General Integrated Plan Elements (PWR & BWR)

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 Hatch Nuclear Plant (HNP or Hatch) are seismic, ice, high winds and high temperature as detailed below:

Seismic Hazard Assessment:

Per the Hatch Unit 1 (HNP-1) and Hatch Unit 2 (HNP-2) Final Safety Analysis Reports (FSAR) (References 1 and 2) Section 2.5, the seismic criteria for HNP include two design basis earthquake spectra: Operating Basis Earthquake (OBE) and the Design Basis Earthquake (DBE) (Safe Shutdown Earthquake). The DBE and the OBE are 0.15g and 0.08g, respectively; these values constitute the design basis of HNP. Per NEI 12-06 Section 5.2 (Reference 3), all sites will consider the seismic hazard.

The HNP FSAR was reviewed to perform a limited evaluation of the liquefaction potential outside the power block area for a design basis earthquake (DBE) event.

There are no liquefaction susceptible soils within the area of the principle structures for a DBE event with a maximum horizontal acceleration equal to 0.15 g, according to HNP-1 FSAR Section 2.7.7 – Liquefaction Potential and HNP-2 FSAR Section 2.5.4.8 – Liquefaction Potential. Therefore, the likelihood of liquefaction at the site for a DBE event with a maximum horizontal acceleration equal to 0.15 g appears to be low based on the information presented in the HNP-1 and HNP-2 FSARs.

Thus the Hatch site screens in for an assessment for seismic hazard except for liquefaction.

External Flood Hazard Assessment:

Not applicable, Hatch is built above the design basis flood level. Per HNP-2 FSAR Chapter 2 (Section 2.4) the Probable Maximum Flood (PMF) elevation is 105 ft with wave crests to 108.3 ft. The grade level at Hatch is 129.5’, and the floor elevation in the Intake Structure is 111 ft (Reference 2). Therefore, Hatch is built above the design basis flood level and is considered a “dry” site by the NEI (Section 6.2.1) guidance and “dry” sites are not required to evaluate flood-induced challenges.

Thus the Hatch site screens out for an assessment for external flooding.

Extreme Cold Hazard Assessment:

The guidelines provided in NEI 12-06 (Section 8.2.1) generally exclude the need to consider extreme snowfall at plant sites in the southeastern U.S. below the 35th parallel. The Hatch plant site is located below the 35th parallel (Reference 2 Section 2.1.1.1) and thus the capability to address impedances caused by extreme snowfall with snow removal equipment need not be provided. According to HNP-2 FSAR Section 2.4.7, there is no record of the Altamaha River freezing over. The minimum recorded river temperature is at Doctortown, Georgia and is 37.4°F, and is safely above the freezing temperature. Therefore, there is no risk of ice blockage, frazil ice, or loss of UHS due to ice.

Comment [EEB1]: Awkward usage

Comment [EEB2]: Need to discuss liquefaction soils along portable equipment deployment routes.

Comment [EEB3]: HNP 1 UFSAR points to HNP2 for this section. It might be worth discussing that here.

Comment [EEB4]: 12-06

Comment [J5]: Ironic that beyond design basis flooding is not postulable.

Comment [EEB6]: Location is included later, but would be better included here for the reader to follow the discussion.

Comment [EEB7]: Consider using the word “hindrances” rather than “impedances” in order to avoid confusion in the context of loss of all ac power and the usages of the term impedance in the electrical arts.

The Hatch site is located within the region characterized by EPRI as ice severity level 5 (Reference 3, Figure 8-2). The plant's design basis is 0.25 inches of ice every 9 years (Reference 2 Section 2.3.1.3). As such, the Hatch site is subject to severe icing conditions that could also cause catastrophic destruction to electrical transmission lines.

Thus the Hatch site screens in for an assessment for extreme cold for ice only.

High Wind Hazard Assessment:

Plant Hatch is located at 82°20'39" W longitude and 31°56'2" N latitude (Reference 2 Section 2.1.1.1). Per NEI 12-06 guidance hurricanes and tornado hazards are applicable to Hatch. NEI 12-06 Figures 7-1 and 7-2 were used for this assessment.

Thus the Hatch site screens in for an assessment for High Wind Hazard.

Extreme High Temperature Hazard Assessment:

Per NEI 12-06 Section 9.2, all sites will address high temperatures. In the middle coastal plain of Georgia summers are warm and humid, with rare periods of extremely hot weather over 100°F (Reference 2 Section 2.3.1.2). 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. Site industrial safety procedures currently address activities with a potential for heat stress to prevent adverse impacts on personnel.

Thus the Hatch site screens in for an assessment for extreme High Temperature.

Summary of extreme external hazards Assessments:

The hazards applicable to HNP are seismic, ice, high wind and high temperature.

References:

1. Hatch Nuclear Plant Unit 1 Final Safety Analysis Report, Revision 31, 1112
2. Hatch Nuclear Plant Unit 2 Final Safety Analysis Report, Revision 31, 11/12
3. Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, NEI 12-06, Revision 0, August 2012

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.*

Comment [EEB8]: This is out of the generally seen order for latitude and longitude. N.b., it matches the discussion in the UFSAR, which makes the statement that "The Universal Transverse Mercator coordinates of the HNP-2 reactor, to the nearest 100 m, are Zone 17R LF 3,533,700 m N and 372,900 m E. These coordinates correspond to 82°20'39" W long. and 31°56'2" N lat. The HNP-1 reactor is located 149 ft 3 in. due north of the HNP-2 reactor." This statement is incorrect because it relates a northward displacement to a longitude and an eastward displacement to a latitude.

Comment [EEB9]: Section 2.3.2.2 lists maximum temperatures of 111.0 F or 113.3 F. This was based on UFSAR Rev 28. Need to discuss the difference.

Comment [EEB10]: Considered.

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

- 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 DC battery banks are available.
  - Seismically designed AC and DC distribution available.
  - Plant initial response is the same as SBO.
  - Best estimate analysis and decay heat is used to establish operator time and action.
  - No single failure of SSC assumed. Therefore, RCIC will perform.
- Margin will be added to design FLEX components and hard connection points to address future requirements as re-evaluation warrants. Portable FLEX components will be procured commercially.
- The design hardened connections are protected against external events or are established at multiple and diverse locations.
- Deployment strategies and deployment routes are assessed for hazards impact.
- Phase 2 FLEX components are stored at the site and available after the event they were designed to mitigate.
- 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 (Reference 1) guidance if other design basis information or industry guidance is not available.

Exceptions for the site security plan or other (license/site specific) requirements of a nature requiring NRC approval will be communicated in a future 6 month update following identification.

References:

1. NUMARC 87-00, Station Blackout, Revision 1

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.*

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

Comment [EEB11]: Considered.

Comment [EEB12]: This is not really true because a loss of all ac power will require failures of the EDGs.

Comment [EEB13]: N.b., the endorsed guidance of NEI 12-06 requires guidelines or proecedures for manual initiation of RCIC. This should be addressed in timelines.

Comment [EEB14]: This assumption should be linked to the protection of the equipment, not the purpose of the equipment.

Comment [EEB15]: Wrong title.

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)*

Discussion of time constraints identified in Attachment 1A table.

- 10-35 minutes, Operators override the auto-swap of RCIC suction valves in accordance with EOPs to maintain suction from the CST (table item 3) - Time critical at the point when torus water level reaches the high level setpoint (approximately 35 - 45 minutes) which would initiate the automatic swap of the RCIC suction from the CST to the torus. It is desirable to maintain suction from the CST because it is a source of higher quality water and is also a step directed by EOPs (Reference 1).
- 48 minutes, Entry into ELAP (table item 4) - Time critical at a time greater than 1 hour. Time 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 EDGs. Entry into ELAP provides guidance to operators to perform ELAP actions. Table top evaluation was performed by site personnel to validate the one hour estimate.
- 1 hour, DC Load shed complete (table item 5) - DC buses are readily available for operator access and breakers will be appropriately identified (labeled) 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 to expect that operators can complete the DC bus load shed in approximately 10 minutes.
- 1 hour, Reactor pressure control to keep from entering Unsafe Region of HCTL Curve (table item 6) - Using manual control of SRVs, depressurize the RPV IAW EOPs (to approximately 200 – 400 psig) to keep in the Safe Region of the HCTL curve (Reference 2). Time critical at the point of entering the Unsafe Region of the HCTL Curve (Approximately 3 hours per MAAP analysis (Reference 11)). SRV control is maintained from the control room with sufficient DC power and pneumatic pressure to operate the SRVs throughout Phase 1 (Reference 4).
- 6.5-7.5 hours - When CST inventory is near depletion, swap RCIC suction from CST to torus to preserve RCIC availability (table item 7) - CST inventory is estimated to last approximately 6.5-7.5 hours (References 5 and 11). To maintain RCIC operating the suction must be swapped to a suction source that contains available inventory, i.e., the torus.

Comment [MM16]: I find this expected timing to be non-conservative. Especially when the licensee later says that one-hour is a reasonable assumption for operators to perform initial assessment of EDGs.

Comment [EEB17]: Is there a reference documenting the tabletop evaluation? Was the simulator used? Why is the tabletop evaluation valid?

Comment [MM18]: How can load shedding be complete within an hour before the extent of the condition is really known? Need to know what actions are required for load shedding including a list of loads to be shed.

Comment [EEB19]: Given the conservative choice of 1 hour discussed above for entry into the ELAP procedures, this time is unreasonable. It might be reasonably achievable given a 48 minute start time for ELAP, but should be justified by a discussion of the number of breakers to open and their proximity to where the operator is expected to be at time 48.

- 7.5 Hours, Initiate use of Hardened Containment Vent System (HCVS) per EOPs to maintain containment parameters below design limits and within the limits that allow continued use of RCIC (table item 8) - The reliable operation of HCVS will be met because HCVS is seismic and will be powered by DC buses with motive force supplied to HCVS valves from installed accumulators and portable nitrogen storage bottles per EA-12-050. Critical HCVS controls and instruments associated with containment will be DC powered and operated from the MCR or a Remote Operating Station on each unit. (Reference 10)

- 10 Hours, Transition from Phase 1 to Phase 2 for Core cooling function by placing FLEX pumps in service to make up to the CST (table item 9) - FLEX pumps will be staged beginning at approximately 6 – 8 hours time frame (Reference 4). The combined CST and suppression pool credited volume is estimated to be sufficient out to 20-24 hours (Reference 4). FLEX pumps will be maintained in on-site FLEX storage buildings (Reference 4). FLEX pumps will be transferred and staged via haul routes and staging areas evaluated for impact from external hazards (Reference 4). Modifications to RHRSW, Intake Structure, Reactor Building, and CST will be implemented to facilitate the connections and operational actions required to provide makeup to the CST (or reactor vessel via RHR or CRD) as necessary (Reference 4). Programs and training will be implemented to support operation of FLEX pumps. Two hours is a reasonable assumption to transfer and place FLEX portable pumps into service.

- 12 Hours, Power up both divisions of station Class 1E battery chargers using a FLEX 600 VAC DG to supply power to both divisions of Class 1E emergency 600 VAC buses C and D (table item 10) - Time critical after 20 hours. Battery durations are calculated to last at least 21 hours (Reference 4). FLEX DG will be staged beginning at approximately 8-10 hours time frame (Reference 4). FLEX DG will be maintained in on-site FLEX storage buildings (Reference 4). FLEX DG will be transferred and staged via haul routes and staging areas evaluated for impact from external hazards (Reference 4). Modifications to Buses C and D and to the control building will be implemented to facilitate the connections and operational actions required to supply buses C and D from the FLEX DGs (Reference 4). Programs and training will be implemented to support operation of FLEX DGs. Two hours is a reasonable assumption to transfer and place the FLEX portable DG into service.

- 20-24 hours, Swap RCIC suction from the torus to the CST when torus level impacts RCIC required NPSH (between 146" and 102") or before torus level reaches 102" (table item 12) - Time critical when the reduction in torus level begins to impact RCIC required NPSH or when 102" is reached (102" is the limiting level to maintain coverage over the RCIC exhaust).

Technical Basis Support information

1. On behalf of the Boiling Water Reactor Owners Group (BWROG), GE-Hitachi (GEH) developed a document (NEDC-33771P, Revision 0 (Reference 3)) to supplement the guidance in NEI 12-06 by providing additional BWR-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

Comment [MM20]: Need to review DC loading assumptions.

Comment [EEB21]: This will likely be an open item pending EA-12-050.

Comment [EEB22]: Discuss why this is reasonable.

Comment [MM23]: Need to demonstrate this by test, not just by calcs. Should providing battery rated capacities, loading assumptions, and equipment loading for review.

Comment [EEB24]: Discuss why this is reasonable.

Comment [EEB25]: Needs to be submitted to NRC at least for information.

Comment [J26]: Agree – difficult to provide feedback without having seen this.

actions for performance of a site-specific gap analysis. In the document, GEH utilized the NRC accepted SUPERHEX (SHEX) computer code methodology for BWR's long term containment analysis for the ELAP analysis. As part of this document, a generic BWR 4/Mark I containment NSSS evaluation was performed. The BWR 4/Mark I containment analysis is applicable to the HNP (a BWR 4 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 spent fuel pool cooling. The guidance provided in the guidance was utilized as appropriate to develop coping strategies and for prediction of the plant's response. The NSSS vendor has performed site specific evaluations associated with RPV and containment response and impacts (References 5, 6, 7, 8, and 9).

2. HNP containment integrity for Phases 1 through 3 was evaluated by use of computer code MAAP 4.05 (Reference 11).
3. A best estimated bounding decay heat curve was developed by GEH using ANSI 5.1 (DRF 0000-0152-0890 (Reference 5)) for use in NSSS modeling.
4. Environmental conditions within the station areas were evaluated utilizing methods and tools in NUMARC 87-00 (Reference 13) or Gothic 8.0 (EPRI software).
5. Per the guidance in 10 CFR 50.63 and Regulatory Guide 1.155 HNP is an alternate AC, 4 hr coping plant for Station Blackout (SBO) considerations. Applicable portions of supporting analysis have been used in ELAP evaluations (Reference 12, HNP-2 FSAR Section 8.4.2).

Comment [J27]:

Comment [MM28]: Need to identify which portions were used.

<u>References</u>:

1. 31EO-EOP-010-1 (2), RC RPV Control (Non-ATWS), Version 10.0
2. 31EO-EOP—012-1, (2), PC Primary Containment Control
3. NEDC-33771P, Project Task Report BWROG GEH Evaluation of FLEX Implementation Guidelines, Draft A
4. SNCH084-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0
5. GEH Letter Number 316004-004, J.W. Mays to Ron J. Bush, Transmittal of (proprietary) Response to ENERCON Letter WHC12-02 dated 8/10/12 concerning RPV make-up rates for RCIC and Portable Pumps based on RPV pressure, dated 10/03/2012
6. GEH Letter Number 316004-012, J.W. Mays to Ron J. Bush, Transmittal of (proprietary) Response to ENERCON Letter WHC12-003 dated 8/14/12 concerning core and containment cooling and SNC Purchase Order SNG10046615, Item 1.1 concerning use of containment and torus sprays during a FLEX beyond design basis event, dated December 19, 2012
7. GEH Letter Number 316004-004, J.W. Mays to Ron J. Bush, Transmittal of (proprietary) Response to ENERCON Letter WHC12-004 dated 9/04/12 concerning use of river water for reactor vessel injection during ELAP conditions
8. GEH Letter Number 316004-006, J.W. Mays to Ron J. Bush, Transmittal of (proprietary) Response to ENERCON Letter WHC12-006 dated 9/21/12 concerning

Comment [EEB29]: Discussed as Rev. 0 above.

level limits associated with torus level, dated October 12, 2012

9. GEH Letter Number 316004-010, J.W. Mays to Ron J. Bush, Transmittal of (proprietary) Response to ENERCON Letter WHC12-011 dated 11/27/12 concerning impact to fuel and fuel cooling from use of river water injection, dated December 12, 2012
10. Submittal for NRC Order EA-12-050, Hardened Containment Vent System
11. SMNH-12-032, Containment Analysis of FLEX Strategies (MAAP Calculation), Revision 0
12. Hatch Nuclear Plant Unit 2 Final Safety Analysis Report, Revision 31, 11/12
13. NUMARC 87-00, Station Blackout, Revision 1

Comment [EEB30]: Placeholder for EA-12-050 integrated plan?

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 Figure 8 of Reference 1 are expected to be utilized to transport FLEX equipment to the deployment areas. 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 actions to clear the pathways.

Comment [EEB31]: Liquefaction potential assessed?

References:

1. SNCH084-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0

Comment [EEB32]: Will this be provided?

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

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.*
HNP will implement an administrative program for implementation of the HNP FLEX strategies in accordance with NEI 12-06 guidance. The equipment for ELAP will be dedicated to FLEX and 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. Standard industry PMs will be established for all components and testing procedure will be developed and frequencies established based on type of equipment 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 EP will be performed no later than 2016, prior to the 1st HNP unit design implementation. These programs and controls will be implemented in accordance with the Systematic Approach to Training.	
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*
The industry will establish two (2) Regional Response Centers (RRC) to support utilities in response to beyond design-basis external events (BDBEE). 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. Communications will be established between the affected nuclear site and the Strategic Alliance for FLEX Emergency Response (SAFER) team and required equipment mobilized as needed. Equipment will initially be moved from an RRC to a local staging area, established by the SAFER team and the utility. The equipment will be prepared at the staging area prior to transportation to the site. First arriving equipment, as established during development of the nuclear site's playbook, will be delivered to the site within 24 hours from the initial request. Also available will be locally held portable equipment that could be requested from site to site and utility to utility on an as required basis thus establishing 64 response centers capable of providing specific Phase 2 equipment.	
Notes:	

Comment [EEB33]: HNP will use them?

Comment [MM34]: Will we be reviewing and approving these?

Comment [EEB35]: Needs to reflect licensee actions and how they will meet NEI 12-06 Chapter 12. E.g., the licensee has negotiated/will sign a contract with SAFER that provides ….

Maintain Core Cooling
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**
BWR 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, Startup, and Hot Shutdown At the initiation of the BDBEE, main steam isolation valves (MSIVs) automatically close, feedwater is lost, and safety relief valves (SRVs) automatically cycle to control pressure, causing reactor water level to decrease. When reactor water level reaches -35 inches, reactor core isolation cooling (RCIC) and high pressure coolant injection (HPCI) (References 15, 16, 17, 18, 19, 19, 20), automatically start with suction from the Condensate Storage Tanks (CST) (Reference 1, Technical Specification (TS) Bases, 3.3.5.1, Function 3A and TS Bases 3.3.5.2, Function 1) and operate to inject makeup water to the reactor vessel. This injection recovers the reactor level to the normal band. The SRVs control reactor pressure (Reference 1, Table 3.3.6.3-1). Due to SRV actuation, the torus level, increases to the setpoint that causes RCIC suction valves to automatically swap from the CST to the torus (Reference 1, TS Table 3.3.5.2-1, Function 4, and TS Bases 3.3.5.2, Function 4), followed shortly by HPCI (Reference 1, TS Table 3.3.5.1-1, Function 3e, and TS Bases 3.3.5.1, Function 3e). These automatic valve swaps are overridden in accordance with EOPs to maintain RCIC suction from the CST (Reference 9). RCIC and HPCI valves and controls are powered by station DC power. (References 29 and 30, HNP-1 FSAR Sections 4.7.3 and 6.3.1 HNP-2 FSAR Section 5.5.6.3 and 6.3.2.2.1), HPCI is secured and RCIC provides all makeup flow to the reactor vessel. After determination that Emergency Diesel Generators (EDGs) cannot be restarted, the operating crew determines the event is a beyond-design-basis event and anticipates a loss of power for an extended time period at approximately 1 hour into the event (Reference 5). RCIC is maintained feeding the reactor vessel with suction from the CST. The RCIC trip signals and isolation signals that could possibly prevent RCIC operation during the ELAP will be overridden in accordance with procedural direction. Additionally, the automatic depressurization system (ADS) will be either placed in 'inhibit' or closely monitored to prevent automatic initiation of ADS. This is necessary to ensure reactor pressure is not reduced to a pressure which would prevent operation of RCIC. As stated above, 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 the drywell pneumatics system (References 29 and 30, HNP-1 FSAR Section 4.4.5 and HNP-2 FSAR Sections 5.2.2.2.3 and 7.3.1.2.2)). For Phase 1, the

Comment [EEB36]: Discuss the extent to which this sequence has been previously licensed in order to avoid review of currently licensed items.

[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.

power for the SRVs is supplied by the station batteries. At event initiation the normal pneumatic supply is lost due to loss of power; however, the nitrogen storage tank automatically supplies backup pneumatic pressure for SRV operation. In addition, each SRV is provided an accumulator which contains enough pneumatic pressure to operate each valve through 5 open/close cycles (References 29 and 30 HNP-1 FSAR Section 4.4.5 and HNP-2 FSAR Section 5.2.2.2.3). Mechanical SRV operation will also control reactor pressure.

The torus continues to heat up due to RCIC exhaust and SRV cycling. Based on experience derived from Fukushima, the RCIC system can run at a much higher lube oil temperature and suction source temperature (Reference 6) than that originally assumed for the operation of RCIC. Additionally, the BWROG is developing a RCIC study (Reference 31) which will allow operation of RCIC at a lube oil temperature of >230°F; SNC will take the necessary actions to allow operation at elevated temperatures. Regarding net positive suction head (NPSH) for RCIC, at the time of the suction transfer from CST to torus, the makeup flow required is approximately 190 gpm at a torus water temperature of approximately 222°F (Reference 7). The Unit 1 RCIC pump data sheet, S16844 (Reference 32) shows an ~~required~~ NPSHR of 11.8 ft at 339 GPM for the normal operating speed of the pump, 3579 RPM. The NPSHR decreases at flow rates lower than 339 GPM and at pump speeds slower than 3579 RPM. Therefore, an NPSHR of 11.8 can be conservatively assumed to be bounding for a flowrate of 190-200 GPM. Using this value as a minimum allowed NPSH for the pump, MAAP analysis (Reference 24) shows that the NPSHA remains above the NPSHR limit during the time RCIC is aligned to the torus. HNP-2 RCIC pump NPSH requirements are similar to those for NHP-1. During the time that torus temperature is increasing operators reduce reactor pressure to a pressure range (200 to 400 psig) which provides margin to the Unsafe Region of the heat capacity temperature limit (HCTL) curve (References 9 and 11). When the torus temperature reaches the Unsafe Region of the HCTL, RPV emergency depressurization is required (References 9 and 11). In accordance with EPGs and per BWR Owner's Group (BWROG) guidance, EOPs will be revised to allow termination of RPV emergency depressurization at a pressure that will allow continued RCIC operation, because steam driven RCIC is the sole means of core cooling (Reference 4).

The maximum suppression pool water level allowed in the torus while the vessel is pressurized is governed by curves in the Emergency Operating Procedures (EOPs). Reference 11, EOP procedure 31EO-OPS-001-0, EOP General Information, contains the curves for Heat Capacity Temperature Limit (HCTL), SRV Tailpipe Level Limit (SRVTPLL), and Pressure Suppression Pressure Limit (PSP) each of which provide limits or requirements which govern or prescribe actions such as RPV emergency depressurization based on or related to level in the torus. EOPs will be revised to direct operators to terminate RPV emergency depressurization to prevent the loss of RCIC, if it is the only available injection source for ensuring adequate core cooling.

The primary strategy for core cooling is to supply high quality water via RCIC with suction from the CST. The design of the Condensate Storage Tanks ensures that 100,000 gallons of water is available to RCIC and HPCI suctions for injection into the reactor vessel; the design includes standpipes internal to the tank that prevents usage of at least 100,000 gallons in the tank by systems other than RCIC and HPCI (Reference 1). Based on Reference 7, Reference 24 and the scenario as described above, the 100,000 gallons of water in the CST will be depleted between approximately 6.5 and 7.5 hours.

The enclosure walls surrounding the tanks provide protection from tornado missiles. The walls are 20' tall for both HNP-1 and HNP-2 (References 21 and 22), and protect approximately half of the tank or 250,000 gallons of CST water; however, only 100,000 gallons of this volume is credited as

Comment [EEB37]: How many operations can it supply and how many are expected to be necessary?

Comment [EEB38]: Modifications? Replacement of bearing materials? Identify the actions somewhere.

Comment [J39]:

Comment [EEB40]: HNP

Comment [EEB41]: Which one is bounding? How similar?

Comment [J42]: Notably, seal leakage is presumably not a concern for BWRs with RCIC due to relatively high makeup capacity; however, this does not necessarily apply to 4 BWRs with isolation condensers instead of RCIC. They are fundamentally different – presumably this is addressed in NEDC-33771P report we haven't seen.

being available for RCIC usage due to the internal standpipe configuration. The required amount of makeup to the reactor over 72 hours is approximately 600,000 gallons (References 7, 24 and 33). 100,000 gal is supplied from CST during the initial 6.5-7.5 hours. The remainder is provided by taking suction from the torus and/or, in Phase 2, from the CST after FLEX pumps have replenished the CST (Reference 33).

Cold Shutdown and Refueling

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 vessel will heatup. When temperature reaches 212°F, (Hot Shutdown) the vessel will begin to pressurize. During the pressure rise RCIC can be returned to service with suction from the CST to provide injection flow. When pressure rises to the SRV setpoints then pressure will be controlled by SRVs. The primary and alternate strategies for Cold Shutdown are the same as those for Power Operation, Startup, and Hot Shutdown as discussed above for core cooling. Drywell airlock may be open, but the amount of steaming will have limited impact on the Reactor Building since Phase 2 manpower will be available to shut the airlock before Phase 2 actions are required in the reactor building airlock area.

During Refueling, many variables exist which impact the ability to cool the core. In the event of an ELAP during Refueling, there are no installed plant systems available to cool the core, thus transition to Phase 2 will occur immediately. To accommodate the activities of vessel disassembly and refueling, water levels in the reactor vessel and the reactor cavity are often changed. The most limiting condition is the case in which the reactor head is removed and water level in the vessel 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 quite rapidly. As indicated in procedure 34AB-E11-001-1(2) (Reference 12), if the event occurs at 1 day after shutdown, boiling will occur in less than 1 hour with fuel uncovering in less than 6 hours.

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-. Deploying and implementation of portable FLEX pumps to supply injection flow must commence immediately from the time of the event. This should be plausible because more personnel are on site during outages to provide the necessary resources. Guidance will be provided to ensure that sufficient area is available for deployment and that haul paths remain accessible without interference from outage equipment during refueling outages.

Comment [EEB43]: At what pressure?

Comment [J44]: Perhaps it's available anyway, but worth noting RCIC is not typically required by TS to be operable in cold shutdown.

Comment [J45]: Surprising that in an ELAP, closure of the drywell airlock could have so low a priority (phase 2 is after say 10 hours). Impact of stylized "no additional failures" assumption.

Comment [EEB46]: 12-06

Comment [EEB47]: Feasible.

Comment [J48]: This may have been a deliberate choice – prompt implementation of portable equipment may be plausible, but that it is generally feasible, from the standpoint of avoiding core damage without credit for installed equipment, etc., is not obvious. I'm not sure what initial condition is postulable here and what is out of bounds (e.g., vessel level / equipment availability), and hence what level of assurance is needed. Maybe they are only saying they will do the best they can in for some problematic initial conditions, without explicit warranty of the result?

References:

1. Edwin I. Hatch Nuclear Plant Technical Specifications & Bases, Revised 11-14-2012
2. Letter from Dr. Robert P. Kennedy to Mr. Donald P. Moore (Southern Company Services), "Hatch Condensate Water Tank," dated August 13, 1993 and attached calculation Hatch CWT dated 9/24/89, and Hatch Condensate Water Tank dated 8/10/93.
3. Email from Ken Whitmore to Bill Chenault, "CST Files No. 4 of 4," dated 9/11/2012
4. BWROG EPG Issue Number 1103, 3/1/12
5. Table Top Timeline performed by Hatch Operations Personnel for IER 11-4/FLEX Response

6. 0000-0143-0382-R0 (proprietary), GEH Feasibility Study of RCIC System Operation in Prolonged Station Blackout
7. GEH Letter Number 316004-004, J.W. Mays to Ron J. Bush, Transmittal of (proprietary) Response to ENERCON Letter WHC12-02 dated 8/10/12 concerning RPV make-up rates for RCIC and Portable Pumps based on RPV pressure, dated 10/03/2012
8. SNCH084-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0
9. NEDC-33771P, Project Task Report BWROG GEH Evaluation of FLEX Implementation Guidelines, Revision 0
10. 31EO-EOP-010-1 (2), RC RPV Control (Non-ATWS), Version 10.0
11. 34SO-E51-001-1(2), Reactor Core Isolation Cooling (RCIC) System, Version 8.0
12. 31EO-OPS-001-0, EOP General Information, Version
13. 34AB-E11-001-1(2), Loss of Shutdown Cooling, Version 3.13 (Version 6.11)
14. 31EO-EOP-100-1(2), Miscellaneous Emergency Overrides, Version 4.0
15. 34SO-P70-001-1 (2), Drywell Pneumatic System, Version 11.6
16. H16334, Sheet 1, RCIC System P&ID, Version 49.0
17. H16335, Sheet 2, RCIC System P&ID, Version 34.0
18. H26023, Sheet 1, RCIC System P&ID, Version 41.0
19. H26024, Sheet 2, RCIC System P&ID, Version 33.0
20. H16332, Sheet 1, HPCI System P&ID, Version 65.0
21. H26020, Sheet 1, HPCI System P&ID, Version 51.0
22. H12313, Outdoor Conc. Cond. Storage Tank Retaining Wall, Revision 2
23. H22401, Condensate Storage Tank Outdoor Concrete Slab and Wall Neat Line, Revision 7
24. SNCH084-CALC-001, Makeup Water and Its Impact on Suppression Pool Levels, Revision 0.0.
25. # TBD, Containment Analysis of FLEX Strategies (MAAP Calculation), Revision 0
26. BH1-M-V005-0047, NPSH Limits – HPCI and RCIC Pumps, Revision 7
27. BH1-M-V001-0038, Torus Water Level, Revision 1.0
28. 34SO-E41-001-1(2), High Pressure Coolant Injection (HPCI) System, Version 25.1
29. **Error! Reference source not found.**~~34SO-E51-001-1~~(2), Reactor Core Isolation Cooling (RCIC) System, Version 26.2 (24.0)
29. Hatch Nuclear Plant Unit 1 Final Safety Analysis Report," Revision 31, 11/12
30. Hatch Nuclear Plant Unit 2 Final Safety Analysis Report, Revision 31, 11/12
31. 0000-0147-5233-R0, BWROG Project Task Report, RCIC Pinch Points, Operation in Prolonged Station Blackout, Feasibility Study, Revision 0
32. S16844, RCIC Pump – Performance Test Data

Details:

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

SNC 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*

- Change power supply of containment instrumentation (torus temperature, pressure and level, drywell temperature and pressure) from the AC instrument buses to station batteries to provide continuous power to critical instruments so that critical containment parameters can be monitored throughout the event.
- Change emergency control room lighting from incandescent to LED bulbs to improve the station battery duration and reduce heat load in the MCR.
- Change Appendix R lighting from incandescent to LED to lengthen the duration of lighting required in critical areas of the plant (primarily HCVS operation areas, NRC Order EA-12-050)
- Label non-critical DC loads to allow operators to more readily identify the loads that will be shed during the Phase 1 deep load shedding activity.

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

Reactor Vessel Essential Instrumentation	**Safety Function**
RPV Level – WR (B21-LI-R604A, B) (Ref. 1)	Reactor vessel inventory and core heat removal
RPV Pressure (C32-PI-R605B, C) (Ref. 1)	Reactor vessel pressure boundary and pressure control
Containment Essential Instrumentation	**Safety Function**
Drywell & Torus Pressure (T48-PR-R608, R609) (Ref. 2)	Containment integrity
Drywell & Torus Temperature (T47-TR-R611, R612) (Ref. 3)	Containment integrity
Torus Water Level (T48-L/PR-R607A, B) (Ref. 2)	Containment integrity
Spent Fuel Pool Essential Instrumentation	**Safety Function**
SFP Level (Component # TBD)	SFP inventory

HNP will have the following key instruments remain available following load stripping due to their power sources:

- RPV Level – NR (C32-LI-R606B, C)
- RPV Level – WR (B21-L/PR-R623A, B)
- RPV Pressure (C32-PI-R605A)
- RPV Pressure - Local Indication P004 & P005 panels (B21-PI-R004A, B)
- Drywell Wide Range Radiation Monitor (T48-P/RR-R601A, B)
-

Comment [EEB49]: RCIC modifications?

Comment [J50]: The event description above appears to be based on knowledge of the CST level to support swapping of RCIC. Is CST level instrumentation necessary, or is this switchover an automatic action that is to occur outside the operator's field of vision, without verification in the control room?

Also, SRV positions? (at least for a few that may be preferentially used for pressure control?) Would be ideal, and parallel to the PWR instrumentation.

Comment [JL351]: Containment vent position (open / closed)?

Comment [EEB52]: EA-12-051?

Notes: The duration of each station battery was calculated to last at least 21 hours.

References:

1. H16063, Nuclear Boiler System P&ID, Version 37.0
2. H16024, Primary Containment Purge & Inerting System, P.&I.D., Version 51
3. H16007, Drywell Cooling System, Version 22.0

Comment [EEB53]: Refer to the calculation.

Comment [MM54]: This needs to be demonstrated by test.

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, as in Phase 1, reactor core cooling is maintained using RCIC in automatic mode (i.e. with operators controlling the RCIC flow controller) with suction from the CST. When CST grade water becomes depleted, RCIC suction will be swapped to the torus. RCIC will continue to inject water from the torus until the torus level reaches the torus low level limit and must be re-aligned to the CST. The torus water level will drop due to evaporation through the Hardened Containment Vent System (HCVS) which was operated to maintain containment parameters below design limits and RCIC operating parameters within acceptable limits (see the Maintain Containment response for additional discussion of the HCVS). During the time that RCIC suction is aligned to the torus the CST will be replenished by using portable FLEX pumps taking suction from the Ultimate Heat Sink (Altamaha River). The FLEX pumps will provide water to the CST via the existing RHRSW piping (between the intake structure and the reactor building), permanently installed FLEX piping in the reactor building, and a FLEX hose jumper from the reactor building to the CST. The portable FLEX pumps deployed near the Intake Structure at the river will be connected to the Division I seismically qualified RHRSW piping via FLEX hose and flanged connections at the Intake Structure. To provide makeup flow from RHRSW to the CST a FLEX hose jumper will be utilized between FLEX Connection #1 at a new Reactor Building penetration and the CST FLEX fill connection (see **Error! Reference source not found.**~~Figure~~ 1 and **Error! Reference source not found.**~~Figure 3~~)(Reference 16).

During Phase 2, reactor pressure is controlled by manual operation of SRVs as described in Phase 1. As backup to the nitrogen tank and the SRV accumulators, pre-staged emergency N2 bottles can be valved in per 34SO-P70-001-1 (2), Drywell Pneumatic System (Reference 13).

Use of raw water (Altamaha River) as a direct injection source was evaluated by GEH (Reference 14) for impact to fuel and heat transfer. GEH concluded that there would not be a serious threat to the fuel from use of river water, but stated that potential clogging of the inlet or outlet of the fuel bundles should be minimized by including some level of straining to minimize ingress of large quantities of debris with the river water. This recommendation is addressed by connecting to the RHRSW system upstream of the currently installed system strainers (D002A/B and D003A/B) (Reference 8) such that any river water injected is directed through the system strainers. The strainers are in parallel such that one remains in service while the other is in maintenance. In addition, the suction hose of the FLEX pumps is fitted with a strainer to prevent large debris from entering the suction of the pump.

The 125 VDC batteries are available for up to 21 hours without recharging (Reference 15). Connection to 600V Bus C and D provides the ability to power Battery Chargers A/B and D/E which charge the Batteries A and B and supply DC loads. The FLEX 600 VAC, 600 kW DG will be connected at approximately 12 hours and is sized to power two 125/250 VDC Battery Chargers, RHR Room Cooler and RHR Motor Operated Valves (MOVs) per division, and other selected

Comment [J55]: Agree straining is good, but it is not obvious, particularly for the core inlets, that clogging will not occur. For example, what is the service water strainer opening versus the fuel filter clearances? In the presence of doubt, one wonders whether the minimum downcomer level control point in this procedure is sufficient to ensure reflood through steam separators in case of inlet blockage?

Also, are the strainers self-cleaning based on flow, or is electrical power required?

Comment [MM56]: Same as previous comment. Licensees will need to show us that the existing batteries can perform the expected function for the assumed duration. ALSO, need to know the battery room temperature assumptions (concerned with electrolyte boiling/evaporation).

Comment [MM57]: Need to describe the fuel supply to this generator. What equipment will be loaded on this generator? Need more specifics on the capability and capacity of the generator.

Maintain Core Cooling
BWR Portable Equipment Phase 2:

loads. Permanently installed cables will be installed from a point near the switchgear to the exterior of the Control Building. The deployment area of the FLEX 600 VAC DG powering the 600 V bus will be located near the maintenance building (**Error! Reference source not found.**~~Figure 3~~). Cables from the generators are run to a connection point on the exterior of the Control Building (Reference 16).

Alternate Strategy

Providing defense in depth for RCIC, the FLEX pumps deployed at the river can provide RPV injection via the normal RHR injection flow path (see **Error! Reference source not found.**~~Figure~~ 1). The same connections from the river to the reactor building as used in the primary strategy will be able to supply water to the RHR SW header in the reactor building. The RHR system cross tie valves, E11-F073A(B) and F075A(B), will be opened so that makeup water can be injected via the normal RHR injection flow path. (References 2, 3, 4, and 5). Alternatively to RPV makeup via the normal RHR flow path, makeup flow be provided via a connection to the CRD system piping. This will be accomplished via permanent piping and hoses installed for utilization in the FLEX strategy with a connection to the control rod drive (CRD) system at Seismic Category II piping downstream of C11-F018 on the CRD pump test bypass piping. See **Error! Reference source not found.**~~Figure~~ 1, Flow Diagram for FLEX Strategies, which illustrates the makeup and injection strategies discussed above (Reference 6, 7, 9, 10, 11, and 12). If the RPV is still pressurized then SRVs will be opened to depressurize to a pressure at which the FLEX pumps can maintain RPV level (less than approximately 150 psig per Reference 16).

Comment [EEB58]: "… flow may be …?"

Comment [EEB59]: May be acceptable as an alternate strategy.

Phase 2 strategies for makeup water during Modes 4-5 will be identical to core cooling strategies during Operation, Startup, and Hot Shutdown modes. FLEX pumps will take suction from the UHS/river and discharge into the RHRSW piping (to cross-connect into the RHR injection flow path), or discharge into the CRD connection as shown in Figure 1, Flow Diagram for FLEX Strategies.

As an alternate strategy to power the battery chargers from their 600 VAC electrical buses, a welding receptacle type of connection point will be installed on each of the battery chargers. This will allow connecting power cables from the FLEX 600 VAC DG directly to the battery charger via the welding receptacle (Reference 16).

References:

1. 31EO-EOP-010-1 (2), RC RPV Control (Non-ATWS), Version 10.0
2. H16329, Sheet 1, RHR System P&ID, Version 78.0
3. H16330, Sheet 2, RHR System P&ID, Version 66.0
4. H26014, Sheet 1, RHR System P&ID, Version 63.0
5. H26015, Sheet 2, RHR System P&ID, Version 56.0
6. H26006, Sheet 1, Control Rod Drive System P&ID, Version 30.0
7. H26007, Sheet 2, Control Rod Drive System P&ID, Version 45.0

Maintain Core Cooling	
BWR Portable Equipment Phase 2:	
8. H21039, R.H.R. Service Water System P. & I. D., Version 45.0 9. A2100, Piping Class Summary a. 2C11A, Revision 1.0 b. 2G41A Revision 0 c. 2N21A Revision 0 10. A1100, Piping Class Summary a. 1C11A, Revision 1.0 b. G41A Revision 0 c. N21A Revision 0 11. NEDC-33771P, Project Task Report BWROG GEH Evaluation of FLEX Implementation Guidelines, Draft A 12. H16065, Sheet 2, Control Rod Drive System P&ID, Version 49.0 13. 34SO-P70-001-1 (2), Drywell Pneumatic System, Version 11.6 14. GEH Response to ENERCON Information Request WHC 12-004 (proprietary), Regarding Use of River Water for Reactor Vessel Injection During ELAP Conditions 15. SNCH084-CALC-002, Station Service Battery Discharge Capacity During Extended Loss of All AC Power, Revision 0.0 16. SNCH084-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
SNC 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 connection points on the RHRSW piping at the intake structure for the FLEX pump discharge hose connection. (Primary and alternate strategies) (This modification also provides sufficient capacity to connect the larger RRC pump to the RHRSW piping to provide flow to the RHR HXs for SDC or torus cooling). • Install connection points on the RHRSW piping in RB to provide makeup flow to CST, SFP, vessel injection flow via RHR or CRD, and cooling water flow to RHR, MCR, and RCIC room coolers. (Primary and alternate strategies)	

<table>
<tr><td colspan="2">Maintain Core Cooling</td></tr>
<tr><td colspan="2">BWR Portable Equipment Phase 2:</td></tr>
<tr><td colspan="2">

Install new RB penetration and modify existing RB penetration to facilitate connection points for hose to provide makeup flow to CST. (Primary strategy)
Install new connections at CST for makeup from the FLEX pumps via the RHRSW piping. (Primary strategy)
Install hose connection point at CRD piping for alternate method of direct injection. (Alternate strategy)
Add connection points and cabling at control building wall to connect FLEX 600 VAC diesel generators to the 600 VAC Bus C and Bus D to provide power to battery chargers and critical AC components. (Primary strategy)
Add connection points and transfer switches locally at battery chargers to provide for direct connection from 600 VAC DGs. (Alternate strategy)

</td></tr>
<tr><td>Key Reactor Parameters</td><td>List instrumentation credited or recovered for this coping evaluation.</td></tr>
<tr><td colspan="2">Same as instruments listed in above section, Core Cooling Phase 1</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2">Storage / Protection of Equipment :
Describe storage / protection plan or schedule to determine storage requirements</td></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 section 11. The schedule to construct the structures is still to be determined.

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

</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">Not applicable per NEI 12-06 as outlined within the first section of this Integrated Plan.</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 section 11. The schedule to construct the structures is still to be determined.

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

</td></tr>
<tr><td>Snow, Ice, and Extreme Cold</td><td>List how equipment is protected or schedule to protect</td></tr>
</table>

Maintain Core Cooling		
BWR Portable Equipment Phase 2:		
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. • HNP procedures and programs are being developed to address storage structures requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to HNP.		
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. • HNP procedures and programs are being developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to HNP.		
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 yet been decided. **Error! Reference source not found.**~~Figure 3~~ identifies clear deployment paths onsite for the transportation of FLEX equipment. For this function a clear deployment path has been shown from the identified roads to the Intake Structure and FLEX pump staging areas next to the Altamaha River.	• Construct staging area at the UHS (river) for FLEX pump operation, including ramps that will allow access to the river for pump suction over the possible range of water levels. (Primary and alternate strategies)	• 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 at the exterior of the RB for CST fill capability from the FLEX pumps 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 outside the Intake Structure and designed to withstand the applicable hazards.

Maintain Core Cooling		
BWR Portable Equipment Phase 2:		
		• Electrical connection points for the FLEX 600 VAC DGs will be established at the control building west wall and designed to withstand the applicable hazards.

Notes:

References:

1. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide", Rev. 0, August 2012

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 RHR into the Shutdown Cooling mode. This will be accomplished by powering up a Division I or II RHR pump from the Class 1E emergency E or G 4160 V bus utilizing a 4160 VAC RRC FLEX portable diesel generator (i.e., from the RRC) and supplying the RHR Heat Exchanger with river water with a large portable RRC FLEX pump (i.e., from the RRC) at the intake structure via the RHRSW piping (Reference 1). The 4160 V RRC FLEX diesel generator will be capable of carrying approximately 3250 kW load which is sufficient to carry all of the loads on 4160 V bus E or G necessary to support the Phase 3 FLEX strategies which includes an RHR pump and its support equipment (i.e., MOVs, jockey pump, room coolers, etc.). The RRC FLEX pump will be sized to provide sufficient flow to the RHR heat exchanger to support SDC or Torus Cooling modes of RHR. This strategy for SDC can be accomplished utilizing a single large RRC FLEX pump or multiple RRC FLEX pumps, depending on pump sizes available from the RRC. In order to prevent pipe damage due to water hammer, the jockey pumps will be repowered to allow proper venting prior to RHR shutdown cooling operation. The primary strategy is provided by RHR A(B) and the secondary strategy is provided by RHR B(A) (Reference 1). *Alternative Strategy* Alternate means of core cooling can be provided by connecting to and using the opposite division of RHR and RHRSW as that used for the primary function. An alternate means of providing power to the RHR pumps for SDC operation is to run 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. References: 1. SNCH084-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
SNC 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.	

Maintain Core Cooling	
BWR Portable Equipment Phase 3:	
Identify modifications	*List modifications*
• Add connection point to RHRSW at Intake Structure with sufficient capacity to support the larger RRC pumps used for SDC and torus cooling. (This is same modification noted in the Core Cooling Phase 2 section above) (Primary Strategy) •	
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*
Phase 3 equipment will be provided by the Regional Response Center (RRC) which is to be located in Memphis, TN. Equipment transported to the site will be either immediately staged at the point of use location (pumps and generators) or temporarily stored at the lay down area shown on Figure 3 until moved to the point of use area. Deployment paths identified on Figure 3 will be used to move equipment as necessary.	No modifications identified for Phase 3 deployment issues	• The FLEX/RRC pump makeup connections at the Intake Structure and connection points at RB penetrations will be designed to withstand the applicable hazards or have diverse connections. • All other equipment will be portable
Notes:		

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)**
BWR 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 and HCVS. In accordance with NEI 12-06 (Reference 5), the containment is assumed to be isolated following the event. As the torus heats up and the water begins to boil, the containment will begin to heat up and pressurize. Additionally, the torus level rises due to the transfer of inventory from the CST to the torus (via RCIC and SRVs). According to MAAP analysis (Reference 3) the limiting containment parameter will be the torus level which increases to the SRVTPLL (Unit 1 is bounding) at approximately 7.5 hours. Because it is necessary to ensure the capability of SRVs to perform the pressure relief function without damaging the containment it is necessary to reduce inventory in the torus. This is accomplished by venting the containment. In this case, the HCVS is used as implemented per EA-12-050, Reliable Hardened Containment Vents (Reference 4) with control from the main control room (MCR) or remote operating station. The torus temperature is also a limiting factor for implementation of the ELAP strategy (Reference 3). As discussed in Phase 1 Core Cooling section above, RCIC suction temperature will be allowed to go as high as 230°F. At the time that RCIC suction is swapped from the CST to the torus, torus temperature is approximately 220°F and rapidly increasing (Reference 3). By opening the HCVS at approximately the 7.5 hour point, the temperature peaks at approximately 225°F at approximately 8.6 hours (Reference 3). The containment design pressure is 56 psig (Reference 1, HNP-1 FSAR Section 5.2.2.2 and HNP-2 FSAR Section 6.2.3.1.1). Containment pressure limits are not expected to be reached during the event as indicated by MAAP analysis (Reference 3), because the HCVS is opened prior to exceeding any containment pressure limits. Thus, containment integrity is not challenged and remains functional throughout the event. As indicated by MAAP analysis (Reference 3), the containment will require venting with the Reliable Hardened Vent (RHV) system at approximately 7.5 hours after event initiation. Monitoring of containment (drywell) pressure and temperature will be available via normal plant instrumentation. Phase 1 (i.e., the use of permanently installed plant equipment/features) of containment integrity is maintained throughout the duration of the event; no non-permanently installed equipment is required to maintain containment integrity. Therefore, there is no defined end time for the Phase 1 coping period for maintaining containment integrity. An alternative strategy for containment

Comment [JL360]: As such, why is it not preferable to allow RCIC to switch to the torus early in the event? While it does begin to use the suppression pool grade water earlier, allowing the switch to the torus could be advantageous from the perspective of husbanding CST water and reducing the quantity of raw water that needs to be injected.

Comment [EEB61]: HCVS?

[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.

during Phase 1 is not provided, because containment integrity is maintained by the plant's design features.

References:

1. Hatch Nuclear Plant Unit s 1 and 2 Final Safety Analysis Report, Revision 31, 11/12
2. 31EO-EOP—012-1, (2), PC Primary Containment Control
3. # TBD, Containment Analysis of FLEX Strategies (MAAP Calculation), Revision 0
4. EA 12-050, Interim Staff Guidance, "Reliable Hardened Containment Vents", Revision 0
5. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide", Rev. 0, August 2012

Details:

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

HNP EOP, 31EO-EOP-013-1(2), Primary Containment Control exists to direct operators in protection and control of containment integrity.

SNC 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*

Comment [EEB62]: Lighting modifications discussed above.

Hardened Containment Vent System (HCVS) (i.e., Reliable Hardened Vent) is currently installed but will be enhanced 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 & Torus Pressure (T48-PR-R608, R609) (Ref. 1)	Containment integrity
Drywell & Torus Temperature (T47-TR-R611, R612) (Ref.2)	Containment integrity
Torus Water Level (T48-L/PR-R607A, B) (Ref.1)	Containment integrity
Containment Harden Vent Rad Monitor (Component No. TBD)	RHVS effluent radioactivity
RHV system valve position indication (Component No. TBD)	RHVS operability
RHV system pressure indication (Component No. TBD)	RHVS operability
RHV system power status	RHVS operability
Nitrogen system supply status (Component No. TBD)	RHVS operability
RHV effluent temperature (Component No. TBD)	RHVS operability

Notes:

References:

1. H16024, Primary Containment Purge & Inerting System, P.&I.D., Version 51
2. H16007, Drywell Cooling System, Version 22.0

<table>
<tr><td colspan="2" align="center">Maintain Containment</td></tr>
<tr><td colspan="2" align="center">BWR Portable Equipment Phase 2:</td></tr>
<tr><td colspan="2">Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain containment integrity. 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. No portable equipment is required. See Phase 1 description for discussion of containment integrity applicable throughout the event.</td></tr>
<tr><td colspan="2" align="center">Details:</td></tr>
<tr><td>Provide a brief description of Procedures / Strategies / Guidelines</td><td>Confirm that procedure/guidance exists or will be developed to support implementation</td></tr>
<tr><td colspan="2">See procedures listed in Phase 1 section</td></tr>
<tr><td>Identify modifications</td><td>List modifications</td></tr>
<tr><td colspan="2">See modifications listed in Phase 1 section</td></tr>
<tr><td>Key Containment Parameters</td><td>List instrumentation credited or recovered for this coping evaluation.</td></tr>
<tr><td colspan="2">See instrumentation listed in Phase 1 section</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2" align="center">Storage / Protection of Equipment :
Describe storage / protection plan or schedule to determine storage requirements</td></tr>
<tr><td>Seismic</td><td>List how equipment is protected or schedule to protect</td></tr>
<tr><td colspan="2">The HCVS is currently installed but will be enhanced in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents and guidance in JLD-ISG-2012-02. The HCVS will meet the design requirements as specified for reasonable protection per NEI 12-06.</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">Not applicable per NEI 12-06 as outlined within the first section of this Integrated Plan.</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">The HCVS is currently installed but will be enhanced in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents and guidance in JLD-ISG-2012-02. The HCVS will meet the design requirements as specified for reasonable protection per NEI 12-06.</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">The HCVS is currently installed but will be enhanced in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents and</td></tr>
</table>

Comment [EEB63]: But see the discussion of portable N2 bottles on page 5.

Maintain Containment		
BWR Portable Equipment Phase 2:		
guidance in JLD-ISG-2012-02. The HCVS will meet the design requirements as specified for reasonable protection per NEI 12-06.		
High Temperatures	*List how equipment is protected or schedule to protect*	
The HCVS is currently installed but will be enhanced in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents and guidance in JLD-ISG-2012-02. The HCVS will meet the design requirements as specified for reasonable protection per 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*
HCVS is designed as permanently installed equipment. No deployment strategy is required.	The Hardened Containment Vent System (HCVS) is currently installed but will be enhanced in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents and guidance in JLD-ISG-2012-02.	HCVS is designed as permanently installed equipment. No connection points are required.
Notes:		

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 containment integrity. Identify methods (containment vent or alternative / Hydrogen Igniters)and strategy(ies) utilized to achieve this coping time. **See Phase 2 discussion.**		
Details:		
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*	
See Phase 2 discussion.		
Identify modifications	*List modifications*	
See Phase 2 discussion.		
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*	
See Phase 2 discussion.		
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*
See Phase 2 discussion.	See Phase 2 discussion.	See Phase 2 discussion.
Notes:		

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**	
BWR 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 There are no phase 1 actions required at this time that need to be addressed. Fuel in the SFP is cooled by maintaining 21' of water over top of fuel.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
Phase 1 strategy is to use plant design to maintain cooling to fuel in the SFP. Water level is maintained at least 21 feet above the top of irradiated fuel assemblies seated in the SFP (Reference 1).	
Identify modifications	*List modifications*
Modification to install SFP level instrumentation per Order EA-12-051	
Key SFP Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Per NRC Order EA-12-051	
Notes: <u>References</u> 1. 34SO-G41-003-1(2), Fuel Pool Cooling and Cleanup System, Version 20.27 (23.31)	

[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
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 21 feet (Reference 2, Specification 3.7.8) over the top of the stored spent fuel. Using the design basis maximum heat load, the SFP water inventory will heat up from 110°F to 212°F during the first 12 hours for Unit 1 and Unit 2 (Reference 7). Thus, the transition from Phase 1 to Phase 2 for SFP cooling function will occur at approximately t= 12 hours. The required makeup rate to maintain the fuel pool filled during this time is 24 gpm (Reference 7). 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 onsite and offsite. Note that the time to boil is determined from the design basis decay heat load in the spent fuel pool. The design basis spent fuel pool heat load is the heat load 30 days following a refueling outage (Reference 1, HNP-2 FSAR Section 9.1.2.3.1). More realistic time dependent heat loads post-shutdown are available in procedures 34AB-G41-001-1 and 34AB-G41-001-2 (References 4 & 5). Makeup to the SFP will be provided by one of three baseline capabilities. Full Core Offload Calculation SMNH 98-019 (Reference 7) concludes that the time to boil in the SFP for a core offload is 4.2 hours, and the water loss is 72 gpm. 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 onsite and offsite. Thus, Phase 2 actions after 8 hours is acceptable because only 3.52 feet of level (16,416 gallons) will have evaporated by T=8 hours (Reference 9). See Cold Shutdown and Refueling discussion in Core Cooling section for discussion on actions required if an ELAP occurs during a refueling outage. *Primary Strategy Method 1* The first method is with the FLEX pump connected and providing flow to the RHRSW system piping at the Intake Structure, and cross-connecting the RHRSW system to the RHR system (i.e., opening E11-F073B and F075B). Reversal of a spectacle flange in the line between the RHR system and Fuel Pool Cooling (FPC) system is required (Reference 6). Then, the RHR to SFP cooling assist valves, G41-F020B and G41-F011B, are opened, thus providing makeup flow to the SFP through spargers in the SFP via seismically qualified piping. The required head at a 50 gpm flow rate is about 180 ft (80 psi) (Reference 8). The flow and pressure provided by the FLEX pump is sufficient to meet these requirements. *Primary Strategy Method 2* The second method to provide water to the SFP utilizes the FLEX pump connected to the RHRSW piping at the intake structure to supply water to the new FLEX piping in the reactor building. A branch line will be provided that terminates on the refueling floor with a hose connection. A hose long enough to reach the SFP will be pre-staged nearby to allow filling of the SFP utilizing river water (primary source) via FLEX pump. The flow requirement for this mode is 24 gpm which is

Comment [EEB64]: But see FSAR Section 9.1.3.2.2 regarding the core offload heatload, which would be limiting.

Comment [EEB65]: Should use this number as minimum flowrate for strategies.

Comment [EEB66]: Why was 50 chosen?

Comment [EEB67]: Why was 24 chosen?

Maintain Spent Fuel Pool Cooling	
BWR Portable Equipment Phase 2:	
easily supplied by the FLEX pump. *Primary Strategy Method 3* The third method to provide water to the SFP utilizes the FLEX pump connected to the RHRSW piping at the intake structure to supply water to the new FLEX piping in the reactor building. A branch line will be provided that terminates on the refueling floor with a hose connection. A hose long enough to reach the SFP will be prestaged nearby to allow connection to a monitor spray nozzle on the refuel floor. The monitor spray nozzle will be used as necessary to provide spray flow over the SFP. According to the NEI 12-06 guide, a 250 gpm flow rate is required for a SFP spray. The required head at this flow rate is about 270 ft (120 psi) (Reference 8). The flow and pressure provided by the FLEX pump is sufficient to meet the NEI requirement (Reference 9). *Alternate Strategy* In addition, a FLEX pump with suction from the CST is capable of pumping water to the SFP via the same flow path described above. <u>References</u>: 1. Hatch Nuclear Plant Units 1 and 2 Final Safety Analysis Report, Revision 31, 11/12 2. Edwin I. Hatch Nuclear Plant Technical Specifications & Bases, Revised 11-14-2012 3. 31EO-TSG-001-0, Technical Support Guidelines, Version 8.0 4. 34AB-G41-001-1, Loss of Fuel Pool Cooling, Version 3.4 5. 34AB-G41-001-2, Loss of Fuel Pool Cooling, Version 4.3 6. H16329, Sheet 1, RHR System P&ID, Version 78.0 7. SMNH 98-019, Fuel Pool Time To Boil, Revision 2.0 8. SNCH084-CALC-003, FLEX Pump Requirements, Revision 0 9. SNCH084-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0	
Schedule:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
SNC 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*
• Modification to install SFP level instrumentation per Order EA-12-051 • Modification to install hard pipe from the RHRSW connection on the 130' elevation of the RB	

Maintain Spent Fuel Pool Cooling		
BWR Portable Equipment Phase 2:		
to the refuel floor with connections for the hoses that will provide makeup flow and spray flow.		
Key SFP Parameters	*List instrumentation credited or recovered for this coping evaluation.*	
Per NRC Order EA-12-051		
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**		
Seismic	*List how equipment is protected or schedule to protect*	
Permanent piping systems used to provide water from the intake structure to the plant is the RHRSW piping which is seismically qualified. New pipes 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*	
Not applicable per NEI 12-06 as outlined within the first section of this Integrated Plan.		
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 **(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*

Maintain Spent Fuel Pool Cooling		
BWR Portable Equipment Phase 2:		
• The pumps used to provide the SFP cooling and makeup functions are the same FLEX pumps described in the Core Cooling section. See Phase 2 Core Cooling for discussion of deployment strategy for FLEX pumps. • The monitor spray nozzle and fire hoses needed to spray and or makeup to the SFP will be kept at an accessible and protected area of the refueling floor or reactor building.	• See Phase 2 Core Cooling for discussion of modification necessary to deploy the FLEX pumps. • Piping modifications will be installed to provide flow from the RHRSW piping on the 130' elevation of the RB to the refueling floor.	See Phase 2 Core Cooling for discussion of protection of connection points for FLEX pumps.
Notes:		

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. Same as Phase 2.		
Schedule:		
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*	
N/A		
Identify modifications	*List modifications*	
Modification to install SFP level instrumentation per Order EA-12-051		
Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation.*	
Spent Fuel Pool Level Per Order EA-12-051		
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*
See Phase 2 discussion	See Phase 2 discussion	See Phase 2 discussion
Notes:		

Safety Functions Support
Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications.
BWR Installed Equipment Phase 1
Provide a general description of the coping strategies using installed equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy(ies) utilized to achieve coping times. <u>Main Control Room Habitability</u> Under ELAP conditions with no mitigating actions taken, initial analysis projects the control room to surpass 110°F (the assumed maximum temperature for efficient human performance as described in NUMARC 87-00 (Reference 2)) in a time of approximately 9 hours. The Phase 1 FLEX strategy is to block open the entrance air lock at the stairwell to the MCR and the lower stairwell doors coupled with the opening of the outside freight elevator doors when the MCR temperature reaches 96°F (the assumed outside temperature at the time of event occurrence). This will establish a flow path for air to flow from the control building (and outside) 130' elevation to the MCR. The preliminary assessment indicates that by employing this strategy the MCR temperature will rise to approximately 108°F at the 9 hour point by which time phase 2 actions can be implemented (Reference 4). See Phase 2 discussion below. <u>RCIC Room Habitability</u> The design area temperature limit for equipment qualification is 295°F as listed in HNP-1 FSAR Tables 7.16-7 and HNP-2 FSAR Table 3.11-1. For long term operation (6 months), the safety-related components of the RCIC room are designed to operate with area temperatures of 148 °F as discussed in the HNP-1 FSAR Section 10.18.5 and HNP-2 FSAR Section 9.4.2.2.3 (Reference 1). The existing GOTHIC calculation SMNH-12-008 (Reference 3) explores different cases of room heat up with a loss of all cooling. The transients evaluated by this calculation last 8 hours for purposes of immediate operator action determination. Under the Station Blackout case the temperature remains below 148°F for the entire transient of 8 hours. To determine the temperature impact to the RCIC room over an extended period, the curves in the above calculation were extrapolated to 72 hours. The extrapolation indicated that temperature in the RCIC room will rise to approximately 131°F in approximately 72 hours. Thus RCIC room temperature is maintained well below design limits during RCIC operations in Phase 1. For the purposes of NEI 12-06 it is not anticipated that continuous habitability would be required in the RCIC room. If personnel entry is required into the RCIC room then personal protective measures such as ice vests will be taken. <u>References</u>: 1. Hatch Nuclear Plant Units 1 and 2 Final Safety Analysis Report, Revision 31, 11/12 2. NUMARC 87-00, Station Blackout, Revision 1

Comment [EEB68]: What ambient temperature was assumed for analysis?

Comment [EEB69]: Why is the extrapolation valid?

Comment [MM70]: What about battery room temperature?

Comment [EEB71]: How are ice vests made available in SBO or ELAP conditions?

[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.

3. SMNH-12-008, Transient Analysis for Hatch Unit 1 & 2 RCIC Pump, Revision 1.0. 4. SNCH084-CALC-004, Hatch Main Control Room Heatup Evaluation during an Extended Loss of all AC Power, Revision 0	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
SNC 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*
Modification to enclose the small open area between the MCR entrance stairwell door and the MCR entrance on the turbine deck elevation to allow flow path for airflow from the 130' elevation of the control building to the MCR.	
Key Parameter	*List instrumentation credited for this coping evaluation phase.*
Temperature indication for the MCR is available from a battery powered thermometer that is mounted in the center of the MCR. Additionally, several battery operated portable temperature instruments are available if necessary from the Instrument and Control (I&C) shop.	
Notes:	

Comment [EEB72]: Spare batteries?

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

Primary Strategy

The primary strategy for maintaining the environment of the MCR during Phase 2 will be the employment of a portable fan in the stairwell and MCR doors. The fan will be powered by a portable FLEX diesel generators to initiate a forced air flow path up the stairwell in the control building and through the MCR, replacing hot MCR air with cooler air from the lower control building elevations and outside via the 130' elevation freight elevator doors.

Alternative Strategy

An alternate strategy for maintaining the environment of the MCR during Phase 2 is to power the MCR chillers and air handling units if the 600 VAC switchgear is energized with the FLEX 600 VAC DG. Cooling water will be provided to the control room air conditioning units by cross-connecting RHRSW to the reactor building service water piping that supplies cooling water to the MCR air conditioning units (References 4 and 7). The new FLEX cross-connection will provide the means to supply 120 gpm each to two of the MCR air conditioning units.

RCIC Room Habitability

Primary Strategy

The primary strategy for maintaining the environment of the RCIC room will use the same strategy as in Phase 1 section above. Based on extrapolation of the heat up curves in existing GOTHIC calculation SMNH-12-008 (Reference 9), temperature in the RCIC room will rise to approximately 131°F in approximately 72 hours. Thus RCIC room temperature is maintained well below equipment design limits during RCIC operations in Phase 1, Phase 2, and Phase 3.

Comment [EEB73]: Why is extrapolation valid?

Alternative Strategy

It is not anticipated that habitability of the RCIC room will be required, however, if personnel habitability becomes necessary then a method of cooling or exhausting heat from the RCIC room will be established. The room cooler will be powered after the 600 V FLEX diesel generators have been connected as emergency power. Cooling water from the RHRSW system will be supplied for the room coolers.

RCIC room flooding

RCIC room flooding will be evaluated and action taken to mitigate the effects.

Engineered Safety Feature (ESF) Switchgear Rooms

For Phase 2, the rooms containing the 600 VAC ESF switchgear will be begin to heat up as the switchgear is energized by the FLEX 600VAC DGs; therefore, they were evaluated for limiting temperatures for equipment survivability. The calculations performed for Station Blackout (Reference 10), indicate that switchgear rooms rise to 135°F at the end of a four hour coping period.

Safety Functions Support
BWR Portable Equipment Phase 2
Under ELAP conditions, both units' switchgear are deenergized at the onset of the ELAP and remain deenergized until Phase 2 when portions of the switchgear are reenergized by the FLEX 600 VAC DGs. Therefore, in Phase 2 following the energization of some of the 600 VAC switchgear by the FLEX 600 VAC DGs the rooms will begin to heat up and a coping period for the duration of Phase 2 must be considered. Per drawing H-26093 (Reference 3) the design basis temperature limit for the Control Building HVAC system is 110°F. HNP-2 FSAR Section 9.4.7.2.8 (Reference 1) describes the Control Building HVAC System that supplies the 600 VAC switchgear areas. The Unit 1 and 2 switchgear areas are cooled using outside air only. HNP-2 FSAR Section 9.4.7.2.8 states: "A maximum temperature of 110°F is maintained when the outside air is 95°F." An acceptable strategy for heat removal from the switchgear rooms is the establishment of a method to exhaust the heat to the outside by means of portable exhaust fans. Note the 4160 VAC switchgear is not energized during the Phase 2 coping period. <u>Battery Room Ventilation</u> During battery charging operations in Phase 2 and 3, ventilation is required in the main battery rooms due to hydrogen generation. The battery rooms are not evaluated for heat loads because the resultant temperature rise is negligible (Reference 11). The calculation of main battery room hydrogen generation determines that hydrogen levels reach 2% in 1.98 days (Reference 8). Because the battery load calculations indicate the batteries will remain with sufficient power for at least 21 hours (Reference 12), the batteries will likely not be placed on charge until at least 12 hours after event initiation. Hydrogen generation does not occur unless the batteries are on charge. Two percent (2%) hydrogen will not occur before approximately 2 ½ days (i.e., 1.98 days plus 12 hours). Therefore, Phase 2 strategies can safely be used to establish a means to ventilate the rooms. There are two strategies for venting the battery rooms. The primary strategy is to repower the existing emergency exhaust fans which are connected to the Emergency Power bus. This will occur after the FLEX DG has been connected to power the 600 V bus. The alternate strategy is to prop open doors and set up portable fans. <u>Spent Fuel Pool Area</u> 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. The roof of the reactor refueling floor is equipped with vents (Reference 5 and 6) designed to open/operate automatically on a pressure differential of 55 lb/ft^2 between the secondary containment and the outside atmosphere (Reference 1, HNP-1 FSAR Section 3.3.2.3 and HNP-2 FSAR Section 3.3.2.3). However, under Station Blackout conditions, the roof vents have no power to operate and must be operated manually. Manual operation of the roof vents is required at the time that the SFP commences boiling, at approximately 12 hours into the event. The SBO/FLEX strategy to cope with the pressurization of the refueling floor and prevent buildup of steam and condensation is to operate the vents using the manual "pull chains" from the roof of the reactor building and/or to open the air lock doors. Both of these strategies are provided in the Technical Support Guidelines (Reference 2, Attachment 20.). In order to establish flow of air through the SFP area it is necessary to open stairwell doors at the refuel floor elevation and the 130' elevation. Additionally, a door to the outside (through secondary

Comment [EEB74]: Doesn't match the extreme high temperature documented in FSAR Section 2.3.2.2. Why is this valid both here and in the FSAR?

Comment [MM75]: Not just for hydrogen generation. Battery room heat up can impact battery performance, potentially leading to boiling/evaporation of electrolyte.

Safety Functions Support	
BWR Portable Equipment Phase 2	
containment) must be opened. <u>Spent Fuel Pool Gate Seals</u> Removable gates are provided at the transfer canal of the SFP to facilitate movement of fuel during refueling operations. The gates have pneumatic seals that prevent water from leaking out of the SFP when water on the reactor cavity side of the gate is lower than that of the SFP. The seals are supplied by the service air system with a backup supply from an accumulator that provides sufficient air to keep the gate seal pressurized for 24 hours as noted in HNP-1 FSAR Section 10.11.3 (Reference 1). During Phase 2 the SFP gate seals are pressurized as necessary by valving in backup air from the FLEX air compressor located on the east side of the RB. The air compressor is connected at the reactor building penetration and supplies the gate seals via hard pipe run from the 130' elevation to the refueling floor and to the service air system that supplies the gate seals. In addition, the gate seals can be pressurized using backup nitrogen bottles in accordance with procedure 34SO-P51-002, Instrument and Service Air System. <u>References</u>: 1. Hatch Nuclear Plant Units 1 and 2 Final Safety Analysis Report, Revision 31, 11/12 2. 31EO-TSG-001-0, Technical Support Guidelines, Version 8.0 3. H26093, Control Building Ventilation P&ID and Process Flow Diagram, Version 15. 4. H16011, Reactor Building Service Water System P&ID, Version 69.0 5. 116. H22804, Architectural Turbine Building Floor Plan- El 130'-0" (UON) , Version 5.0 6. H15857, Architectural Roof Plan, Version 9.0. 7. H11609, Sheet 2, Service Water Piping 8. BH2-M-0385, Station Battery Room Hydrogen Concentration – Units 1& 2, Revision 6.0 9. SMNH-12-008, Transient Analysis for Hatch Unit 1 & 2 RCIC Pump, Revision 1.0. 10. BH2-M-0578, HNP-1, 2 Control Building Heatup due to Station Blackout, Revision 0.0 11. X4C1500523, Miscellaneous Plant Area SBO Ambient Temperature Analysis [Vogtle Unit 2], Revision 4 12. SNCH084-CALC-002, Station Service Battery Discharge Capacity During Extended Loss of All AC Power, Revision 0.0.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
SNC 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*

Safety Functions Support		
BWR Portable Equipment Phase 2		
• Enclose the small area between the MCR entry door and the 160'elevation door of the stairwell leading to the MCR to create a path for continuous flow of air from the 130' elevation to the MCR • Modify RB penetrations for connection points for air compressors • Modify air supply to the gate seals to provide backup air from a FLEX air compressor. This will involve running hard pipe from the 130' elevation of the RB to the refuel floor gate seal accumulator tank. • Modify RHRSW and RB Service Water system to provide a cross-connect to supply cooling water for MCR chillers, RCIC room coolers, and RHR room coolers		
Key Parameter	*List instrumentation credited for this coping evaluation phase.*	
None		
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**		
Seismic	*List how equipment is protected or schedule to protect*	
FLEX air compressors will be stored in storage buildings designed and protected for seismic concerns in accordance with 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*	
Not applicable per NEI 12-06 as outlined within the first section of this Integrated Plan.		
Severe Storms with High Winds	*List how equipment is protected or schedule to protect*	
FLEX air compressors 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*	
FLEX air compressors 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*	
FLEX air compressors will be stored in storage buildings designed and protected for high temperatures in accordance with NEI 12-06.		
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how	*Identify modifications*	*Identify how the connection is*

Safety Functions Support		
BWR Portable Equipment Phase 2		
the equipment will be deployed to the point of use.		*protected*
The pumps used to provide the cooling water to the room coolers for RCIC and MCR are the same FLEX pumps described in the Core Cooling section. See Phase 2 Core Cooling for discussion of deployment strategy for FLEX pumps. The fans and air compressors that will be deployed for room cooling and SFP gate seals will be stored in the FLEX Storage Building and deployed via identified and evaluated haul routes to the power block and their staging areas.	One reactor building penetration will be modified to provide connection points for the FLEX air compressor to provide air to the gate seals on the refueling floor. No other modifications are necessary, beyond those already identified (buildings, roads, etc.) for deployment of the strategies associated with the Phase 2 support function	Connection points for the FLEX air compressors will be protected from missile hazards.
Notes:		

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

The primary and secondary strategies for cooling the MCR are the same in Phase 3 as for Phase 2. However, the power for the MCR chillers and air handling units may be powered from the 4160 VAC emergency bus if it has been energized by RRC FLEX 4160 VAC DG instead of the FLEX 600 VAC DG.

Comment [MM76]: Need to describe loading capability and fuel capacity of the FLEX DG and provide a list of equipment loads (with loading requirements) that need to be supplied.

Comment [MM77]: Need to describe the cable runs/configuration when using these generators.

RHR Room Habitability

As part of Phase 3 strategies, an RHR pump is placed into service in order to perform torus cooling and shutdown cooling. This results in heat addition to the RHR pump diagonal due to heat generated by the RHR pump motor as well as heat dissipated from the associated piping and RHR heat exchanger. For long term RHR pump operation, the RHR pump room must be cooled to maintain room temperatures within acceptable ranges (limited by maximum allowable RHR pump motor requirements). RHR Room Heat Up Analysis with Loss of Ventilation calculation, BH2-M-0625 (Reference 2), documents a temperature of 196°F after operating one RHR pump, one RHR HX, and RHR piping for 24 hours without ventilation. RHR Room Heat up with Loss of Ventilation calculation, BH2-M-0560 (Reference 3), for post Loss of Coolant Accident (LOCA) heat up has a temp of 148°F after operating for 1.5 hrs with one RHR pump and one RHR heat exchanger. Each of these calculations indicates that the RHR room will reach its maximum design criteria of 148°F following a loss of ventilation. During an ELAP, this limit would be significantly exceeded, as shown in the calculation BH2-M-0625 (Reference 2). Mitigating actions will therefore be employed to prevent the RHR room from surpassing its design maximum of 148°F as described in the FSAR (Reference 1, HNP-1 FSAR Section 10.18.5 and HNP-2 FSAR Section 9.4.2.2.3). This can be accomplished once the RRC 4160V FLEX DG is connected to the 4160 VAC emergency bus at which time the RHR room cooler can be energized and cooling water supplied from the FLEX pump via the FLEX connections provided between the RHRSW piping and PSW cooling water supply piping.

Alternate means of cooling the RHR rooms if the RHR room coolers are not available is to use portable exhaust fans and hose trunks to exhaust hot RHR room air to outside the reactor building.

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.

References:

1. Hatch Nuclear Plant Units 1 and 2 Final Safety Analysis Report, Revision 31, 11/12
2. BH2-M-0625, RHR Room Heat Up Analysis with Loss of Ventilation for Plant Hatch IPE, Revision 1.0.
3. BH2-M-0560, RHR Room Heatup with Loss of Ventilation, Revision 1.0

<table>
<tr><td colspan="3">Safety Functions Support</td></tr>
<tr><td colspan="3">BWR Portable Equipment Phase 3</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Details:</td></tr>
<tr><td>Provide a brief description of Procedures / Strategies / Guidelines</td><td colspan="2">Confirm that procedure/guidance exists or will be developed to support implementation</td></tr>
<tr><td colspan="3">See Phase 2 discussion.</td></tr>
<tr><td>Identify modifications</td><td colspan="2">List modifications</td></tr>
<tr><td colspan="3">See Phase 2 discussion.</td></tr>
<tr><td>Key Containment Parameters</td><td colspan="2">List instrumentation credited or recovered for this coping evaluation.</td></tr>
<tr><td colspan="3">See Phase 2 discussion</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">Deployment Conceptual Design
(Attachment 3 contains Conceptual Sketches)</td></tr>
<tr><td>Strategy</td><td>Modifications</td><td>Protection of connections</td></tr>
<tr><td>Identify Strategy including how the equipment will be deployed to the point of use.</td><td>Identify modifications</td><td>Identify how the connection is protected</td></tr>
<tr><td>See Phase 2, Safety Functions Support</td><td>See Phase 2, Safety Functions Support</td><td>See Phase 2, Safety Functions Support</td></tr>
<tr><td colspan="3">Notes:</td></tr>
</table>

BWR 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
Eight (8) Self-Priming Pumps	**X**		**X**			500 gpm, 215 psia Diesel fuel and required hoses	Will follow EPRI template requirements
Four (4) Super Duty Pickup Trucks					**X**	Super duty pickup truck such as a F350 or Ram 3500 with a fifth wheel that can tow the pumps and DGs.	Will follow EPRI template requirements
Four (4) Portable Air Compressors – Diesel	**X**		**X**			Minimum pressure required to operate E11-F014A	Will follow EPRI template requirements
Four (4) 600VAC Diesel Generators				**X**		60 kW Cables – #1 per Phase.	Will follow EPRI template requirements
Four (4) 600VAC Diesel Generators	**X**	**X**		**X**		600 kW Cables – 3-400 MCM per Phase.	Will follow EPRI template requirements
Four (4) Flatbed Trailers					**X**	Means to store and transport hoses, strainers, cables, and miscellaneous equipment.	Will follow EPRI template requirements
Four (4) Trailers with Fuel Tank and Portable Fuel Containers					**X**	200 gallons	Will follow EPRI template 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 (OPEN ITEM). For the purposes of this table two storage locations have been assumed which results in the number of sets of FLEX equipment to be equal to 2N.

Comment [MM78]: Should provide electrical loading as well.

BWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Two (2) Large FLEX Pumps	**X**	**X**	**X**			2135 gpm minimum	Capacity to supply RHRSW for cold shutdown
Two (2) 4160VAC Diesel Generators	**X**	**X**	**X**	**X**		4160 VAC	To power RHR, etc.
Two (2) sets of Suction hoses and strainers, 5" discharge hoses, and fittings	**X**	**X**	**X**			N/A	Discharge hoses shall fit on FLEX Pump and connect to RHRSW manifold at the intake 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

Phase 3 Response Equipment/Commodities

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

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	60 sec	RCIC/HPCI starts	N	Reactor operator initiates or verifies initiation of reactor water level restoration with steam driven high pressure injection
2	2 min	HPCI secured	N	HPCI will trip automatically when reactor level reaches the high level setpoint
3	10-35 min	Operators override the auto-swap of RCIC suction valves in accordance with EOPs to maintain suction from the CST	Y	Time critical at the point when torus water level reaches the high level setpoint (approximately 35- 45 minutes) which would initiate the automatic swap of the RCIC suction from the CST to the torus. Swap must be overridden to keep suction on CST as required by EOPs.
4	48 min	Attempts to start EDGs have been unsuccessful. Enter ELAP Procedure	Y	Time critical at a time greater than 1 hour. Entry into ELAP provides guidance to operators to perform ELAP actions.
5	1 hr	DC Load shed complete	Y	DC buses are readily available for operator access and breakers will be appropriat identified (labele show which are required to be opened.
6	1 hr	Using manual control of SRVs depressurize the RPV IAW EOPs (to approximately 200 – 400 psig) to keep in the Safe	Y	Time critical at the point of entering the

Comment [MM79]: This is extremely aggressive assumption.

[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
	0	**Event Starts**	NA	Plant @100% power
		Region of the HCTL curve.		Unsafe Region of the HCTL Curve (Approximately 3 hours). EOPs require operators to keep reactor pressure and temperature from causing entry into unsafe region of HCTL curve
7	6.5 – 7.5 hr	When CST inventory is near depletion, swap RCIC suction from CST to torus to preserve RCIC availability	Y	CST inventory is estimated to last approximately 6.5-7.5 hours. To maintain RCIC operating the suction must be swapped to a suction source that contains available inventory, i.e. the torus.
8	7.5 hr	Initiate use of Hardened Containment Vents per EOPs to maintain containment parameters within limits.	Y	The constraint can be met because CHVS is seismic and powered by DC buses with nitrogen supplied from the Nitrogen storage tank to operate the RHVS valves
9	10 hr	Transition from Phase 1 to Phase 2 for Core cooling function by placing FLEX pumps in service to make up to the CST	Y	FLEX pumps will be staged beginning at approximately 6 – 8 hours time frame. Combined CST and torus volume is estimated to be sufficient out to 24 hours.
10	12 hr	Power up the station battery chargers using a FLEX 600 VAC DG to supply power to the buses C and D	Y	Time critical after 20 hours. Batteries durations are calculated to last at least 21 hours
11	12 hr	Begin makeup to SFP as necessary to maintain adequate level in the SFP. (Boiling under design basis conditions begins at 12 hours and requires 24 gpm makeup). Vent the refuel floor to prevent pressurization during pool boiling by opening the reactor building roof vents	N	Boil-off rate is slow with a large volume of water in the SFP
12	20-24 hr	Swap RCIC suction from the torus to the CST when torus level impacts RCIC required NPSH (between 146” and 102”) or before torus level reaches 102”.	Y	Time critical when the reduction in torus level begins to impact RCIC required NPSH

Action item	Elapsed Time	Action	Time Constraint Y/N [5]	Remarks / Applicability
	0	**Event Starts**	NA	Plant @100% power
				or when 102" is reached (102' is the limiting level to maintain coverage over the SRV tailpipe quenchers and the RCIC exhaust).
13	72 hr	Transition from Phase 2 to Phase 3 for Core Cooling function by placing RRC Pumps in service to cool plant down to cold shutdown. Requires staging and operation of 4160 VAC RRC Portable DGs	N	If RRC pumps are not available or some other reason prevents going to cold shutdown then the plant can be maintained in a stable condition with FLEX pumps in service for injection or makeup to CST

Attachment 1B
NSSS Significant Reference Analysis Deviation Table
(NEDC 33771P, GEH Evaluation of FLEX Implementation Guidelines)

Item	Parameter of interest	NEDC value (NEDC 33771P Revision 0, December 2012)	NEDC 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}*
Oct. 2012	Submit 60 Day Status Report	Complete
Feb. 2013	Submit Overall Integrated Implementation Plan	Complete
Apr 2013	Develop Strategies	
June 2013	Purchase Equipment	
Aug 2013	Issue FSGs	
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 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	Unit 1 Implementation Outage (2 Trains)*	
Jun 2015	Implement Training	
Aug. 2015	Submit 6 Month Status Report	
Feb. 2016	Submit 6 Month Status Report	
Apr 2016	Unit 2 Implementation Outage*	
Aug. 2016	Submit 6 Month Status Report	
Dec 2016	Implement Mods	
Dec 2016	Submit Completion Report	

*(Full compliance after second listed refueling outage)

[It is understood that this table can add more granularity with respect to site-specific milestones and resource planning. This format can be altered as required. Dates which correspond to full compliance of the order need to be identified in this section.]

Attachment 3
Conceptual Sketches

(Conceptual sketches, as necessary to indicate equipment which is installed or equipment hookups necessary for the strategies.)