 through 3 strategies for Safety Function Support focuses on providing support equipment that facilitates, but does not directly implement, the safety function strategies. This includes:

- Vital 125 VDC power for Essential Instrumentation
- Emergency lighting
- Ventilation
- Battery Room ventilation for hydrogen control,
- Debris removal, equipment transport, and fuel transport
- UHS access
- FLEX equipment refueling
- Communications
- Consumables

OBJECTIVE

The objective of Safety Function Support is to maintain the continuity of the mitigating strategies for each of the Safety Functions such that severe accident conditions are prevented, and also provide for Industrial and Radiological safety of plant personnel that will implement those strategies.

ACCEPTANCE CRITERIA

Fuel damage (Core and SFP) is prevented. Containment integrity is maintained. At least one channel of Essential Instrumentation is maintained for each Safety Function and redundant indication is also provided wherever possible. Industrial and Radiological Safety of personnel is maintained within established site and Federal limits for severe accident response.

Safety Functions Support

PWR Installed Equipment Phase 1

Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications.

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 strategy(ies) utilized to achieve coping times.

Control Room Habitability

Operator Function – Command and control, emergency response coordination, communications.

Per CCNPP Station Blackout Analysis (Bechtel Calculation M-88-28, Rev. 3) (Reference 13), the Control Room will reach 103°F at four (4) hours into the event. Under ELAP conditions with no mitigating actions taken, the blackout analysis states that the control room may surpass 110°F (the assumed maximum temperature for efficient human performance as described in NUMARC 87-00 (Reference 3)) at some point during a blackout. The Phase 1. FLEX strategy is to remove panel lower covers per the existing station blackout EOP. This will establish natural circulation air flow through the control room panels. A Phase 1 or 2 strategy will be to block open the doors to the Control Room and setup portable air circulation fans powered by small portable AC generators.

(Open Item: Perform an analysis to determine the Control Room temperature response over a period of 72 hours.)

Per CCNPP Station Blackout Analysis (Reference 13), the Control Room has a sufficient level of battery backed lighting to perform all essential tasks for over four (4) hours. The Control Room and adjacent plant computer data acquisition (DAS) rooms have a separate emergency lighting system powered from vital 125 VDC Station Battery 22. The DC load shedding described earlier under Core Cooling will extend this to approximately 10 hours. The modification currently in progress to install cabling and disconnects for the Reserve Battery 01 will allow it to be connected to any one of vital 125 VDC buses. The preferred connection will be to 22 – 125 VDC bus for maintenance of Control Room lighting.

TDAFW Pump Room Habitability

Operator Function – Local manual operation of the TDAFW Pumps

Per CCNPP Station Blackout Analysis (Bechtel Calculation M-88-28, Rev. 3) (Reference 13), the TDAFW Pump Room will reach 137°F at four (4) hours into the event. Per CCNPP Station Blackout Analysis, the TDAFW Pump room is a Dominate Area of Concern (DAC). This calculation assumed that the double watertight doors to the room would be open and operators could enter the room for short periods of time to control and monitor TDAFW pump performance.

Per the CCNPP UFSAR Section 6.9 (Reference 1), the AFW Pump Room cooling system is designed to

[4] Coping modifications consist of modifications installed to increase initial coping time, i.e. generators to preserve vital instruments or increase operating time on battery powered equipment.

Safety Functions Support

PWR Installed Equipment Phase 1

prevent the room air temperature from rising above 130°F so as to prevent failure of the air cooled bearings on the pump during emergency shutdown of the plant. However, during ELAP this small HVAC unit will be without power and cooling water.

Engineering Calculation CA04467, AFW Pump Room Transient Temperature Analysis Under App. R/Non-LOOP, LOCA/LOOP, Appendix R Fire/LOOP and SBO Scenarios, Using Gothic Code (Att. 3, Reference 29). Per this calculation, the SBO scenario determined the expected room temperature is enveloped by the AFW-App R- No Lights scenario. In this scenario the securing of the room lights and the NSR ventilation fan were factored in for limiting room temperature. The scenario showed room temperature peaking at 123.4°F. Based on the slope of the temperature curve the TDAFW pump could be kept in operation for 72 hours without exceeding 130°F air temperature in the room.

(Open Item: Perform an analysis to confirm that TDAFW Pump room air temperature remains below 130°F over 72 hours of pump operation.)

(Open Item: Develop primary and alternate strategies for ventilating the TDAFW Pump Room.)

<u>TDAFW Pump Room Flooding</u>

Operator Function – Local manual operation of the TDAFW Pumps

The Probable Maximum Precipitation (PMP) event for CCNPP is assumed to cause flooding in the Turbine Building. The TDAFW Pump Room is located on the 12 ft. el. of the Turbine Building. The room is a fully protected re-enforced concrete structure that houses the two (2) terry turbine AFW pumps. The room has two watertight door accesses from the 12 ft. el. of the Turbine Building. The room is normally accessed via the Turbine Building via a personnel watertight door and during pump operation by keeping open the double watertight doors. If accessible, the double watertight doors are will be opened to aid in ventilating the room. The room also has two emergency access points, one into the top of the room from the 27 ft. el. of the Turbine Building and one at the 20 ft. el. through the side of the room.

(Open Item: Perform an analysis to confirm the PMP event maximum flood height will not impact the operation of TDAFW or preclude access to the room.)

<u>TDAFW Pump Room Access</u>

Operator Function – Local manual operation of the TDAFW Pumps

A beyond design basis (BDB) seismic event is assumed to cause some level of damage to the Turbine Building. The Turbine Building is a non-seismic structure. Though designed for wind speeds up to 100 mph, it is not designed for wind-driven missiles or for the wind speeds as determined using NEI 12-06, Tables 7-1 and 7-2 for CCNPP. The TDAFW Pump Room is located on the 12 ft. el. of the Turbine Building. The room is a fully protected re-enforced concrete structure that houses the two (2) terry turbine AFW pumps. The room is normally accessed via the Turbine Building via a personnel watertight door and during pump operation by opening and keeping open a double watertight door located on the east side of the room. The room also has two emergency access points, one into the top of the room from the 27 ft. el. of the Turbine Building and one at the 20 ft. el. through the side of the room. The room also has a small ventilation tunnel between the room and the 5 ft. el. Auxiliary Building Exhaust Ventilation Fan Room (5 ft. Fan Room). The tunnel is approximately 24 inches in diameter and about 4 feet long. There is a removable hatch on the

Safety Functions Support

PWR Installed Equipment Phase 1

Auxiliary Building side and a bolted in place screen on the TDAFW pump room side.

(Open Item: Perform an analysis to determine the possible effects of BDB external events on the Turbine Building structure and the potential effect on access to the TDAFW Pump Room.)

(Open Item: Develop an alternate access strategy for access into the TDAFW Pump Room.)

Units 1 and 2 Auxiliary Building 45 Ft. El. Atmospheric Dump Valve (ADV) Enclosure Areas (Areas A408, A428) Habitability

Operator Function – Local manual operation of the ADVs, Phase 2 Core Cooling strategy to run 480 VAC cables through this area.

The CCNPP Station Blackout Analysis does not specify a 4 hour temperature for this area of the 45 ft. el. of the Auxiliary Building. The ADV enclosures are adjacent to the S/G Blowdown Tank. S/G blowdown is secured early in the event per EOP-7, Station Blackout to protect the main condenser from over pressurization and to conserve S/G inventory. However, the stored heat of the S/G blowdown tank will dissipate to the area.

(Open Item: Perform an analysis to determine the temperature profile over 72 hours in the area around ADV enclosures.)

Units 1 and 2 Cable Spreading Rooms (Rooms A306, A302) Habitability

Operator Function – DC load shedding, essential instrumentation power supplies.

The Unit 1 and 2 Cable Spreading Rooms contain the battery chargers, 125 VDC to 120 VAC inverters, bus work, and power panels that supply essential instrumentation power.

Per CCNPP Station Blackout Analysis (Bechtel Calculation M-89-3, Rev. 2) (Reference 13), the Cable Spreading Room will reach 103F at four (4) hours into the event. Under ELAP conditions with no mitigating actions taken, the blackout analysis states that the cable spreading room may surpass 110°F (the assumed maximum temperature for efficient human performance as described in NUMARC 87-00 (Reference 3)) at some point during a blackout. A Phase 1 or 2 strategy will be to block open the doors to the Cable Spreading Room and setup portable air circulation fans powered by small portable AC generators.

(Open Item: Perform an analysis to determine the Cable Spreading Room temperature response over a period of 72 hours.)

Area Emergency Lighting

Battery backed emergency lighting exists in many areas of the plant. The majority of lights consist of 12 watt lamps powered by local battery packs rated for eight hours. Lighting levels are only sufficient for entering and exiting rooms and some important equipment. Personnel will need use flashlights or portable lanterns for supplemental lighting.

Per CCNPP Station Blackout Analysis (Reference 13), the Control Room has a sufficient level of battery backed lighting to perform all essential tasks for over four (4) hours. The Control Room and adjacent plant computer data acquisition (DAS) rooms have a separate emergency lighting system powered from vital 125

Safety Functions Support

PWR Installed Equipment Phase 1

VDC Station Battery 22.

The CCNPP Station Blackout Analysis (Reference 13), Chapter VI, Table 4, Emergency Lighting, has a list of rooms that might be entered by personnel during an SBO, emergency lighting wattage per room, and drawing references for each lighting circuit. Exterior area lighting will be without power during an ELAP. Portable diesel generator powered lighting units will be needed to provide lighting in the areas where FLEX equipment is expected to be deployed.

(Open Item: Investigate changing Appendix R lighting batteries to a longer life battery or new battery technology to lengthen the duration of lighting available in vital areas of the plant.

(Open Item: Procure battery operated hardhat mounted lights ("miners" lights) for on-shift and ERO personnel.)

(Open Item: Procure a sufficient quantity of hand-held battery operated hardhat lanterns for on-shift and ERO personnel.)

(Open Item: Procure six (6) portable diesel generator powered exterior lighting units with 30 ft. masts and a minimum 400,000 lumens.)

(Open Item: Change Appendix R lighting from incandescent to LED to lengthen the duration of lighting available in vital areas of the plant.

<u>Communications Capability</u>

Functions – Onsite ERO notification, ERO coordination, plant operation and control, nuclear security. Offsite ERO notification and ERO recall, survey team coordination, and coordination of offsite response.

The CCNPP Plant Communications System provides communications capability inside and outside of the plant during normal and emergency operating conditions. The system consists of twelve major systems/subsystems:

- Plant Public Address
- Administrative Telephones
- 800 MHz Radio Telephone/Radios
- Dedicated Telephone
- Pager Recall System
- Liquid Natural Gas (LNG) Hotline
- Microwave Telephone
- Nuclear Regulatory Commission (NRC) Hotline
- Sound Powered Phones
- Public Alert and Notification
- Dedicated Cellular Phones
- Dedicated Fixed Satellite Phones
- Portable Satellite Phones

Due the following limitations; limited or no backup power supplies, core equipment located in non-robust or

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unprotected structures, reliance on outside supplier above ground infrastructure, most of the above systems will not be available during some of the external hazard scenarios. Only the sound-powered phones and the portable satellite phones will be available during all external hazards applicable to CCNPP.

CCNPP has an extensive sound-powered phone network, both primary and backup circuits. Phone jacks are located on multiple panels in the Control Room and vital areas of the plant. This system initially will be used by operations personnel for plant control. Eighteen (18) additional sound-powered phone headsets have been purchased and are stored in the Technical Support Center (TSC) Annex for this use.

Five additional portable satellite phones have been purchased for the Control Room and TSC. These phones are stored in the TSC.

(Open Item: Implement a design change to install a protected, backup power supply capable of 24 hrs of operation, for the Plant Public Address system. This includes backup power for the individual building speaker network amplifiers.)

(Open Item: Implement a design change to modify the 800 MHz Radio System to provide protection from external hazards, transmitter and antennas protected from seismic, wind, and wind-driven missiles, including back-up power supply capable of 24 hours operation for the system and repeaters.)

(Open Item: Implement a design change to modify the Fixed Dedicated Satellite Phone System to provide protection from external hazards, and transmitter and antennas protected from seismic, wind, and wind-driven missiles, including back-up power supply capable of 24 hours operation for the system.)

<u>Debris Removal</u>

CCNPP currently has a varied array of wheeled vehicles (forklifts, small tractors, backhoe) that could be used for debris removal. The new CCNPP Fire Engine 171 will be equipment with portable equipment that can aid in debris removal. However, the site lacks tracked or wheeled vehicles of sufficient capacity to remove the possible debris generated during a BDBEE.

(Open Item: Purchase one wheeled and one tracked vehicle with bucket/blade and grapple of sufficient size and load handling capacity to remove debris.)

(Open Item: Purchase the portable equipment needed to outfit CCNPP Fire Engine 171 for debris removal.)

<u>UHS Access</u>

Primary access to the UHS will match that used for B.5.b strategies. This access is via the openings in the CW Discharge Structure (plant outfall) located on the waterfront 10 ft. el. north of the Sewage Treatment Building. However, an alternate UHS location has not been established.

(Open Item: Implement a design change to install a protected alternate means of accessing the UHS for all BDBEEs, including installing necessary modifications to meet required deployment times. The

Safety Functions Support	
PWR Installed Equipment Phase 1	
strategy must also address how debris in the UHS will be filtered / strained and how the resulting debris will effect core cooling.) <u>Consumables</u> Station administrative procedure EP-1-108, Severe Weather Preparation (Reference 37) contains a limited amount of information regarding consumables for site personnel and augment staff personnel who may also be on site, however, it lacks a detailed inventory of consumables that should be stocked to support at least 24 hours of site operation independent of offsite support. **(Open Item: Purchase the consumables that should be stocked to support at least 24 hours of site operation independent of offsite support.)** **(Open Item: Provide a procedure governing the maintenance and distribution of the consumables that will be stocked to support at least 24 hours of site operation independent of offsite support.)** **(Open Item: Develop a strategy to protect onsite consumables for use after a BDBEE.)**	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
CCNPP will utilize the industry developed guidance from the PWROG, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
• Change Appendix R lighting from incandescent to LED to lengthen the duration of lighting available in vital areas of the plant. • Investigate changing Appendix R lighting batteries to a longer life battery or new battery technology to lengthen the duration of lighting available in vital areas of the plant. • Implement a design change to modify the Fixed Dedicated Satellite Phone System to provide protection from external hazards, and transmitter and antennas protected from seismic, wind, and wind-driven missiles, including back-up power supply capable of 24 hours operation for the system. • Implement a design change to modify the 800 MHz Radio System to provide protection from external hazards, transmitter and antennas protected from seismic, wind, and wind-driven missiles, including back-up power supply capable of 24 hours operation for the system and repeaters. • Implement a design change to install to a protected, backup power supply capable of 24 hrs of operation, for the Plant Public Address system. This includes backup power for the individual building speaker network amplifiers.	

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- Implement a design change to install a protected alternate means of accessing the UHS for all BDBEEs, including installing necessary modifications to meet required deployment times. The strategy must also address how debris in the UHS will be filtered/strained and how the resulting debris will affect core cooling.

Key Parameter	*List instrumentation credited for this coping evaluation phase.*

- Control Room temperature indication.
- Cable Spreading Room temperature.
- TDAFW Pump Room temperature.

Notes:

Identify analyses or actions:

- Perform an analysis to determine the Control Room temperature response over a period of 72 hours.
- Perform an analysis to confirm that TDAFW Pump room air temperature remains below 130°F over 72 hours of pump operation.
- Develop primary and alternate strategies for ventilating the TDAFW Pump Room.
- Perform an analysis to confirm the PMP event maximum flood height will not impact the operation of TDAFW or preclude access to the room.
- Perform an analysis to determine the possible effects of BDB external events on the Turbine Building structure and the potential effect on access to the TDAFW Pump Room.
- Develop an alternate access strategy for access into the TDAFW Pump Room.
- Perform an analysis to determine the temperature profile over 72 hours in the area around ADV enclosures.
- Perform an analysis to determine the Cable Spreading Room temperature response over a period of 72 hours.
- Change Appendix R lighting from incandescent to LED to lengthen the duration of lighting available in vital areas of the plant.
- Investigate changing Appendix R lighting batteries to a longer life battery or new battery technology to lengthen the duration of lighting available in vital areas of the plant.
- Procure battery operated hardhat mounted lights ("miners" lights) for on-shift and ERO personnel.
- Procure a sufficient quantity of hand-held battery operated hardhat lanterns for on-shift and ERO personnel.
- Procure six (6) portable diesel generator powered exterior lighting units with 30 ft. masts and a minimum 400,000 lumens.
- Implement a design change to install a protected, backup power supply capable of 24 hrs of operation, for the Plant Public Address system. This includes backup power for the individual building speaker network amplifiers.
- Implement a design change to modify the 800 MHz Radio System to provide protection from external hazards, transmitter and antennas protected from seismic, wind, and wind-driven missiles, including back-up power supply capable of 24 hours operation for the system and repeaters.

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PWR Installed Equipment Phase 1
• Implement a design change to modify the Fixed Dedicated Satellite Phone System to provide protection from external hazards, and transmitter and antennas protected from seismic, wind, and wind-driven missiles, including back-up power supply capable of 24 hours operation for the system. • Purchase one wheeled and one tracked vehicle with bucket/blade and grapple of sufficient size and load handling capacity to remove debris. • Purchase the portable equipment needed to outfit CCNPP Fire Engine 171 for debris removal. • Implement a design change to install a protected alternate means of accessing the UHS for all BDBEEs, including installing necessary modifications to meet required deployment times. The strategy must also address how debris in the UHS will be filtered / strained and how the resulting debris will effect core cooling. • Purchase the consumables that should be stocked to support at least 24 hours of site operation independent of offsite support. • Provide a procedure governing the maintenance and distribution of the consumables that will be stocked to support at least 24 hours of site operation independent of offsite support. • Develop a strategy to protect onsite consumables for use after a BDBEE.

Safety Functions Support

PWR 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 strategy(ies) utilized to achieve coping times.

Control Room Habitability

Primary Strategy

A Phase 2 strategy will be to leave the doors to the Control Room blocked open while running portable air circulation fans powered by small portable AC generators.

Alternate Strategy

Operating Instruction (OI) – 22F, Control Room and Cable Spreading Room Ventilation (Reference 30), Section 6.8 provides a procedure emergency operation of the Control Room and Cable Spreading Room Appendix R Ventilation System. However, the procedure requires power and cooling water sources in order to be successful. A modified version of this procedure as an FSG, with temporary power and cooling water appears feasible.

(Open Item: Develop strategies for use of the Control Room and Cable Spreading Room Appendix R Ventilation System during an ELAP.)

TDAFW Pump Room Habitability

Primary Strategy

The primary Phase 2 strategy will be to restore power to one of the two 480 VAC reactor motor control center (MCC) on each unit via a FLEX 480 VAC diesel generator connected to the MCCs associated vital 480 VAC Load Center. This will allow operation of one of the two TDAFW Pump Room emergency ventilation fans.

Alternative Strategy

The alternate Phase 2 strategy will be to setup a portable air circulation fan powered by a small portable AC generator to ventilate the TDAFW Pump Room.

Vital 125 VDC Station Battery Room Ventilation

During battery charging operations in Phase 2 and 3, ventilation is required in the Station Battery rooms due to hydrogen generation. The primary strategy is restore power to one of the two 480 VAC reactor motor control center (MCC) on each unit via a FLEX 480 VAC diesel generator connected to the MCCs associated vital 480 VAC Load Center. The alternate strategy is to prop open doors and set up portable fans to ventilate the rooms.

(Open Item: Perform an analysis to evaluate hydrogen buildup in the battery rooms during charging and the long term room temperature profiles.)

Safety Functions Support

PWR Portable Equipment Phase 2

Switchgear Rooms

For Phase 2, the vital 480 VAC/4160 VAC Switchgear Rooms containing the 480 VAC Load Centers will be begin to heat up after the load center is energized from the FLEX 480 VAC DGs; therefore, they will need to be evaluated for limiting temperatures for equipment survivability.

The calculations performed for the CCNPP Station Blackout (Reference 13), indicate that switchgear rooms rise to a maximum of 129°F (27 ft. el. Switchgear Room) and 127°F for the 45 ft. el. Switchgear Room at the end of a four hour coping period. These temperatures are beyond the design temperature of 104°F for the electrical equipment. The CCNPP Station Blackout Analysis evaluated the component specific temperature ratings of this equipment. Maximum rated temperatures ranged from 131°F to 176°F. These temperatures are well above the 4 hour SBO temperatures for the switchgear rooms. Under ELAP conditions, both Unit's vital 480 VAC Load Centers are de-energized at the onset of the ELAP and remain de-energized until Phase 2 when at least one (1) 480 VAC Load Center on each unit reenergized from the FLEX 480 VAC DGs. Therefore, in Phase 2 following the re-energization of the 480 VAC Load Centers from the FLEX 480 VAC DGs the rooms will begin to heat up and a coping period for the duration of Phase 2 must be considered.

(Open Item: Perform an analysis to determine the Switchgear Room temperature response under the above scenario and assuming various 480 VAC load center and 4160 VAC bus loadings over a period of 72 hours.)

Spent Fuel Pool Area Venting

Per the NEI 12-06 guidance, a baseline capability for Spent Fuel Cooling is to provide a vent pathway for steam and condensate from the SFP. A cross-area air flow path on the 69 ft. el. can be established by opening the doors to the Auxiliary Building Supply Ventilation air plenum, open the northeast door from the SFP Area to the Unit 1 containment access area, open the door to the Unit 1 Main Vent Fan room, and then open the hatch on the Unit 1 Main Ventilation Exhaust System plenum. This should create a draft path for air flow.

(Open Item: Perform an analysis to verify the above strategy will provide sufficient air flow to vent steam from the SFP Area.)

Fuel Oil and Fuel Oil Transfer

CCNPP has a minimum total of 128,580 gallons of diesel fuel oil stored in fully protected, seismic Class 1 plant structures. This total is the combined Technical Specification minimum levels of 21 Fuel Oil Storage Tank (FOST), 1A DG FOST, and 1A, 1B, 2A, and 2B DG Day Tanks. All of these tanks are located inside of seismic Class 1 re-enforced concrete structures. However, the sulfur content of this diesel fuel oil is well above the maximum recommended by the manufacturers of the diesel engines for the FLEX pumps and generators. The recommended maximum sulfur content in the diesel fuel oil for these machines is 15 ppm. The sulfur content in the tanks described above is 400 ppm. This sulfur level is slowly lowering as new diesel fuel oil is added to the tanks, however it will take many years before the sulfur content is < 15 ppm.

(Open Item: Evaluate the cost of draining 21 FOST and 1A DG FOST and refilling with low sulfur diesel fuel oil.)

(Open Item: Implement a design change to install dedicated FLEX hose connections on 21 FOST, 1A

Safety Functions Support

PWR Portable Equipment Phase 2

DG FOST, and the 1B, 2A, and 2B DG fuel oil Y-strainers.)

The CCNPP Transportation Center located outside of the PA just south of the Outside Building Complex has a buried 4,000 gallon diesel fuel oil tank that will be used on an interim basis for fueling the FLEX pumps, generators, and air compressors. This diesel fuel oil storage tank is refilled when stored volume reaches 2,000 gallons. The turnover rate of this fuel is such that a low sulfur content of $\leq$ 15 ppm is maintained. **(Open Item: Provide a permanent, fully protected diesel fuel oil storage tank for refueling the FLEX diesel-driven equipment.)**

The fleet standard FLEX pump diesel engine has a 190 gallon fuel tank. Fuel consumption rate at maximum horse power is 13.4 gallons per hour. The onboard fuel tank has sufficient fuel capacity for over 12 hours of operation.

The FLEX 100 KW, 125 KVA Cummins Power Generation diesel generator has a 180 gallon fuel tank. Fuel consumption at maximum generator load is 8.2 gallons per hour. The onboard fuel tank has sufficient fuel capacity for over 20 hours of operation.

Fuel Truck
CCNPP has purchased a 2800 gallon fuel oil tanker truck for transport of diesel fuel oil to the FLEX portable equipment. Additionally, two (2) gasoline powered fuel oil transfer pumps and hoses have been purchased for transfer of fuel oil from the identified protected storage locations to the fuel oil tanker truck.

(Open Item: Perform an analysis of the fuel consumption rate for all of the FLEX equipment that could be in operation during an ELAP for a period of 72 hours to determine a conservative refueling interval.)

(Open Item: Develop strategies to reduce the transport time for fuel oil loading and delivery.)

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*

CCNPP will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

Identify modifications	*List modifications*

- Install a permanent, fully protected diesel fuel oil storage tank for refueling the FLEX diesel-driven equipment.
- Install fuel transfer pump hose connection at 21 Fuel Oil Storage Tank (FOST) either 6" or 3" header, 1A Fuel Oil Storage Tank (FOST), and at 1B, 2A, and 2B DG Fuel Oil Y-Strainers

Safety Functions Support	
PWR Portable Equipment Phase 2	
Key Parameter	*List instrumentation credited for this coping evaluation phase.*
Phase 2 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP. **(Open Item: Develop equipment operating procedures or FSGs, considering vendor technical manual operating procedures, for each of the pieces of portable FLEX equipment that will be procured.)**	
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be installed seismically or protected in structures that are seismically qualified. FLEX equipment will be stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be stored in storage structures designed and constructed to meet the requirements of NEI 12-06.	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be stored in storage buildings designed and protected for storms and high winds in accordance with NEI 12-06.	
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be stored in storage buildings designed and protected for snow, ice, and extreme cold in accordance with NEI 12-06.	
High Temperatures	*List how equipment is protected or schedule to protect*
New equipment used to support the Safety Functions will be stored in storage buildings designed and protected for high temperatures in accordance with NEI 12-06.	

Deployment Conceptual Design (Att. 5-1 and 5-2 contain 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*
Permanent storage location and structure have not yet been decided. See Att. 5-1 for the interim storage location and Att. 5-2 for the proposed permanent storage location. Att. 5-1 and 5-2 identify primary and alternate deployment pathways to transport FLEX equipment.	No deployment modifications have been identified to date.	• Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically "'rugged" structure. • New FLEX piping shall be installed to meet necessary seismic requirements.

Notes:

Identify analyses or actions:

- Develop strategies for use of the Control Room and Cable Spreading Room Appendix R Ventilation System during an ELAP.
- Perform an analysis to evaluate hydrogen buildup in the battery rooms during charging and the long term room temperature profiles.
- Perform an analysis to determine the Switchgear Room temperature response following the re-energizing of buses and assuming various 480 VAC load center and 4160 VAC bus loadings over a period of 72 hours.
- Perform an analysis to verify the assumed SFP Area ventilation strategy will provide sufficient air flow to vent steam from the area.
- Perform an analysis of the fuel consumption rate for all of the FLEX equipment that could be in operation during an ELAP for a period of 72 hours to determine a conservative refueling interval.
- Evaluate the cost of draining 21 FOST and 1A DG FOST and refilling with low sulfur diesel fuel oil.
- Implement a design change to install dedicated FLEX hose connections on 21 FOST, 1A DG FOST, and the 1B, 2A, and 2B DG fuel oil Y-strainers.
- Provide a permanent, fully protected diesel fuel oil storage tank for refueling the FLEX diesel-driven equipment.
- Develop strategies to reduce the transport time for fuel oil loading and delivery.
- Develop equipment operating procedures or FSGs, considering vendor technical manual operating procedures, for each of the pieces of portable FLEX equipment that will be procured.

Safety Functions Support

PWR 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 strategy(ies) utilized to achieve coping times.

The CCNPP Phase 3 strategy for portable equipment is to continue the strategies of Phase 2 and maintain the operation of the portable FLEX equipment. As RRC equipment arrives, deployed, and connected, then Safety Function maintenance and support will be transferred to those systems. **(Open Item: Install connection points on Class 1E 4KV Buses for the RRC 4KV portable DG.)**

Control Room Habitability

Primary Strategy

The primary strategy for cooling the Control Room is the same in Phase 3 as for Phase 2.

Alternative Strategy

Repower the Control Room HVAC (CREVS) System chillers and air handling units from their associated 480 VAC MCCs, 480 VAC Load Centers and 4160 VAC vital bus if it has been energized by one of the RRC FLEX 4160 VAC DG.

ECCS Room Habitability

As part of Phase 3 strategies, a LPSI or CS Pump is placed into service in order to establish SDC. This will result in heat-up of the associated ECCS Pump Room due to the heat generated by the 4KV motors, as well as, heat dissipated from the associated piping and RHR heat exchanger. Placing SDC in service will require the SW system to be in service which is the cooling medium for the ECCS Pump Room Air Coolers. When the vital 480 VAC reactor MCCs are re-energized then power will be available to operate the ECCS Pump Room Air Cooler fans.

Other Support Requirements

Other areas of support required in Phase 3 are the same as described in the Phase 2 section of Safety Function Support.

Details:

Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
CCNPP will need to develop procedures needed for implementation of Phase 3 strategies. **(Open Item: Develop procedures or FSG for each of the RRC based strategies and for operation of the equipment provided by the RRC.)**	
Identify modifications	*List modifications*

- Install connection points on Class 1E 4KV Buses for the RRC 4KV portable DG.

Safety Functions Support		
PWR Portable Equipment Phase 3		
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.*	
Phase 3 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.		
Deployment Conceptual Design (Att. 5-1, 5-2, and 12-1 contain 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*
Phase 3 equipment will be provided by the RRC. Equipment transported to the site will be either immediately staged at the point of use location (pumps and generators) or temporarily stored at the proposed lay down areas shown on Att. 12-1 until moved to the point of use area. Att. 5-1 and 5-2 identify primary and alternate deployment pathways to transport FLEX equipment.	No deployment modifications have been identified.	• Plant piping and valves for FLEX connections will be missile protected and enclosed within a Seismic Category 1 or seismically "'rugged" structure. • New FLEX piping shall be installed to meet necessary seismic requirements.

Notes:

Identify analyses or actions:

- Develop procedures or FSG for each of the RRC based strategies and for operation of the equipment provided by the RRC.
- Install connection points on Class 1E 4KV Buses for the RRC 4KV portable DG.

Table 1:
PWR Portable Equipment Phase 2

Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment [(1)]	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Three (3) FLEX Pumps	**X**		**X**			300 gpm, 220 psig Diesel fuel and required hoses	Will follow EPRI template requirements
Two (2) Pickup Trucks					**X**		Will follow EPRI template requirements
Two (2) Portable Air Compressors – Diesel	**X**					100 psig, 185 CFM	Will follow EPRI template requirements
Two (2) 480VAC Diesel Generators	**X**					125 KVA	Will follow EPRI template requirements
Two (2) 480VAC Diesel Generators	**X**	**X**		**X**		675 KVA Cables – 3-400 MCM per Phase.	Will follow EPRI template requirements
Three (3) 14' x 7' Enclosed Trailers	**X**		**X**		**X**	Means to store and transport hoses, strainers, cables, and miscellaneous equipment.	Will follow EPRI template requirements
Fuel Oil Tanker Truck					**X**	2800 gallons	Will follow EPRI template requirements
Two (2) Fuel Oil Transfer Pumps					**X**		Will follow EPRI template requirements

Table 1:
PWR Portable Equipment Phase 2

Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment [(1)]	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Two (2) Monitor Spray Nozzles for SFP Spray and required hoses			**X**			Sized for 250 gpm	Will follow EPRI template requirements

Notes:

(1) The number of storage locations has not been determined. See General Integrated Plan Elements for discussion.

Table 2: PWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Two (2) FLEX Pumps	**X**					500 gpm minimum, 500 psi max.	S/G Make-up
Two (2) Medium Load 480 VAC Diesel Generators	**X**	**X**	**X**	**X**		750 KW, 937 KVA	To restore 480 VAC load centers
Two (2) Small Load 480 VAC Diesel Generators	**X**	**X**	**X**	**X**		250 KW, 312 KVA	To restore battery chargers
Six (6) Small Load 480 VAC Diesel Generators					**X**	5 KVA	To restore lighting and computers
One (1) 4160VAC Diesel Generators					**X**	2MW, 2500 KVA	Restore admin building power
Four (4) 4160VAC Diesel Generators	**X**	**X**	**X**	**X**		2MW, 2500 KVA	To restore one (1) vital 4KV bus on each unit
Two (2) sets of Suction hoses and strainers,	**X**	**X**	**X**			N/A	Discharge hoses shall fit on FLEX Pump and connect to RHRSW manifold at the intake

Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
5" discharge hoses, and fittings							structure.
Two (2)sets of Cables for connecting portable generators	X			X	X	N/A	Supply as required
Six (6) Portable ventilation fans	X	X	X	X		N/A	Supply as required
Two (2) Diesel Generator fuel transfer pump and hoses	X	X	X	X		N/A	Supply as required. To ensure transfer capability of site fuel to portable equipment
Two(2) FLEX high pressure Pumps	X					60 gpm, 1000 - 3000 psi	RCS inventory makeup and boration
One (1) FLEX Pump			X			500 gpm, 500 psi max	SFP Make-up
One (2) FLEX Pump		X				2500 gpm, 300 psi max	Containment Spray
Two (2) FLEX Pumps	X					2500 gpm, 300 psi max	CST Make-up
Two (2) Dewatering Pump					X	5000 gpm, 150 psi max	Supply as required
Ten (10) Submersible Dewatering Pumps					X	400 gpm, 110 psi max	

Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
Two (2) FLEX air compressors	**X**	**X**				2000 SCFM, 90 -110 psi	Restore IA
Four (4) Large Ventilation Fans				**X**		500 cfm	Battery Room ventilation
One (1) Make-up DI Water Trailer	**X**		**X**			200 gpm	
One (1) Well Water Pump	**X**		**X**			100 gpm, 640 ft	
Eight (8) Water Retention Bladders	**X**					5,000 gallons each	Storage of contaminated water

Table 3: Phase 3 Response Equipment/Commodities

Item	Notes
Radiation Protection Equipment • Survey instruments • Dosimetry • Off-site monitoring/sampling	
Commodities • Food • Potable water	MREs - Three meals per day per person for 7 days (500), Microwavable - Three meals per day per person for 7 days (500), Water – 500ml bottles, 3 per person per day for 7 days (500)
Fuel Requirements • Diesel Fuel • Gasoline	Portable battery powered 5 gpm gasoline transfer pump
Heavy Equipment • Transportation equipment • Debris clearing equipment	Two (2) 4WD diesel tow vehicles. RAM 2500 or equivalent with onboard DFO transfer pump. Two (2) Debris Removal Vehicle – One (1) Bobcat S130 or equivalent, one (1) Bobcat T180 or equivalent with grapple bucket.
Portable Lighting	Six (6) Exterior Lighting Units with Integral DG, 30 ft., 400,000 lumens, 10 boxes each of size AA, C, and D flashlight batteries.
Portable Toilets	

Attachment 1-1A:
Sequence of Events Timeline

Action item	**Elapsed Time**	**Action**	**Time Constraint Y/N** [5]	**Remarks / Applicability**
	0	**Event Starts**	NA	Plant @100% power
1	1 min	Implement EOP-0, Standard Post Trip Actions to stabilize plant in hot standby	N	Stabilize plant at 532°F and 2250 psia
2	≤ 10 min	TDAFW Pump begins to deliver flow to S/Gs	N	Original design bases
3	≤ 15 min	SBO EDG fails to start	N	Fails when attempted to start per EOP-0. ELAP determination assumption.
4	≤ 15 min	EOP -7, Station Blackout entered	N	Per EOP-0 Diagnostic Flow Chart
5	≤ 30 min	The Plant Computer and its associated inverter, 1/2Y05A, and 1INV1T11 (Unit 1 only, MK VI Turbine Controls Inverter) must be shed from the DC buses.	Y	Per EOP-7 Technical Bases
6	≤ 30 min	Open the Control Room panel bench board lower front covers. Remove the front and back covers of the Control Room DG Control Consoles.	Y	Per EOP-7 Technical Basis and NUMARC 87-00
7	1 hr	Shift Manager declares ELAP. Begin non-vital DC load shedding, direct deployment of portable diesel-driven alternate AFW Pp, Prepare for RCS cooldown.	Y	Deploy diesel-driven alternate AFW Pp as soon as it safe to do so with goal of ≤ 1 additional hr to connect and ready to run from time of order to deploy. PWROG FLEX Core Team Recommendation.

[5] Instructions: Provide justification if No or NA is selected in the remark column
If yes include technical basis discussion as requires by NEI 12-06 section 3.2.1.7

Action item	Elapsed Time	Action	Time Constraint Y/N [5]	Remarks / Applicability
8	1 hr	Lower Main Generator hydrogen pressure to 2 PSIG, then secure the EMERG H2 SEAL OIL PP.	N	Reduces load draw on 250 VDC battery which could be used to supplement vital DC instrument buses
9	2 hr	Start plant cooldown to RCS cold leg temperature of 350°F at 75°F / hour	Y	WCAP-17601 recommendation
10	2 hr	Complete non-vital DC load shedding	Y	Required to extend battery life > 4 hours. Per CCN0012-17-STUDY-001
11	2 hr	Portable diesel-driven alternate AFW Pp deployed	N	WCAP-17601 recommendation
12	4 hr	Open Control Room doors and place portable fan (s) in operation	N	Per CCNPP SBO Analysis, Control Room could reach 103°F at 4 hrs
13	~ 6 hr	Stabilize RCS cold leg temperature > 350°F. Safety Injection Tanks (SIT) begin to inject	Y	WCAP-17601
14	7 hr	Deploy and connect 12 CST makeup strategy equipment/hoses	Y	Connected and ready to begin makeup by 10 hrs. Consistent with CCNPP calculation CA03767
15	7 hr	Deploy and connect large 480V portable DG to 1 vital load center per unit.	Y	Need to be connected and ready for use by 11 hrs.
16	~10 hr	Commence alternate water source makeup to 12 CST	Y	Consistent with CCNPP calculation CA03767. Per EOP-7, commence makeup at 5 ft. Reference EOP Attachments, Att. 9
17	~11 hr	Energize 1 vital 480V load center per unit. Startup associated battery chargers.	Y	Per CCN0012-17-STUDY-001
18	~12 hr	If needed, start charging and boration on both units.	N	WCAP-17601
19	12 – 24 hrs	Maintain RCS at > 350°F, S/G pressure at 120 psia via natural circ RCS flow, TDAFW, and ADVs	N	WCAP-17601
20	24 – 36 hrs	Transition from TDAFW Pp to Portable diesel-driven alternate AFW Pp	N	

Action item	Elapsed Time	Action	Time Constraint Y/N [5]	Remarks / Applicability
21	> 36 hrs	RRC equipment installed to recover one 1E 4KV bus per unit, one train of SW (UHS), and one train of SDC on each unit. Transition from portable diesel-driven alternate AFW Pp to SDC.	N	

Attachment 1-1B:
NSSS Significant Reference Analysis Deviation Table

Item	Parameter of interest	WCAP value	WCAP page	Plant applied value	Gap and discussion
5	RCP seal CBO flow	Isolate RCP seal CBO flow as early as possible	Section 3.2, page 3-11, Objective #1 Conclusion	Maintain RCP CBO flow	CCNPP has Sulzer RCR875B-3V RCP seals. Per EOP-7 Technical Basis and the RCP seal manufacturer (Sulzer), bleedoff flow is desired to maintain seal integrity. If bleedoff is completely isolated, the vapor seal is subjected to full RCS pressure. Though this seal is designed to withstand system pressure for a limited time, it remains a severe operating condition. If the vapor seal fails, excessive leakage would result.

Attachment 2-1: Milestone Schedule

The following milestone schedule is provided. The dates are planning dates subject to change as design and implementation details are developed. Any changes to the following target dates will be reflected in the subsequent 6 month status reports.

Original Target Date	Activity	Status *{Include date changes in this column}*
Oct. 2012	Submit 60 Day Status Report	Complete
Feb. 2013	Submit Overall Integrated Implementation Plan	
Aug 2013	Submit 6 Month Status Report	
Oct 2013	Develop Mods	
Nov 2013	Develop Strategies/Contract with RRC	
Jan 2014	Procure Equipment	
Jan 2014	Perform Staffing Analysis	
Feb. 2014	Submit 6 Month Status Report	
June 2014	Create Maintenance and Testing Procedures	
Aug. 2014	Submit 6 Month Status Report	
Sept. 2014	Procedure Changes Training Material Complete	
Nov 2014	Develop Training Plan	
Feb. 2015	Submit 6 Month Status Report	
Mar. 2015	Issue FSGs	
Apr 2015	Unit 2 Modification Implementation Outage *	
Jun 2015	Implement Training	
Aug. 2015	Submit 6 Month Status Report	
Feb. 2016	Submit 6 Month Status Report	
Apr 2016	Unit 1 Modification Implementation Outage*	
Aug. 2016	Submit 6 Month Status Report	
Dec 2016	Submit Completion Report	

*(Full compliance after second listed refueling outage)

Attachment 3-1:
References

1. CCNPP Units 1 and 2 Updated Final Safety Analysis Report, Revision 45, October 2, 2012
2. Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, NEI 12-06, Revision 0, August 2012
3. NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors
4. EOP-0-1/2, Post Trip Immediate Actions
5. EOP-7-1(2), Station Blackout
6. EOP-7, Station Blackout Technical Basis
7. CCN0012-17-STUDY-001, Analysis of Calvert Cliffs DC Systems in Support of INPO Event Report L1-11-4
8. WCAP-17601-P, Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering, and Babcox & Wilcox NSSS Designs, Revision 0, August 2012
9. Not Used
10. Not Used
11. AOP-3B-1(2), Abnormal Shutdown Cooling Conditions
12. Not Used
13. Calvert Cliffs Nuclear Power Plant, Baltimore Gas and Electric Company, Station Blackout Analysis, Revision 0, April 17, 1989
14. E-93-016, Revision 1
15. AOP-6F, Spent Fuel Pool Cooling System Malfunctions
16. Not Used
17. Not Used
18. Not Used
19. Not Used
20. Not Used
21. Not Used
22. Not Used
23. Constellation Energy Fleet review of Seismic Issues Related to GI-199, Stevenson & Associates, 11C4050-RPT-001, Revision 0, February 10, 2012
24. Not Used
25. AOP-3B-1(2), Attachment 9, Time to Start Boiling After Loss of SDC
26. Emergency Response Plan Implementing Procedure (ERPIP) – 611, Severe Accident Management Restorative Actions, Attachment 1, Alternate Water Sources.
27. Emergency Response Plan Implementing Procedure (ERPIP) – 612, Candidate High Level Actions SFP Uncovered, Attachment 4, Adding Makeup to the Spent Fuel Pool.
28. Emergency Response Plan Implementing Procedure (ERPIP) – 612, Candidate High Level Actions SFP Uncovered, Attachment 5, Providing Local Spray to the Spent Fuel Pool.

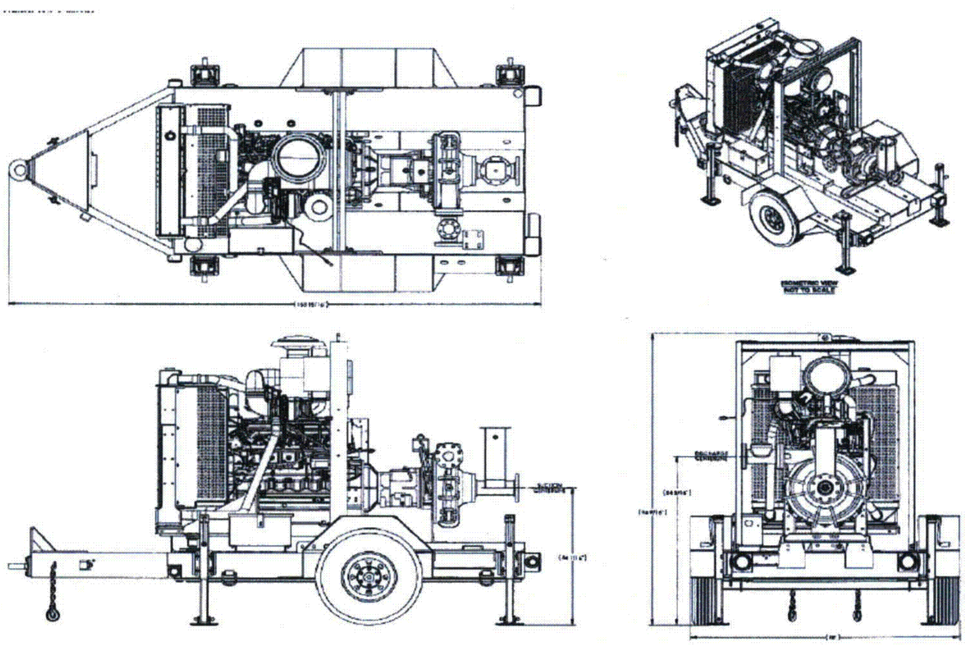
29. Engineering Calculation CA04467, AFW Pump Room Transient Temperature Analysis Under App. R/Non-LOOP, LOCA/LOOP, Appendix R Fire/LOOP and SBO Scenarios, Using Gothic Code, Revision 0001, July 25, 2003
30. Operating Instruction (OI) – 22F, Control Room and Cable Spreading Room Ventilation
31. ECP-11-000293 (Unit 1) and ECP-11-000294 (Unit 2), Install Permanent Battery Test Switches
32. Not Used
33. Not Used
34. NEOP-13, Figure Titled "Minimum Allowed RCS Temperature to Ensure 1% delta-ρ Shutdown vs. Burnup"
35. Operating Instruction (OI) – 25E, Fuel Transfer System
36. PA-PSC-0965, PWROG Core Cooling Position Paper. Revision 0, November 2012
37. Emergency Planning Procedure EP-1-108, Severe Weather Preparation

Attachment 4-1: Fleet Standard FLEX Pump Specifications

The CCNPP fleet standard pumps are assembled Power Prime systems units engineered by Rain for Rent, pump skid model # 3419MX. The three (3) key components consist of the driver John Deere diesel model # 6068HF485 driving a Cornell pump model # 3419MX mounted on a Power Prime trailer model # GP190.

The system is designed with the following key specifications:

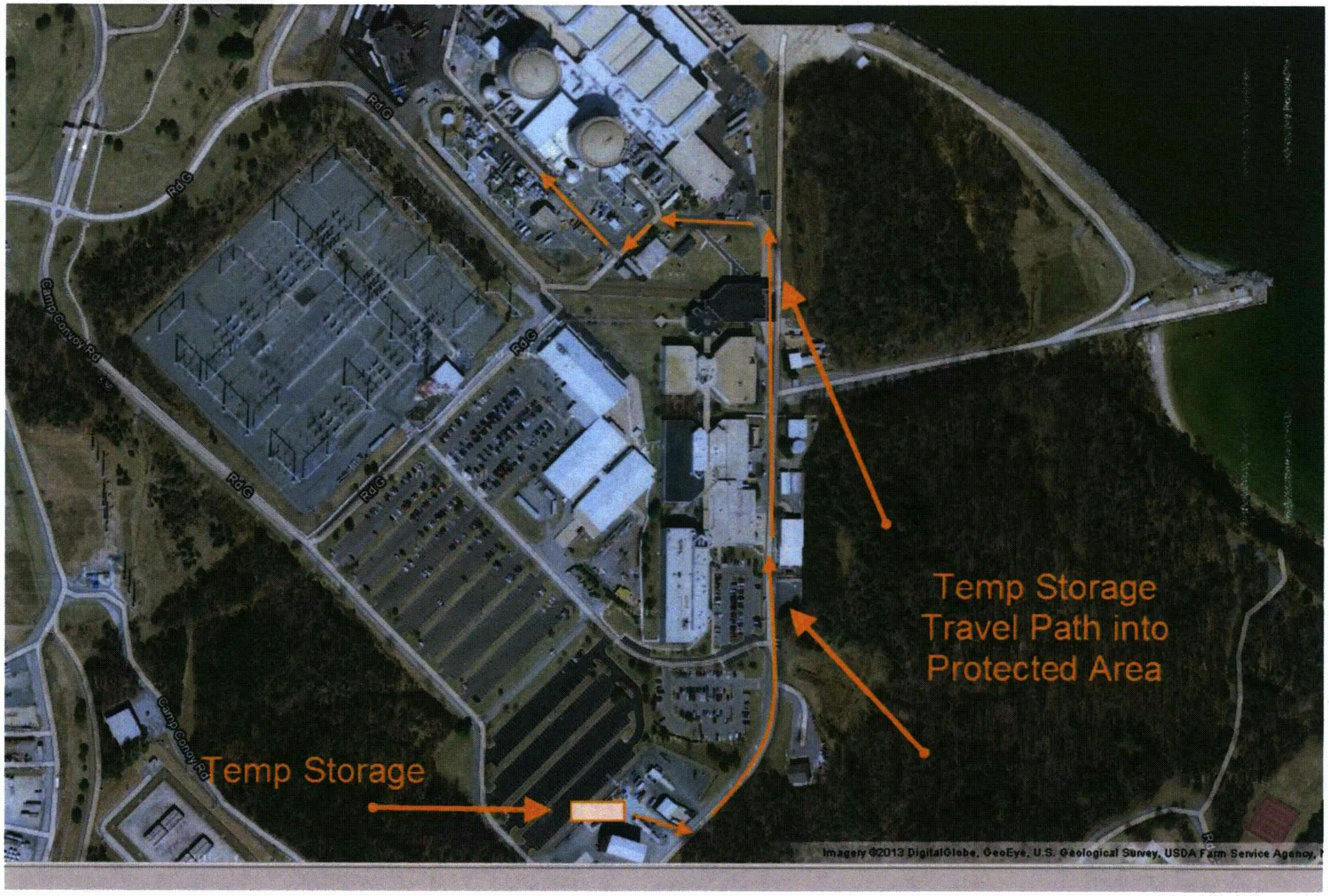
- MAX HP – 275hp
- MAX Flow- 770gpm
- TDH@ MAX Flow- 620f TDH
- MAX TDH- 840 TDH
- MAX RPM- 2400
- MAX Solids Pass- 0.7" Diameter
- MAX Suction Lift- 28f vertically
- 4" Suction/ 3" Discharge
- Fuel Consumption @MAX HP- 0.352lb/hp-hr
- Fuel Capacity- 190gal

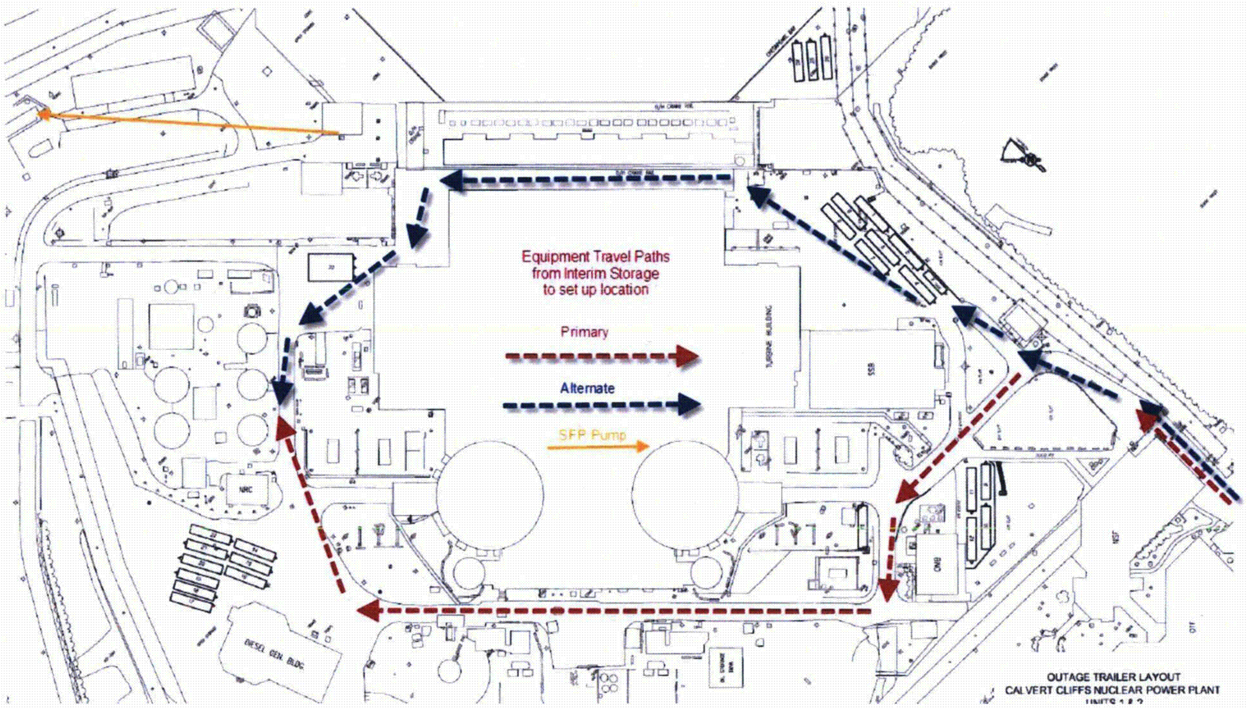


Attachment 4-2:
480 VAC FLEX Portable Generator Specifications

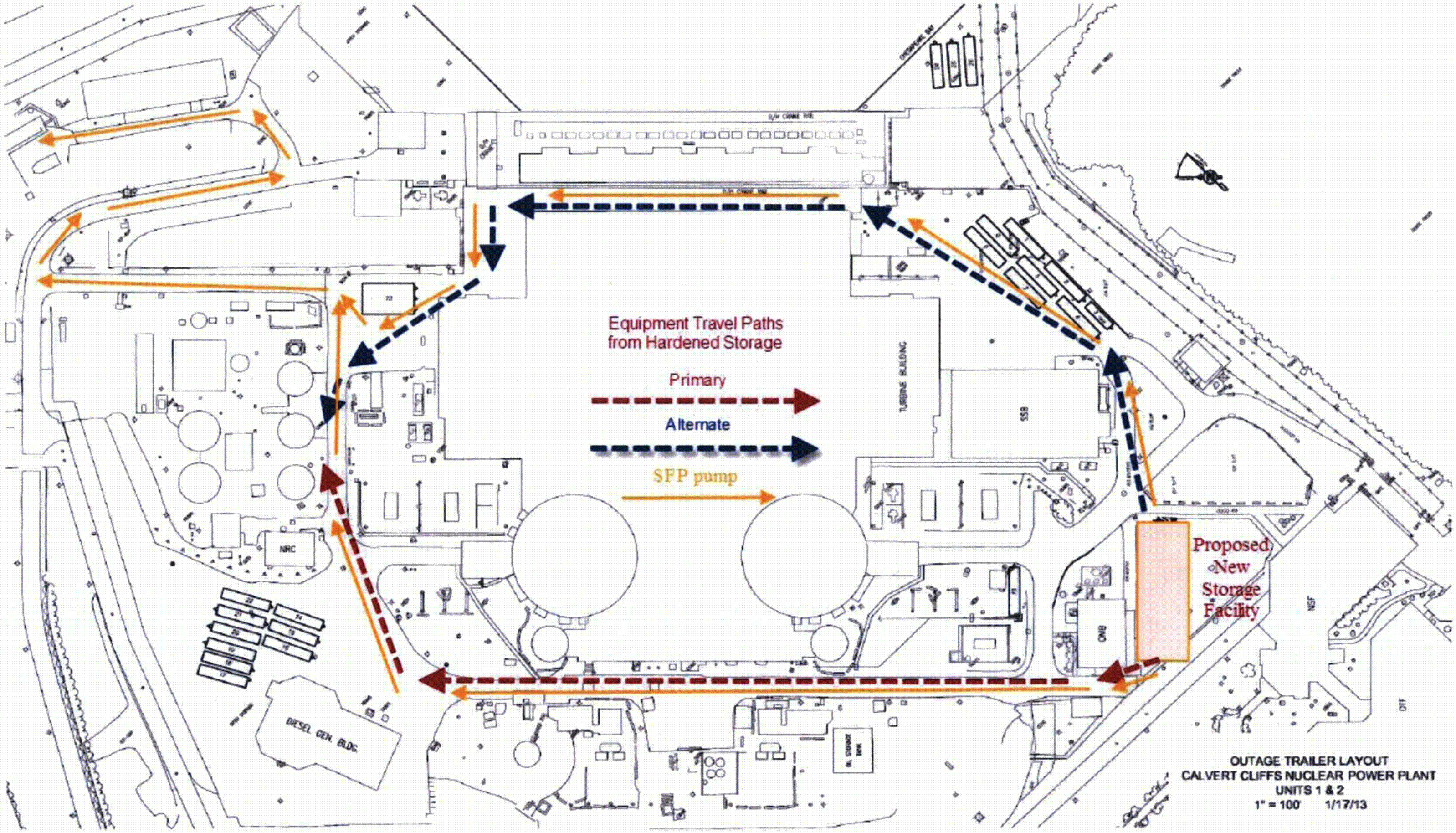
Manufacture: Cummings Power Systems, LLC
Model: C100D6RT 208/480v, 60 Hz, 100kW/125kVA
Engine Model: QSB5-G5, 4 cycle, inline, turbocharged, directed injected.
Trailer Model: C100D6RT
Fuel Consumption: 8.2gal/hr @ full load
Fuel Capacity: 160gal

Attachment 5-1:
Temporary FLEX Equipment Storage Site and Travel Path

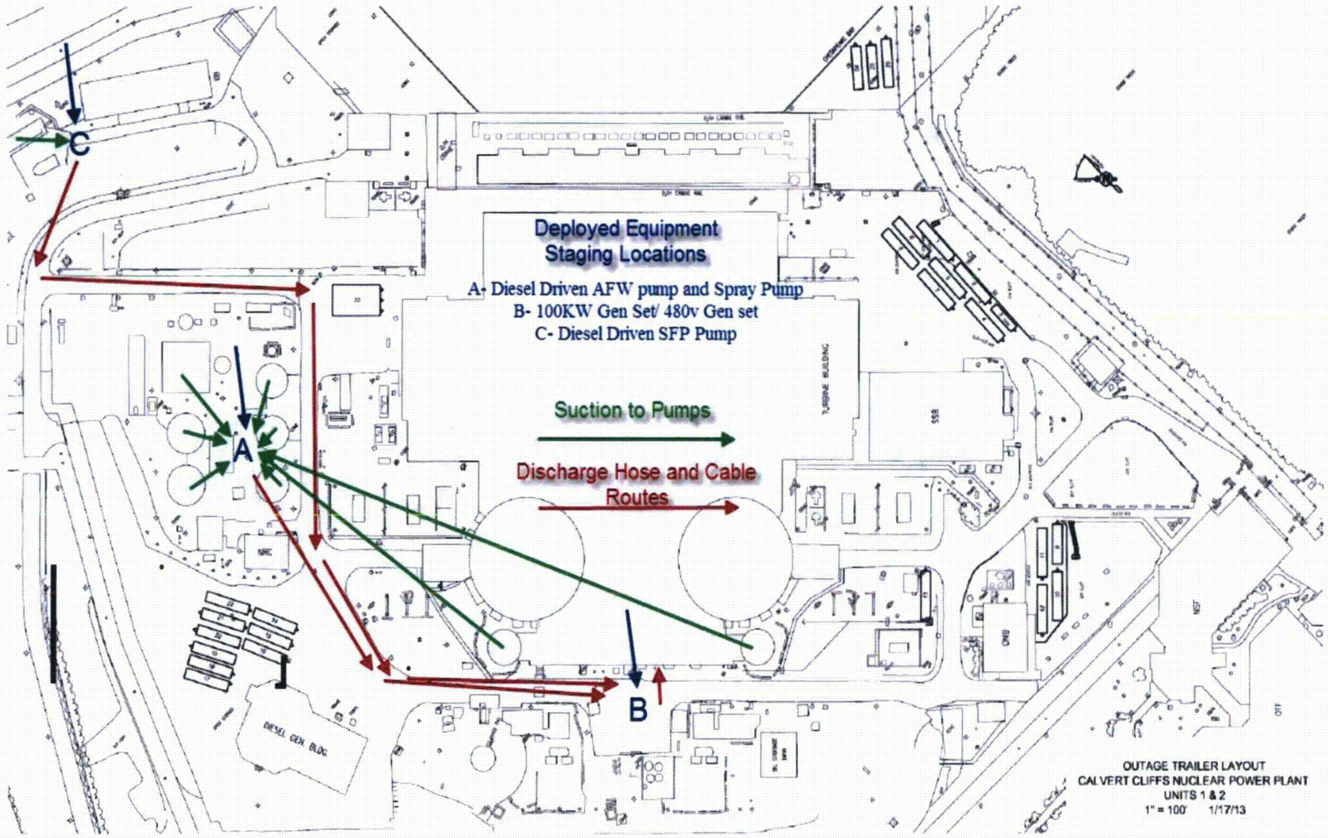



Equipment Travel Paths
from Interim Storage
to set up location
Primary
Alternate
SFP Pump
TURBINE BUILDING
DIESEL GEN. BLDG
OUTAGE TRAILER LAYOUT
CALVERT CLIFFS NUCLEAR POWER PLANT

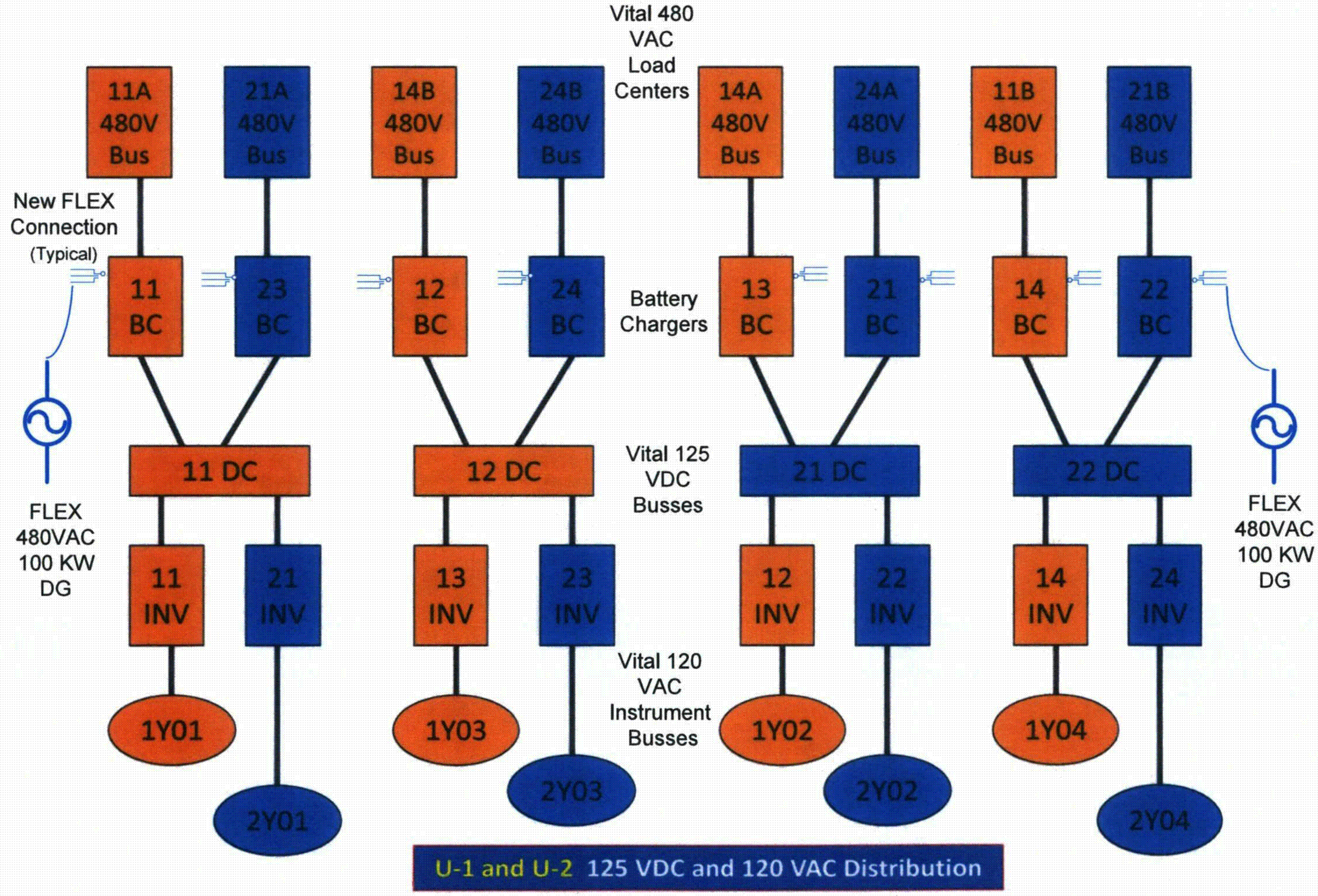
Attachment 5-2:
Proposed FLEX Storage Facility and Travel Paths



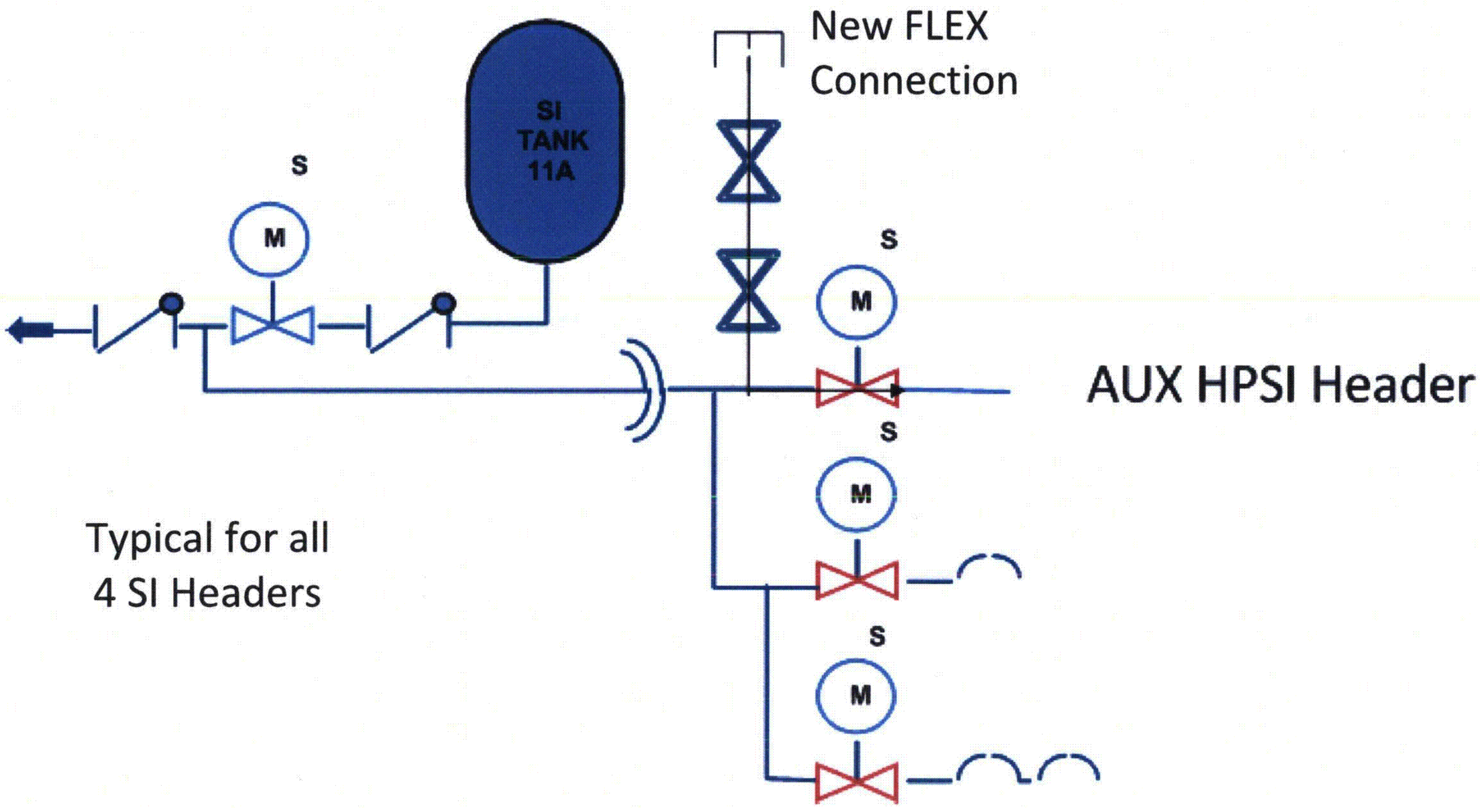
Deployed FLEX Staging Area



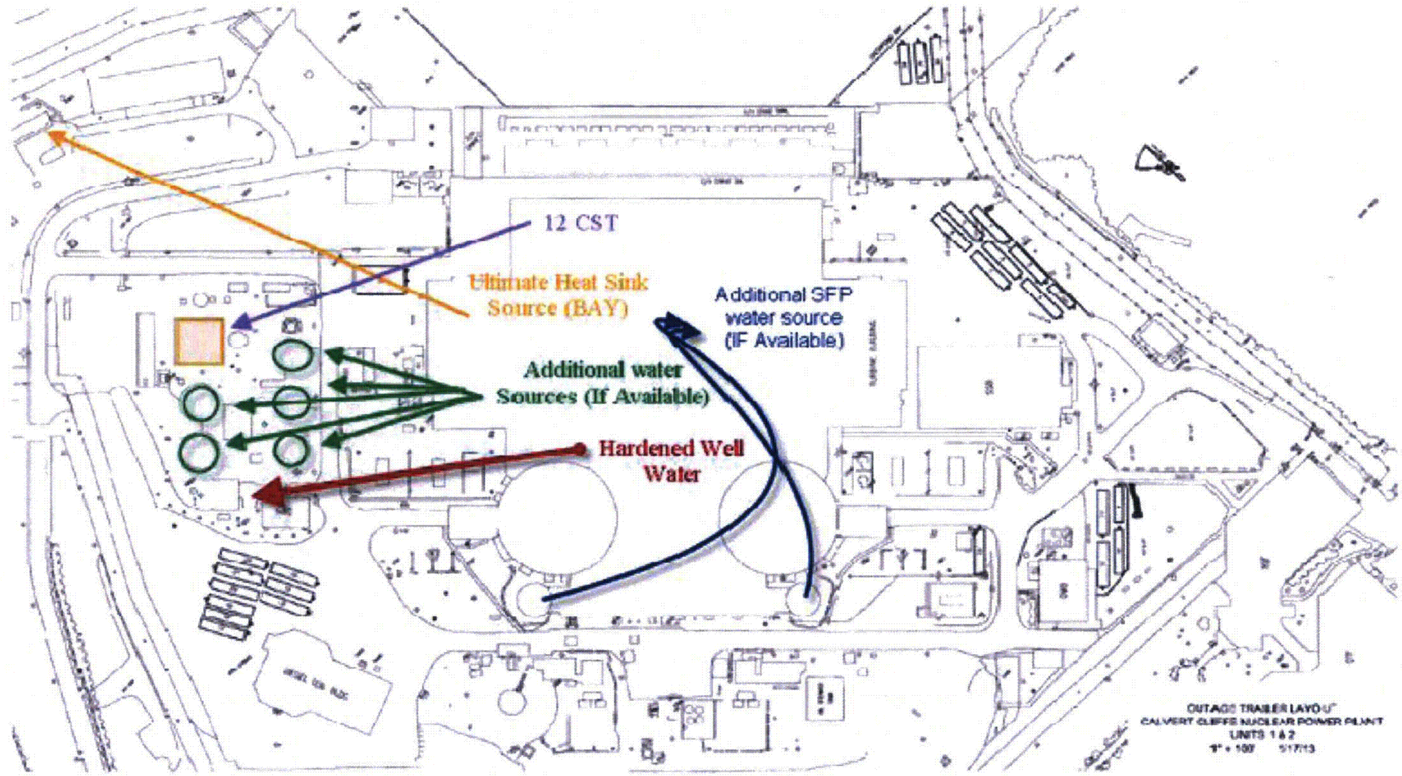
Attachment 6-1:
Vital 125 VDC Battery Chargers FLEX DG Connections



Attachment 7-1:
RCS Injection FLEX Connection



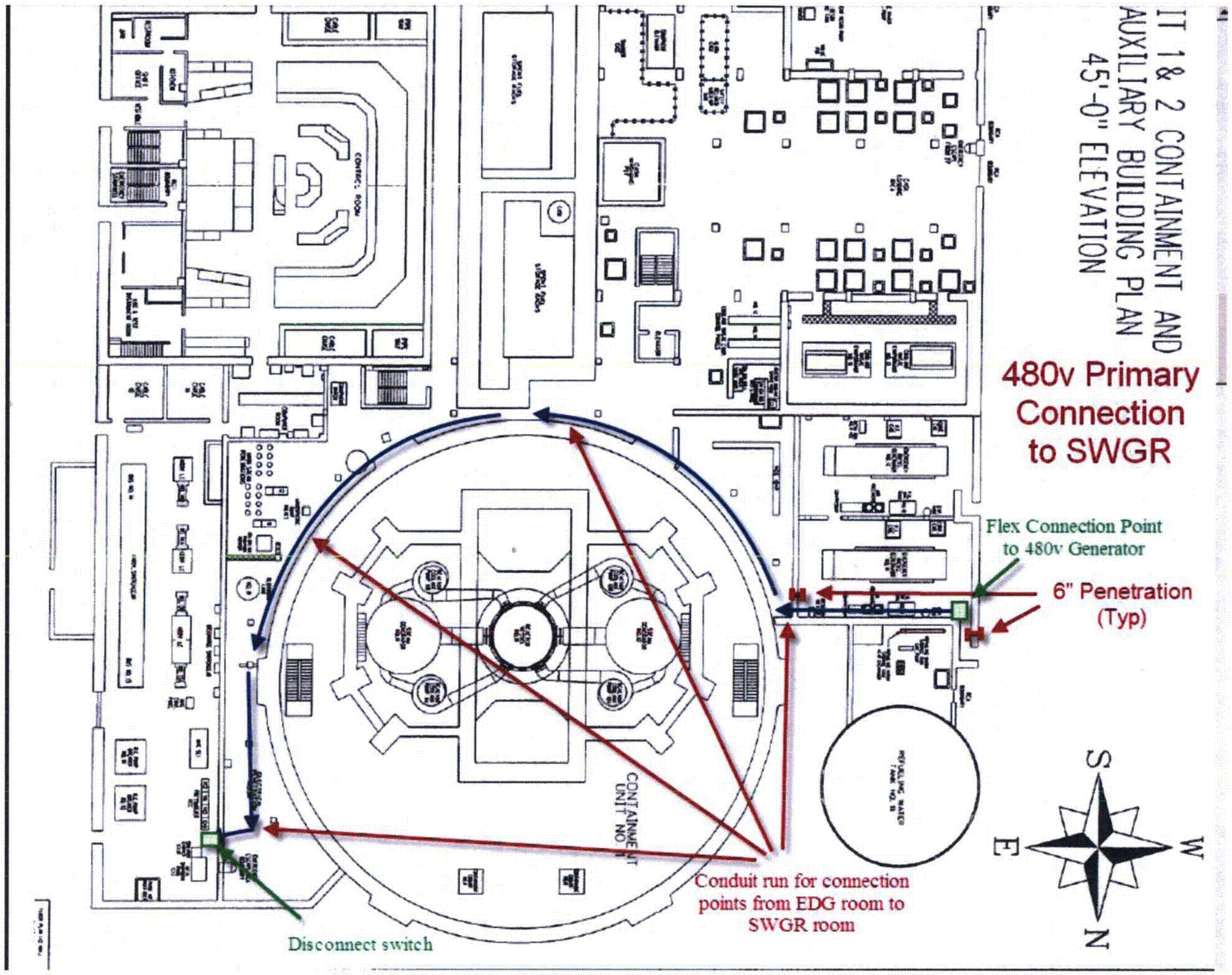
Attachment 8-1:
Water Sources Locations



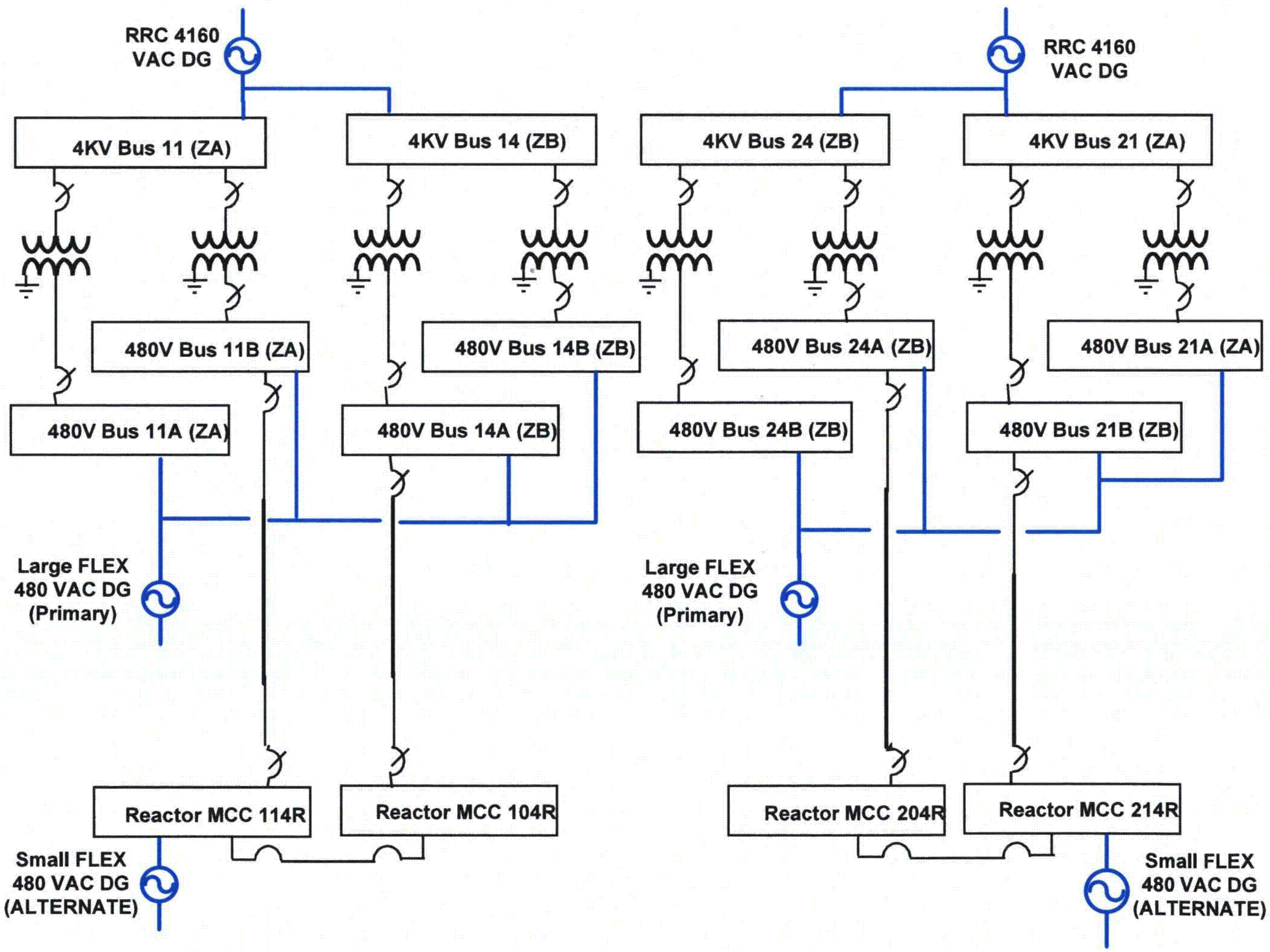
12 CST
12 Well
11 and 21 CSTs,
11 PWST

11 and 21 RWTs
UHS (Chesapeake Bay)
11 and 12 PTWSTs

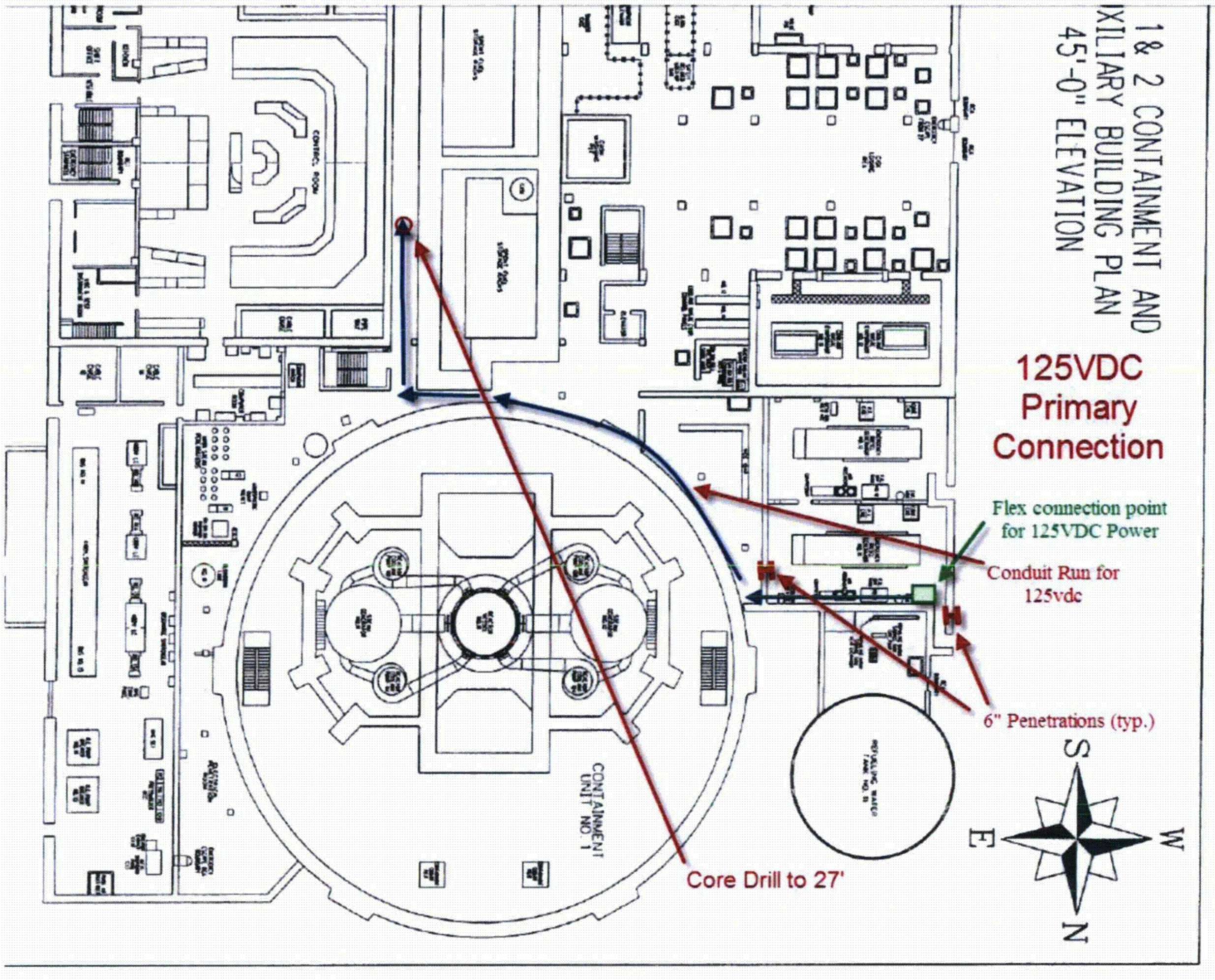
Attachment 9-1:
480VAC Load Center Connection (Primany)

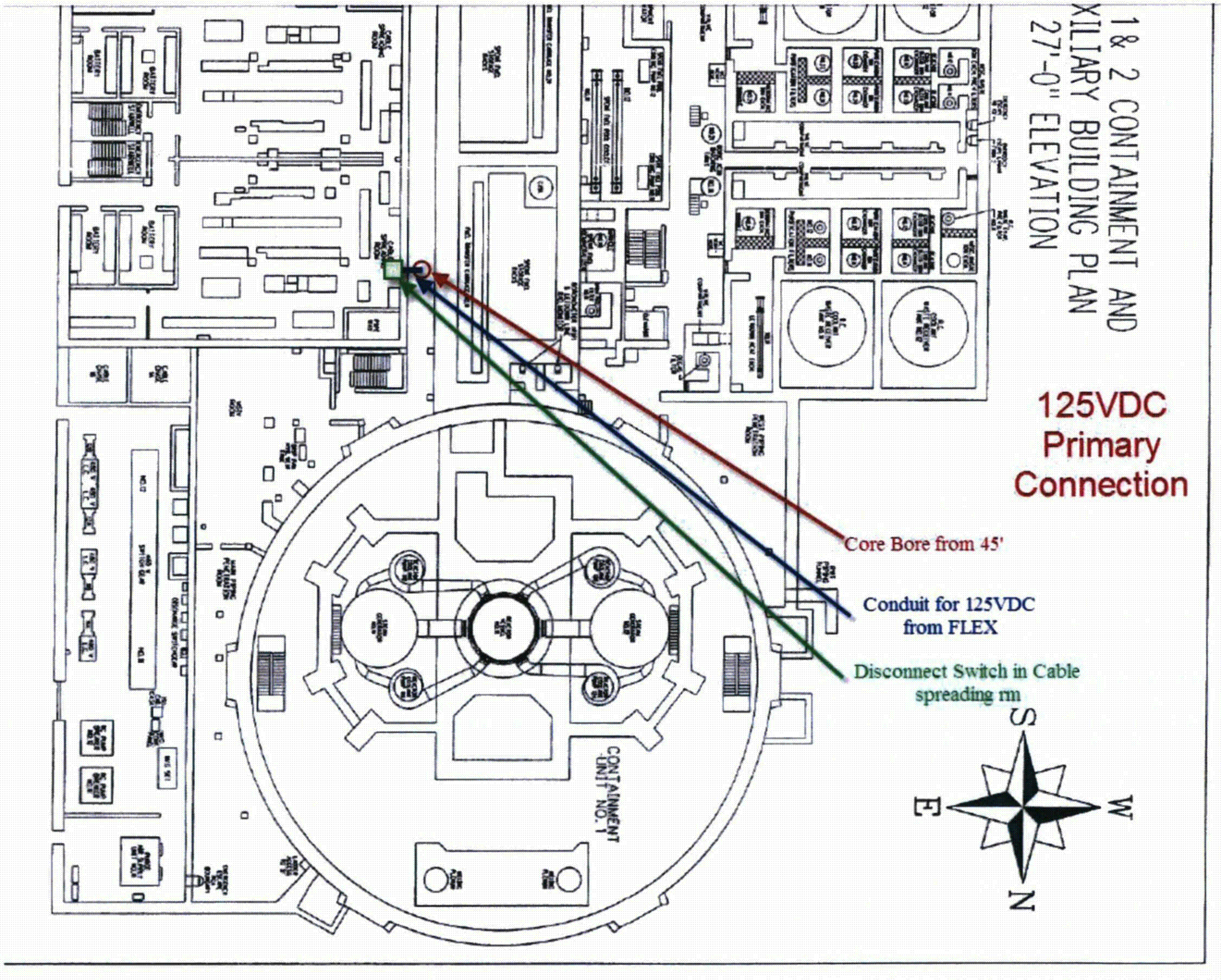


Attachment 9-2:
480VAC Connection to Vital 480 VAC Load Centers

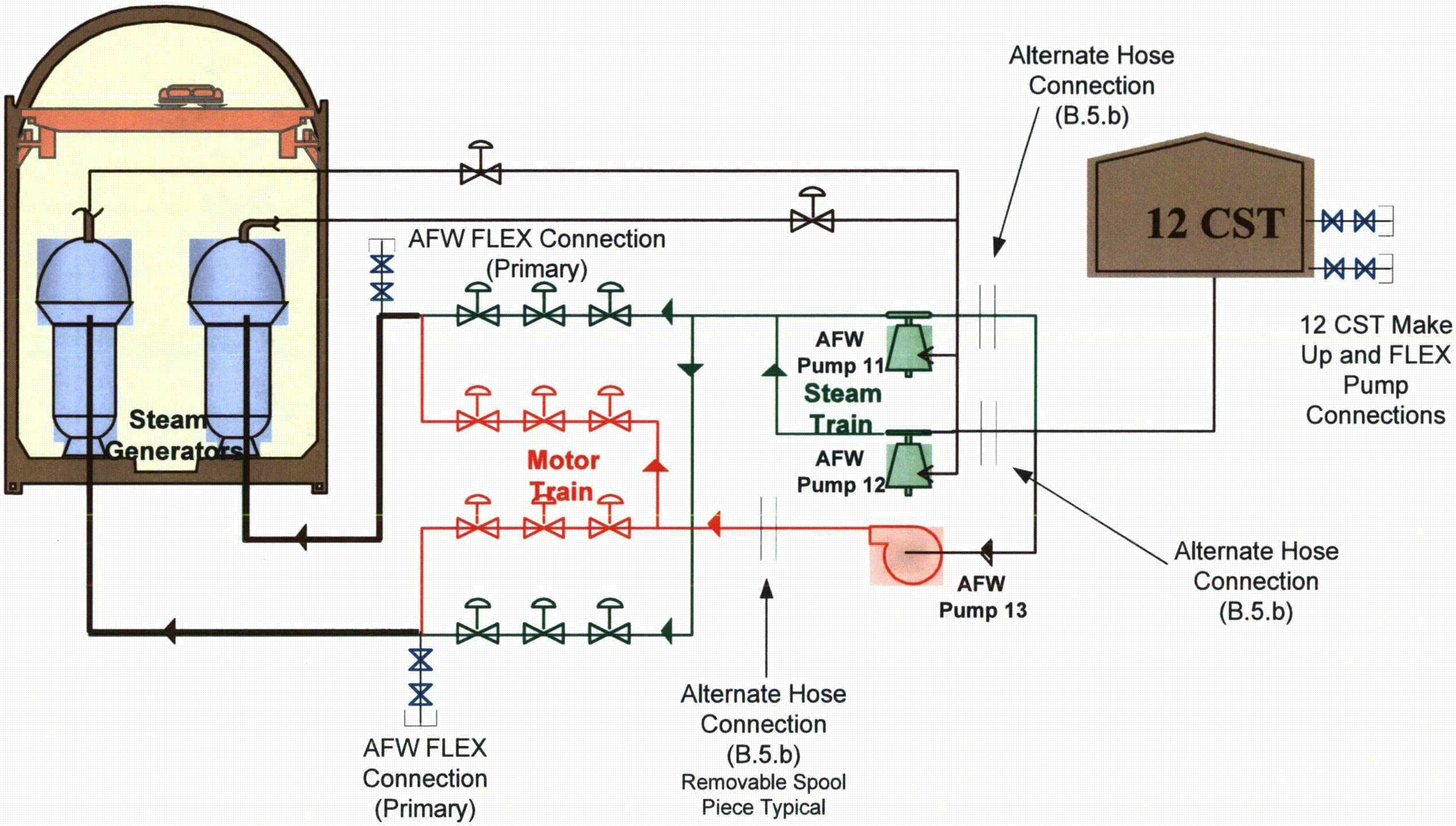


Attachment 10-1:
Vital 125VDC Battery Charger Connection (Alternate)

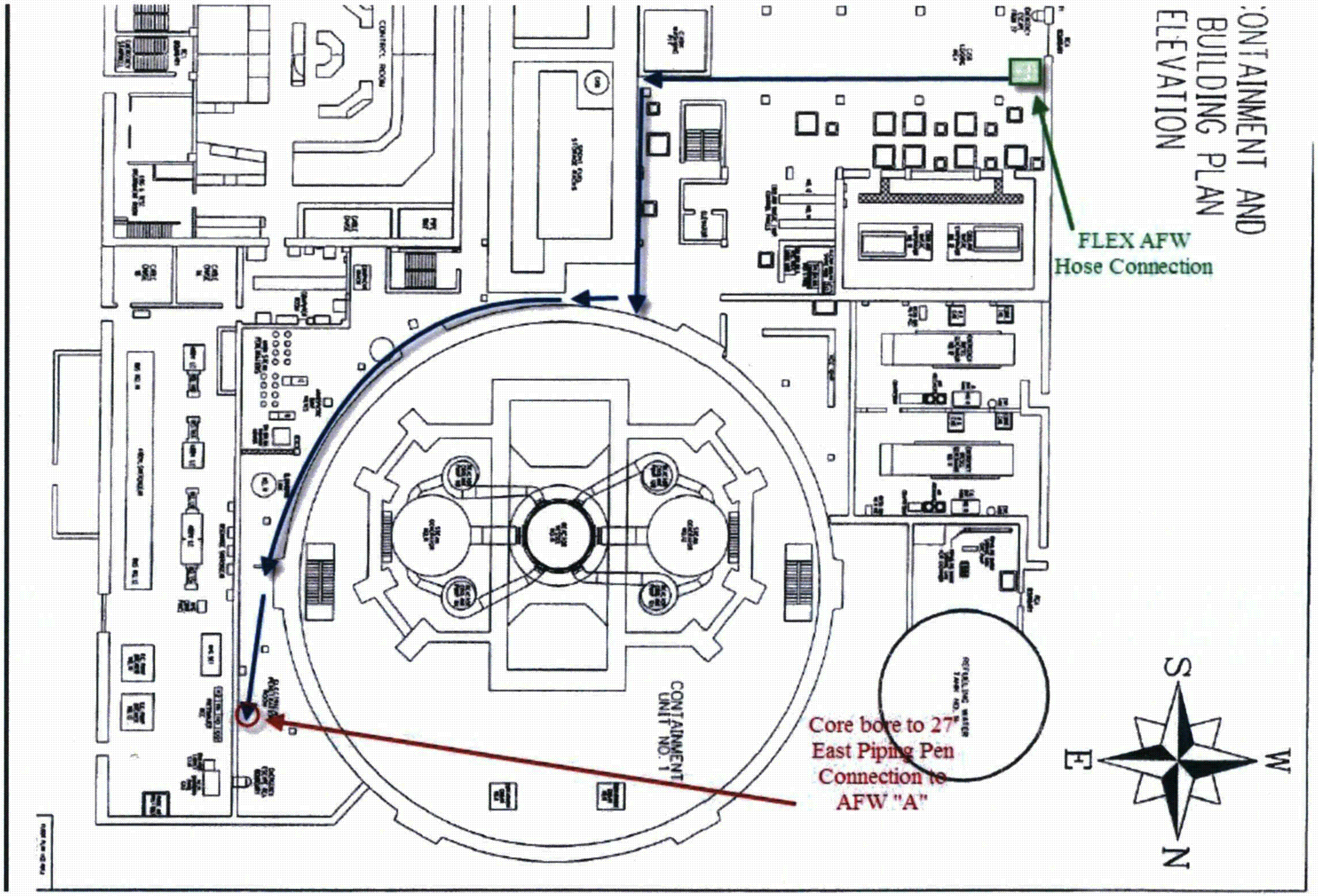



1 & 2 CONTAINMENT AND
XILIARY BUILDING PLAN
27'-0" ELEVATION
125VDC
Primary
Connection
Core Bore from 45'
Conduit for 125VDC
from FLEX
Disconnect Switch in Cable
spreading rm
CONTAINMENT
UNIT NO. 1
S
E
W
N

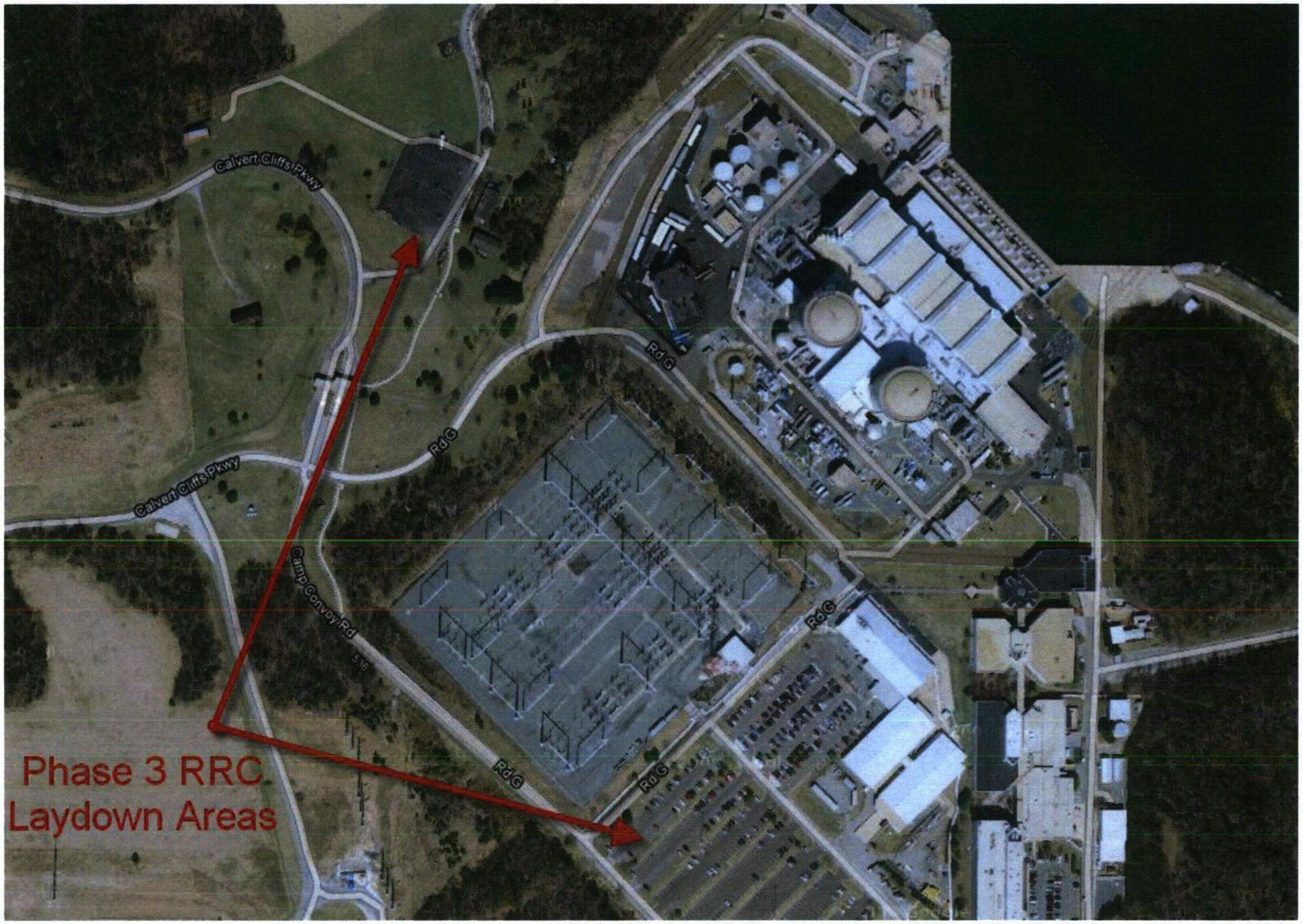
Attachment 11-1:
Auxiliary Feedwater FLEX Connection and Alternate Existing Connection



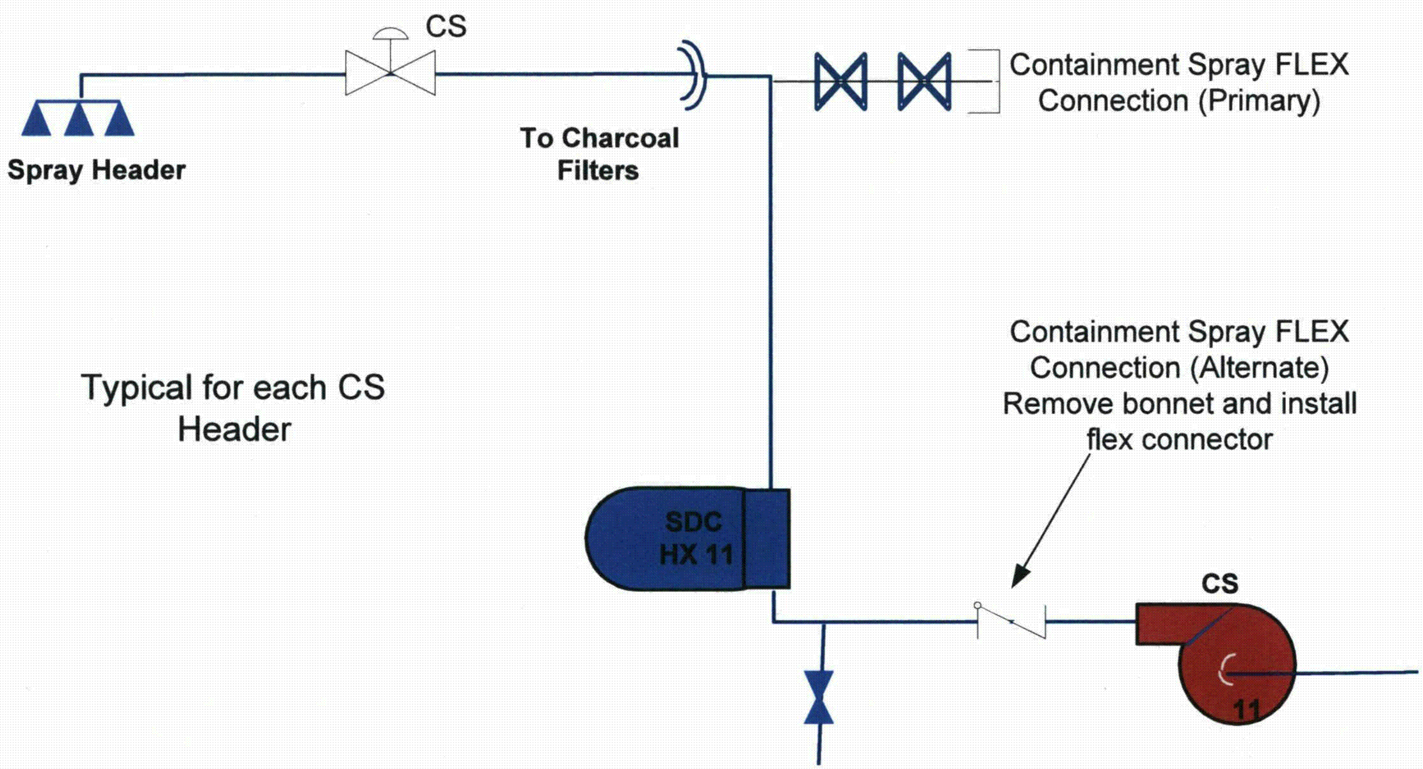
Attachment 11-2:
AFW FLEX Connection (Primary) Piping Run



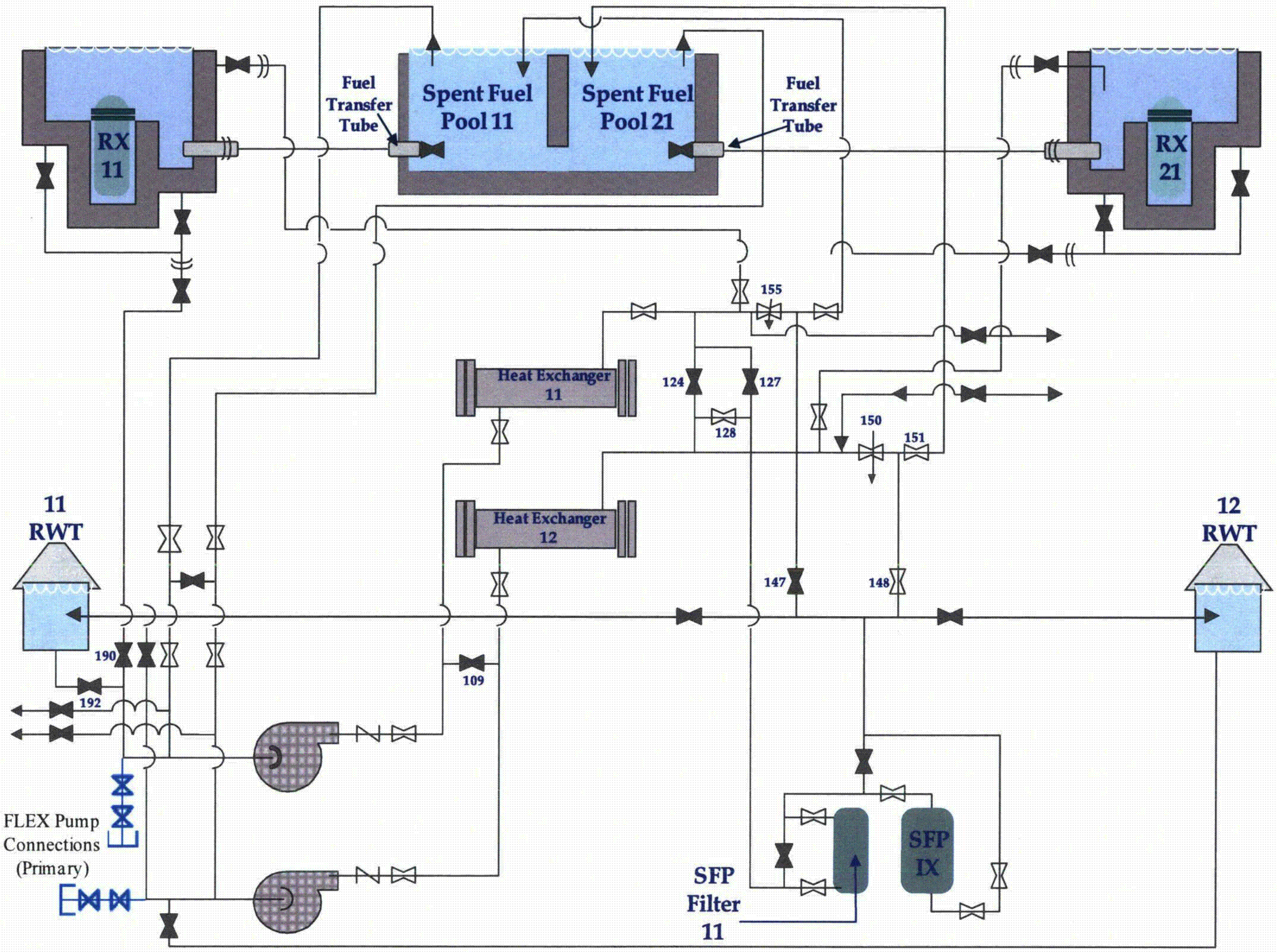
Attachment 12-1:
RRC Potential Onsite Staging Areas



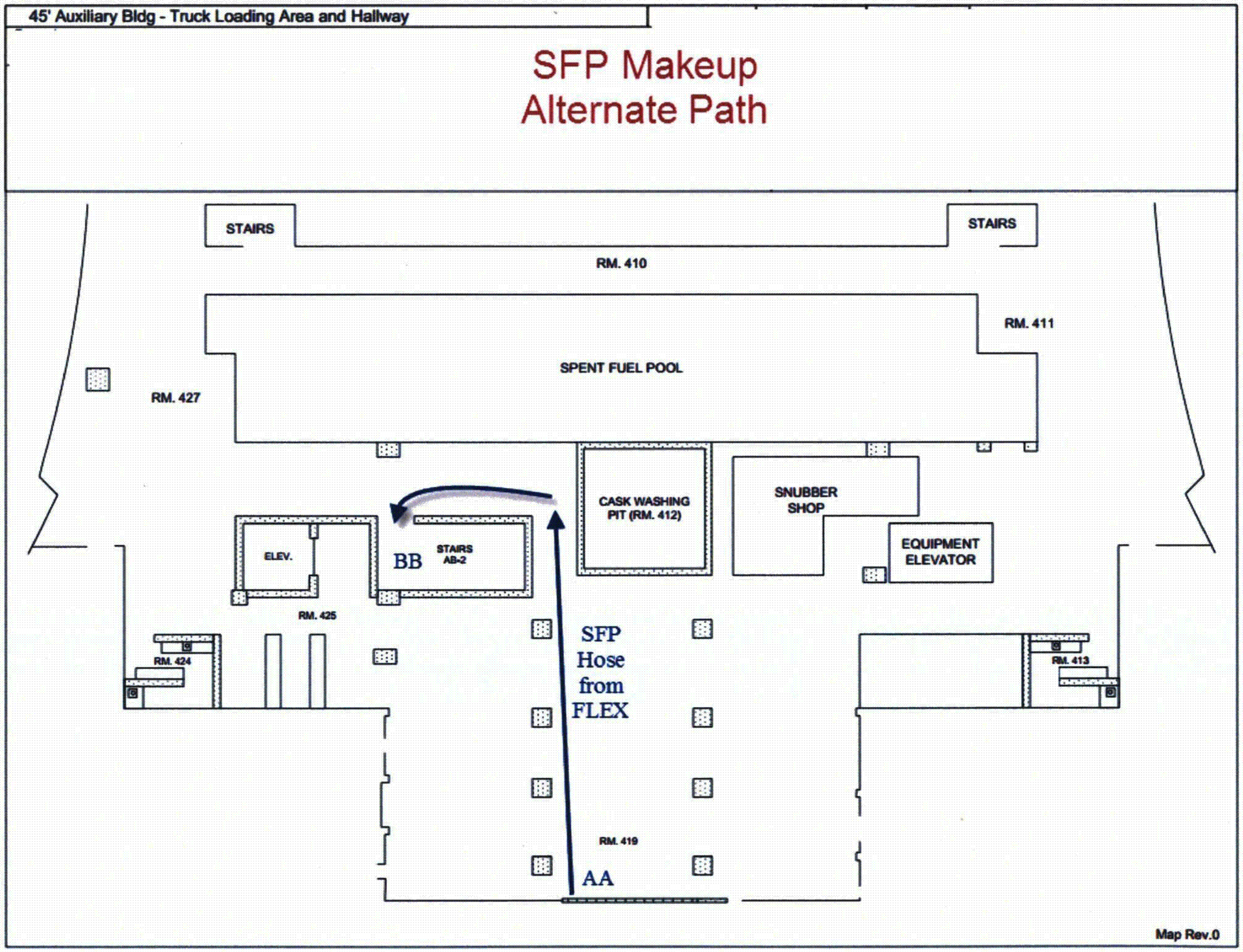
Attachment 13-1: Containment Spray FLEX Connection (Primary and Alternate)

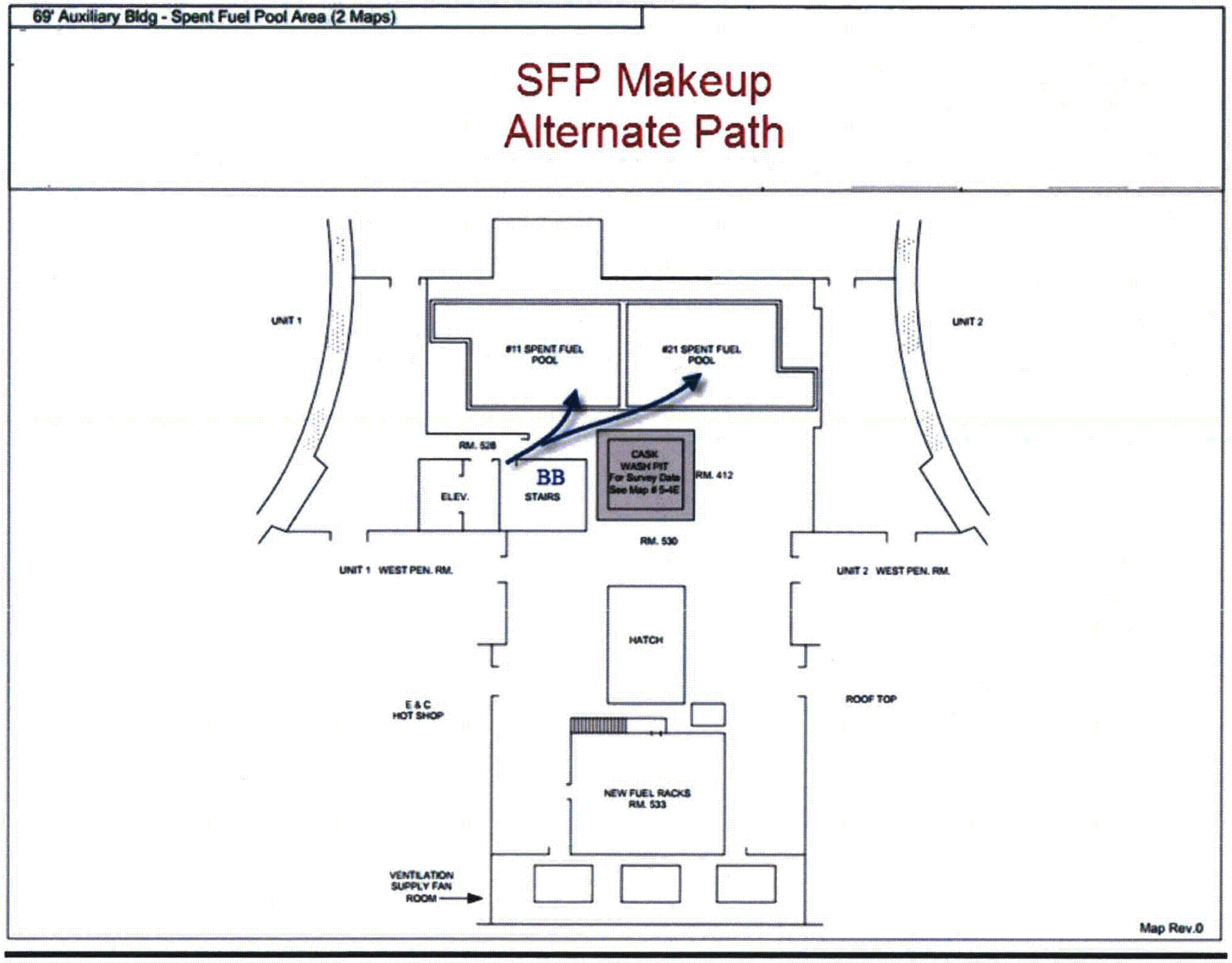


Attachment 14-1:
SFP Makeup (Primary)

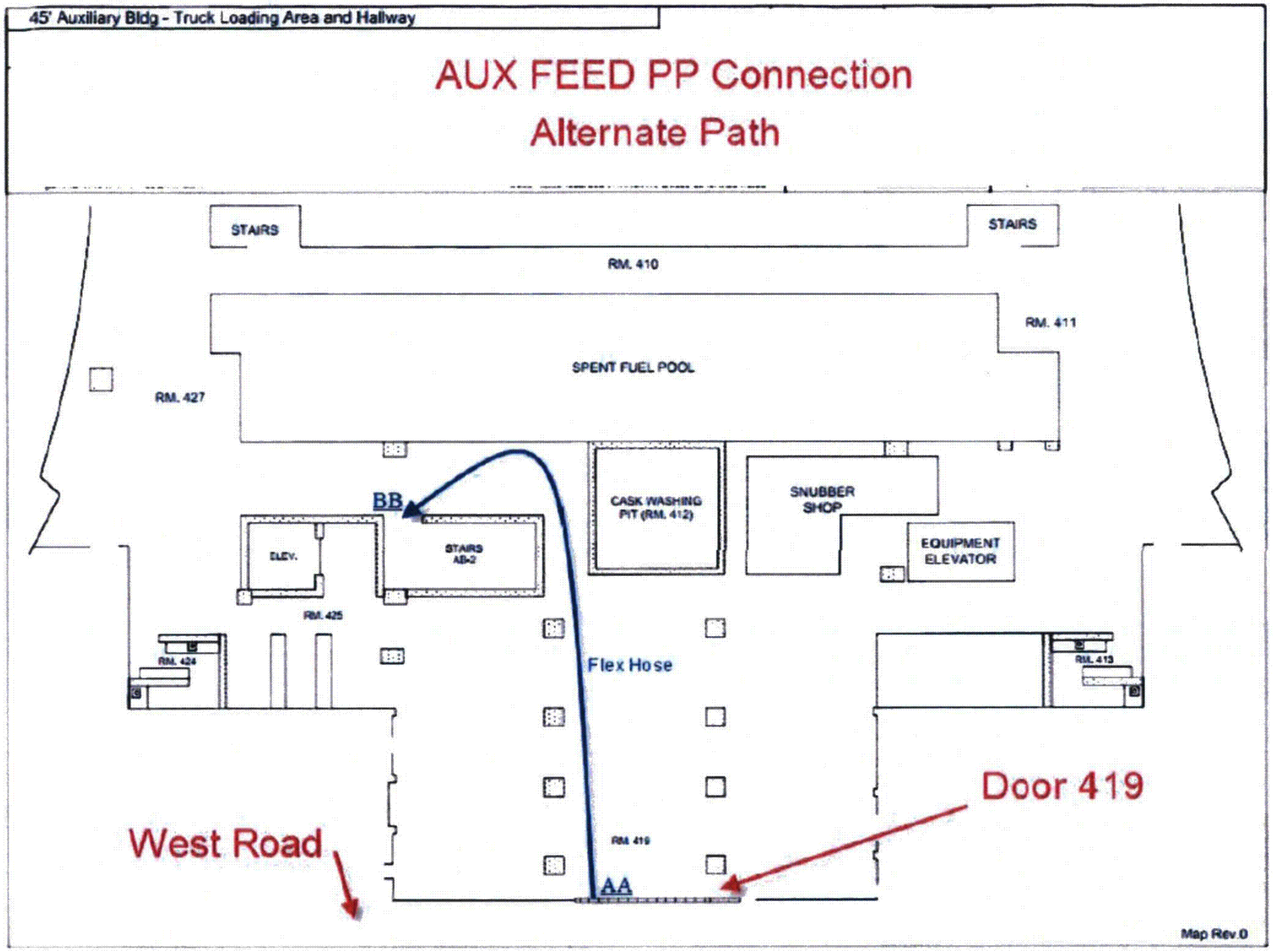


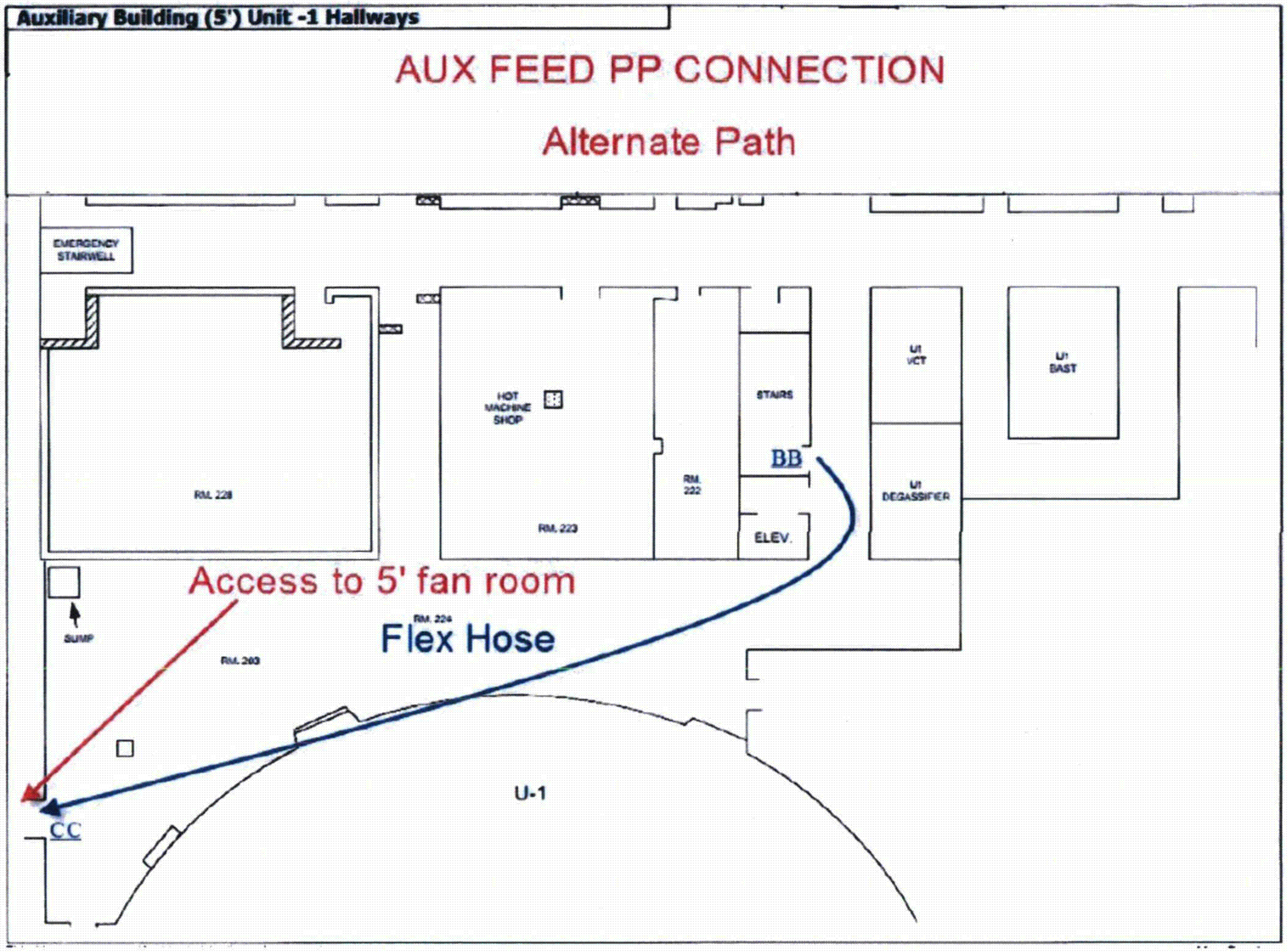
Attachment 15-1:
SFP Makeup (Alternate)



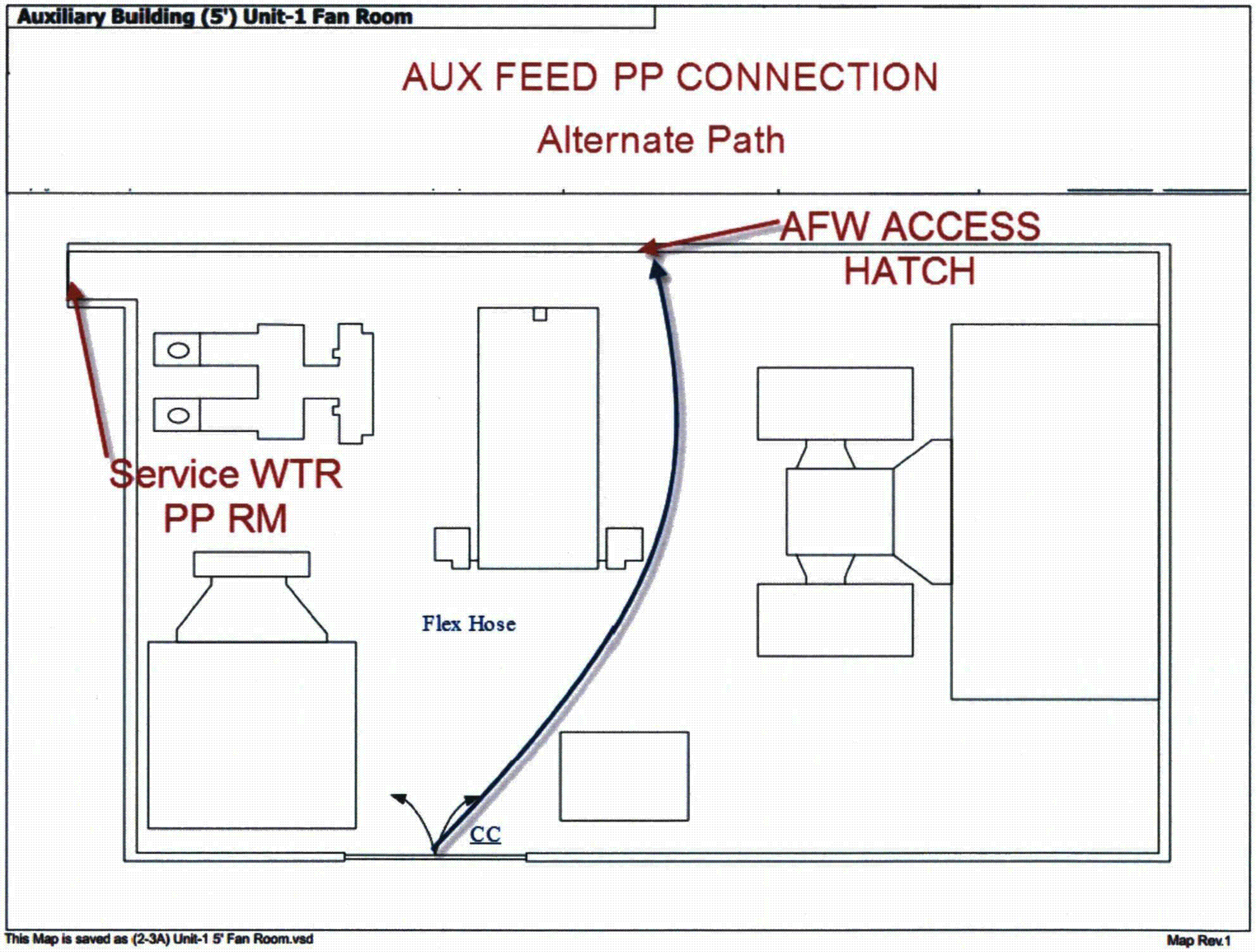

69' Auxiliary Bldg - Spent Fuel Pool Area (2 Maps)
SFP Makeup
Alternate Path
UNIT 1
UNIT 2
#11 SPENT FUEL POOL
#21 SPENT FUEL POOL
RM. 528
BB
STAIRS
ELEV.
CASK WASH PIT For Survey Data See Map # 5-4E
RM. 412
RM. 530
UNIT 1 WEST PEN. RM.
UNIT 2 WEST PEN. RM.
HATCH
E & C HOT SHOP
ROOF TOP
NEW FUEL RACKS RM. 533
VENTILATION SUPPLY FAN ROOM
Map Rev.0

Attachment 16-1: AFW FLEX Connection (Alternate) Hose Path

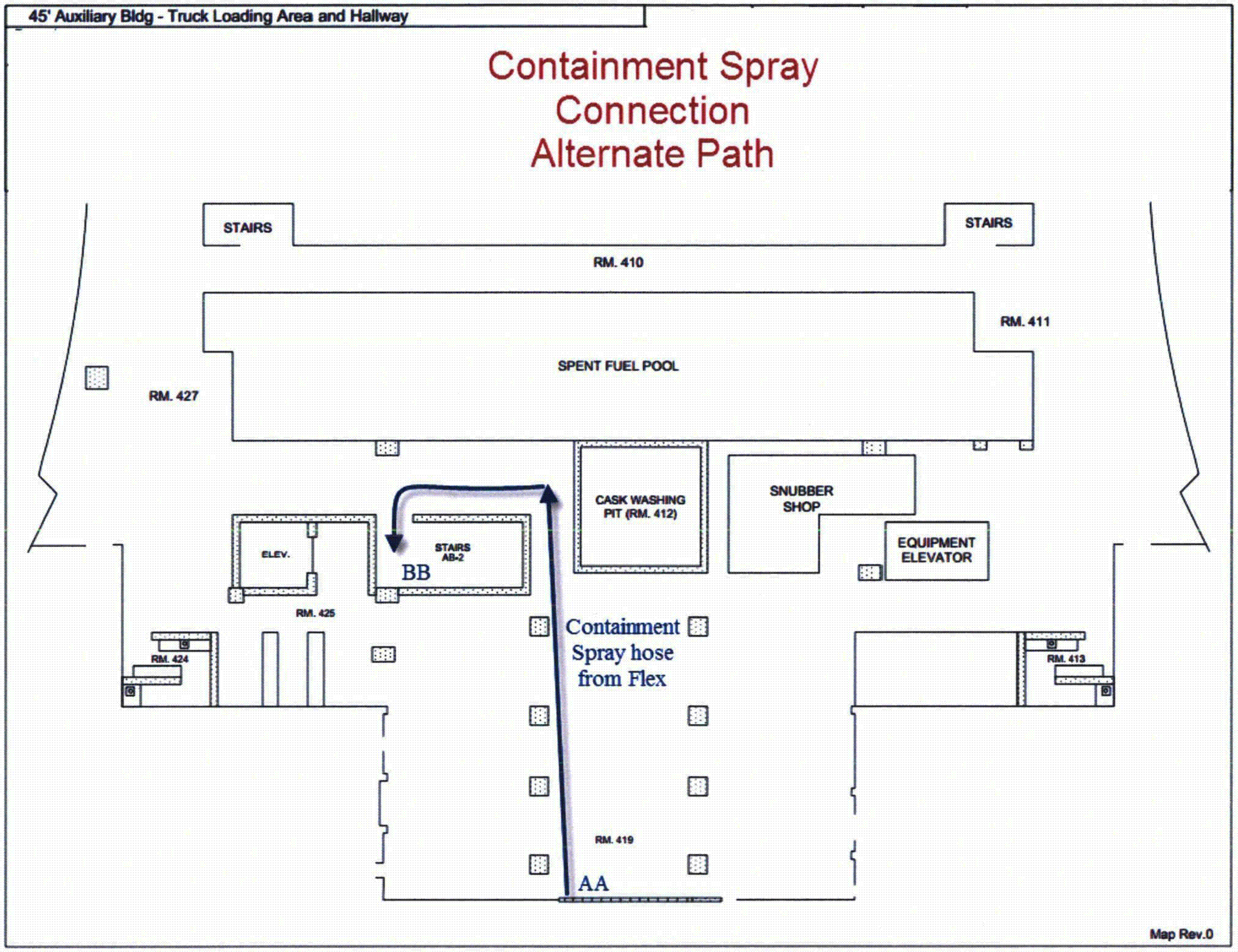


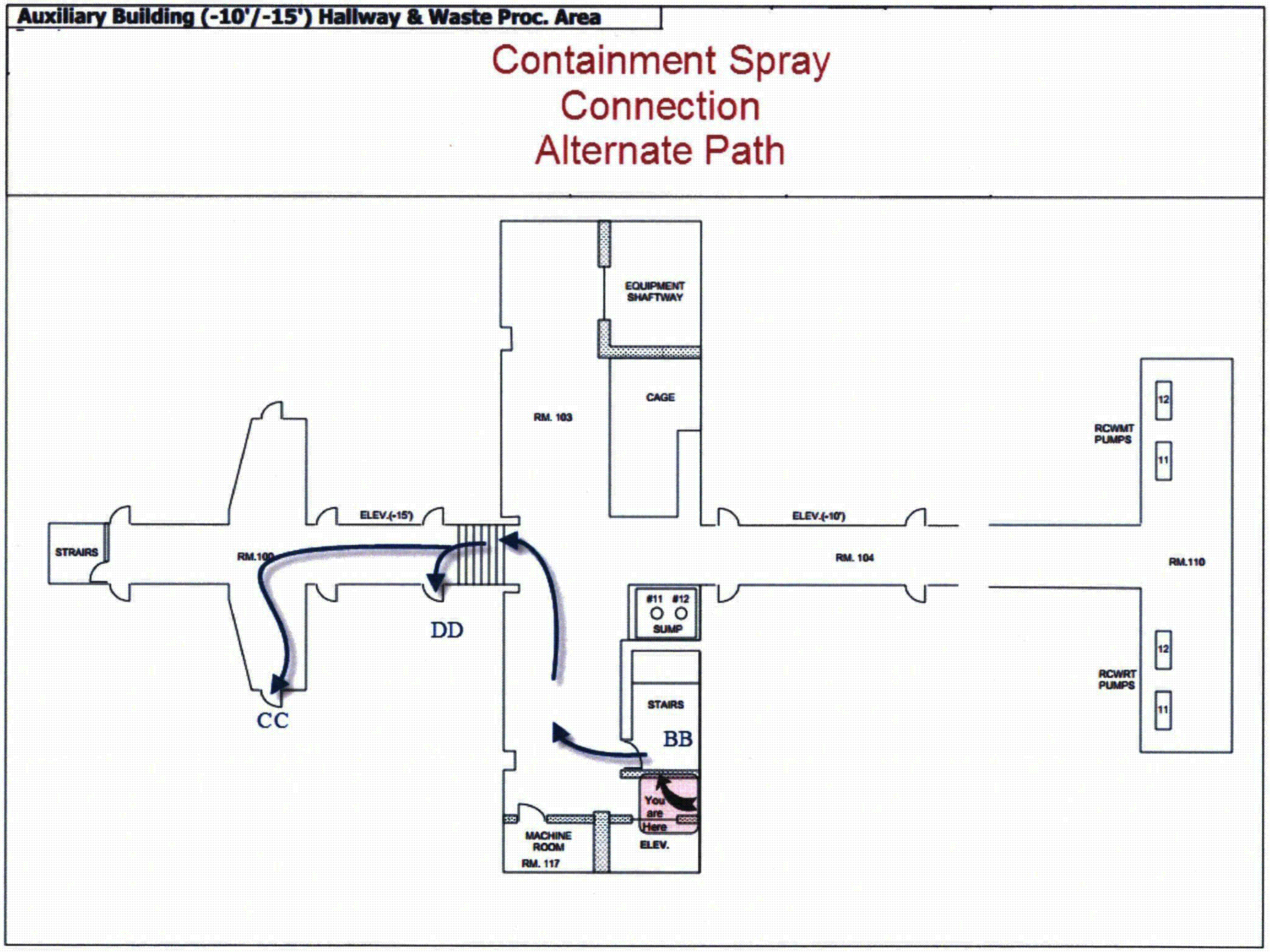

Auxiliary Building (5') Unit -1 Hallways
AUX FEED PP CONNECTION
Alternate Path
EMERGENCY STAIRWELL
RM. 228
HOT MACHINE SHOP
RM. 223
RM. 222
STAIRS
BB
ELEV.
U1 VCT
U1 BAST
U1 DEGASSIFIER
Access to 5' fan room
SUMP
RM. 224
RM. 203
Flex Hose
U-1
CC

Attachment 16-2: AFW FLEX Connection (Alternate) Hose Path

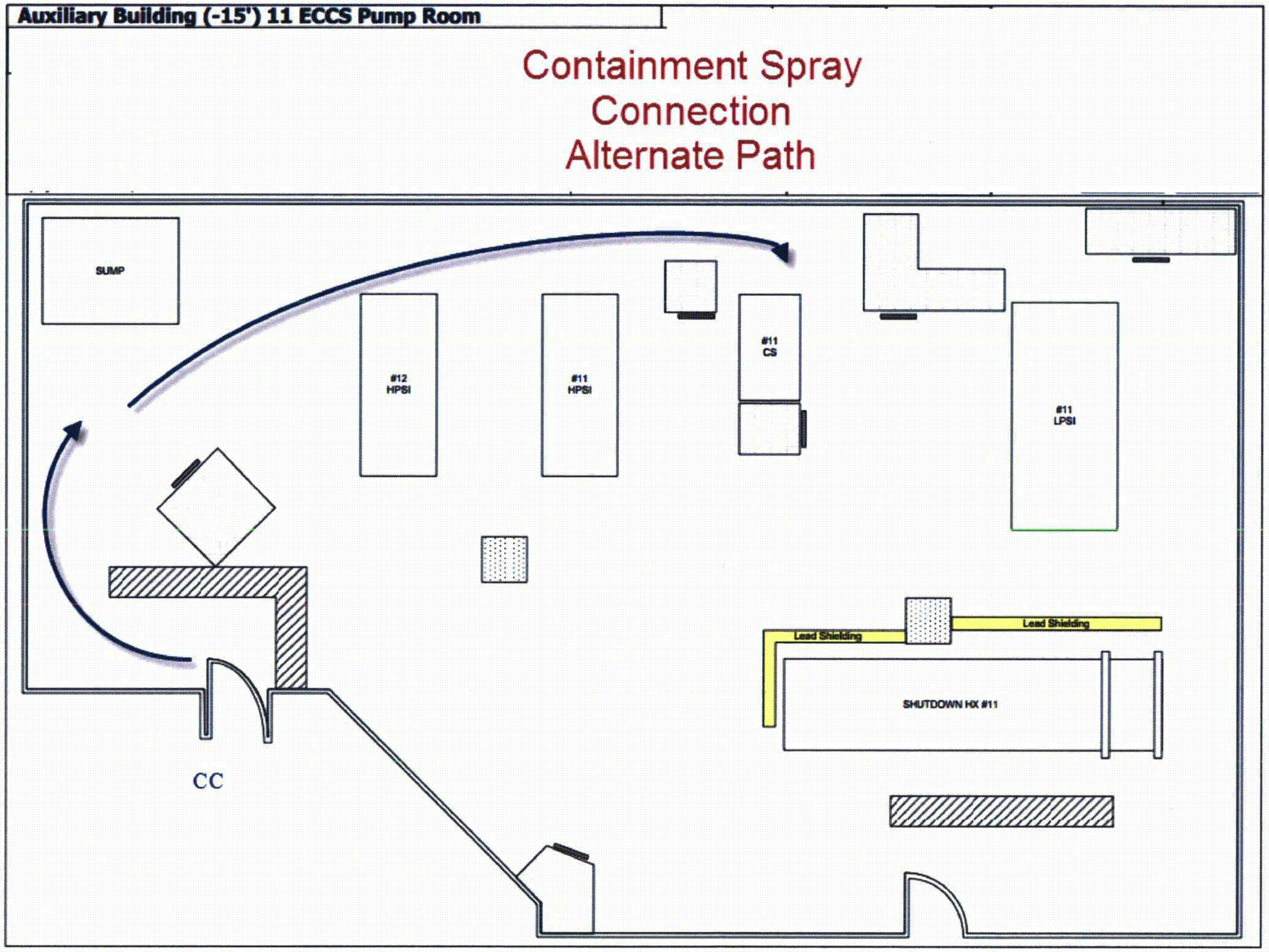


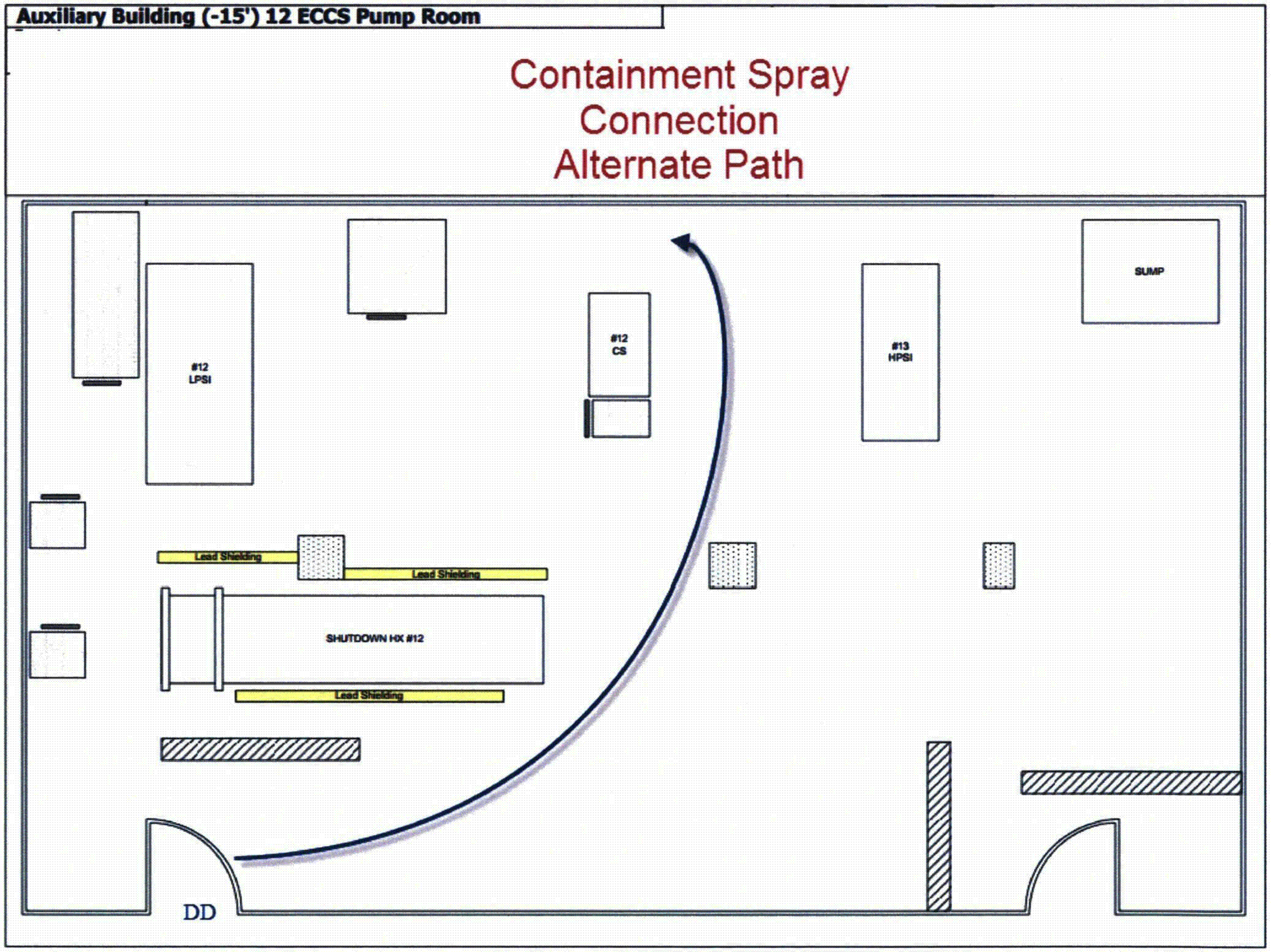
Attachment 16-3:
Containment Spray FLEX Connection (Alternate) Hose Path



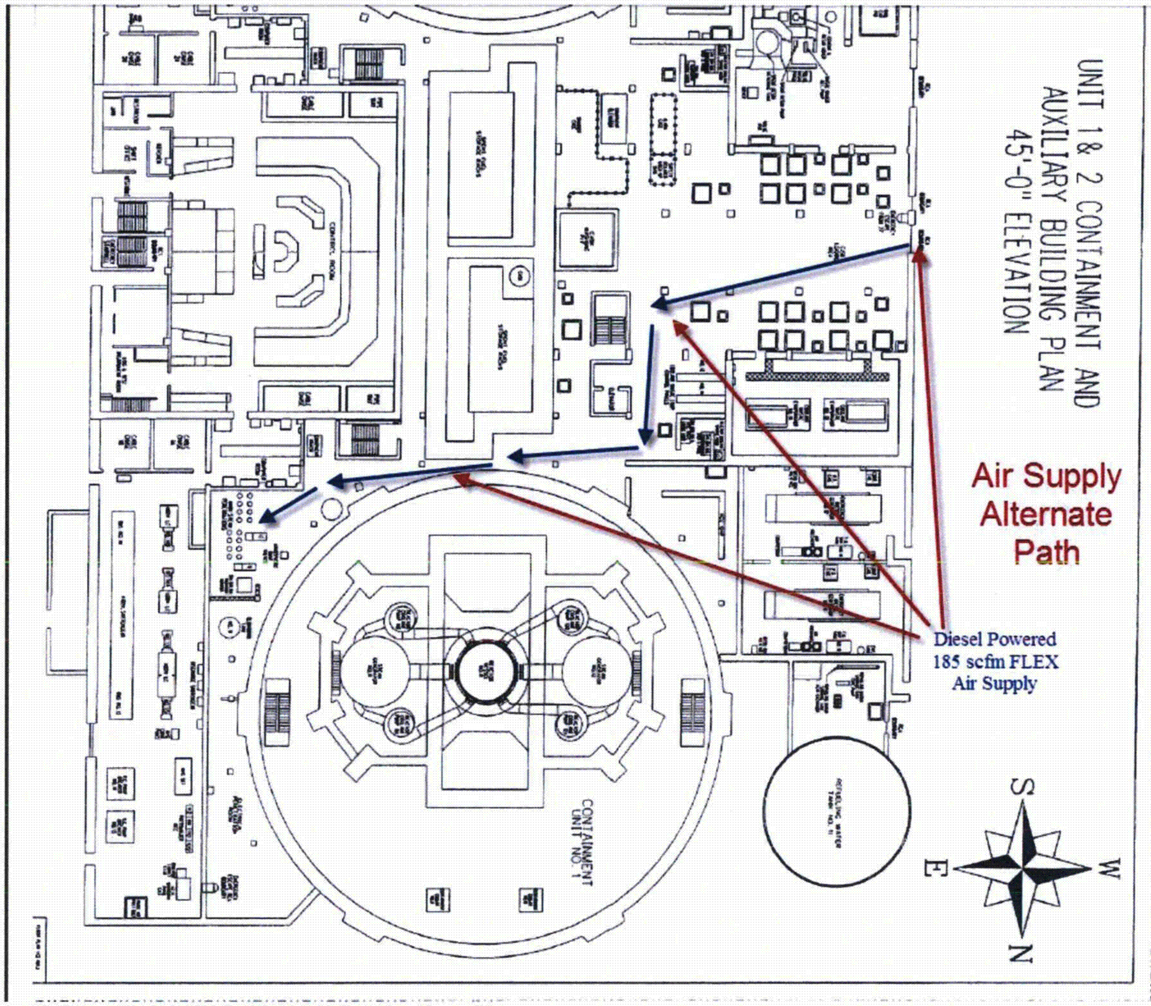

Auxiliary Building (-10'/-15') Hallway & Waste Proc. Area
Containment Spray
Connection
Alternate Path
EQUIPMENT SHAFTWAY
CAGE
RM. 103
RCWMT PUMPS
12
11
ELEV.(-15')
ELEV.(-10')
STRAIRS
RM.100
RM. 104
RM.110
#11 #12
SUMP
DD
CC
STAIRS
BB
RCWRT PUMPS
You are Here
MACHINE ROOM
RM. 117
ELEV.

Attachment 16-4:
Containment Spray FLEX Connection (Alternate) Hose Path

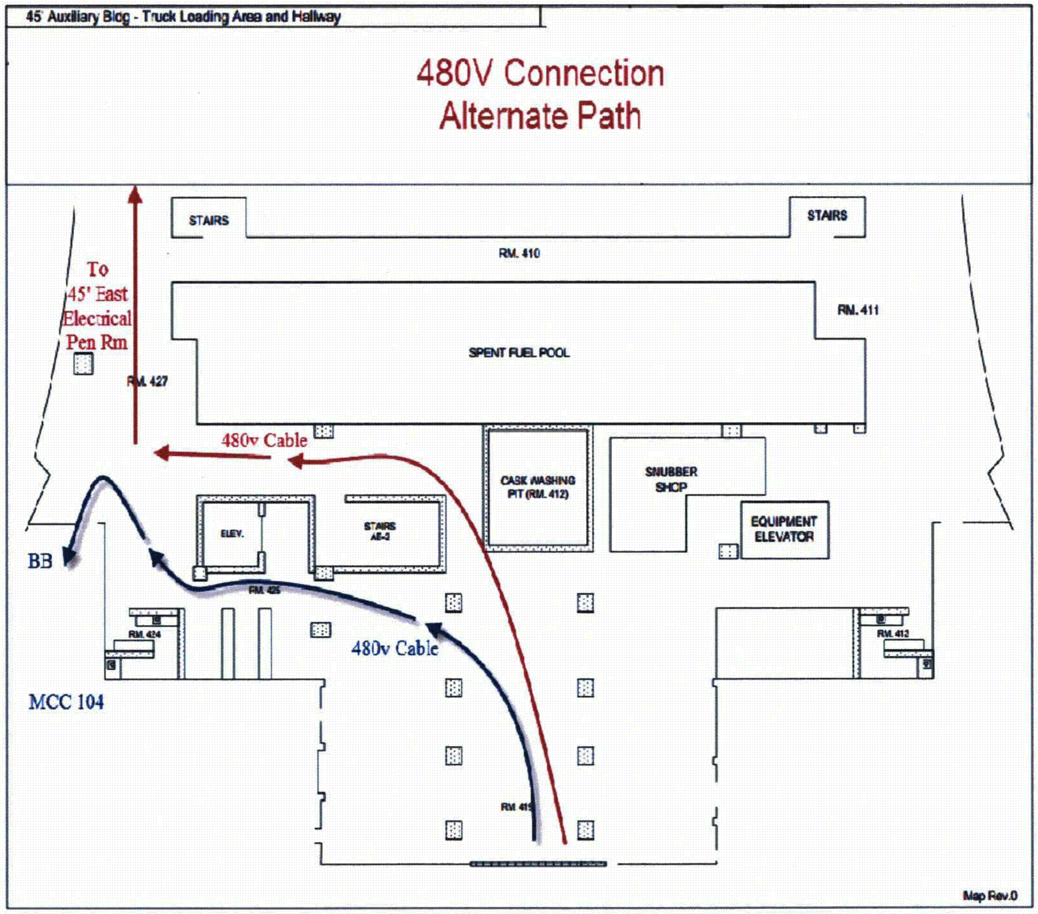



Auxiliary Building (-15') 12 ECCS Pump Room
Containment Spray Connection Alternate Path
SUMP
#12 LPSI
#12 CS
#13 HPSI
Lead Shielding
Lead Shielding
SHUTDOWN HX #12
Lead Shielding
DD

Attachment 16-5: FLEX Compressed Air Supply (Alternate) Hose Path



Attachment 16-6:
480VAC FLEX Cable Paths (MCC and Load Center) (Alternate)



ATTACHMENT (5)

REGULATORY COMMITMENTS CONTAINED IN THIS CORRESPONDENCE

ATTACHMENT (5)

REGULATORY COMMITMENTS CONTAINED IN THIS CORRESPONDENCE

The following table identifies actions committed to in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

REGULATORY COMMITMENT	DUE DATE
Include the status of the final design details and associated procedure guidance for the FLEX Integrated Plan , as well as any revisions to the information contained in the February 28, 2013 submittal, in the 6-month Integrated Plan updates required by NRC Order Number EA-12-049.	Six month intervals from February 28, 2013.