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JAFP-13-0025
February 28, 2013

U.S. Nuclear Regulatory Commission
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SUBJECT: Overall Integrated Plan in Response to March 12, 2012, Commission Order to Modify Licenses With Regard To Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)
James A. FitzPatrick Nuclear Power Plant (JAF)
Docket No. 50-333
License No. DPR-59

REFERENCES:

1. NRC Order Number EA-12-049, *Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, dated March 12, 2012.

2. NRC Interim Staff Guidance JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, Revision 0, dated August 29, 2012 (ML12229A174).

3. Nuclear Energy Institute (NEI) 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, Revision 0, dated August 2012.

4. Initial Status Report in Response to March 12, 2012, *Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)*, dated October 29, 2012, (JAFP-12-0124).

Dear Sir or Madam:

On March 12, 2012, the NRC issued an order (Reference 1) to Entergy Operations, Inc. (Entergy). Reference 1 was immediately effective and requires provisions for mitigating strategies for beyond-design-basis external events. Specific requirements are outlined in the Enclosure of Reference 1.

Reference 1 requires submission of an Overall Integrated Plan by February 28, 2013. The NRC Interim Staff Guidance (Reference 2) was issued August 29, 2012, and endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 3 provides direction regarding the content of this Overall Integrated Plan. The purpose of this letter is to provide that Overall Integrated Plan pursuant to Section IV, Condition C.1, of Reference 1.

Reference 3, Section 13, contains submittal guidance for the Overall Integrated Plan. The enclosure to this letter provides JAF's Overall Integrated Plan pursuant to Reference 3.

Reference 4 provided JAF's initial status report regarding Mitigation Strategies for Beyond-Design-Basis External Events, as required by Reference 1. Entergy has not yet identified any impediments to compliance with the Order, i.e., within two refueling cycles after submittal of the integrated plan, or December 31, 2016, whichever comes first. Future status reports will be provided as required by Section IV, Condition C.2, of Reference 1.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact Mr. Chris M. Adner, Licensing Manager, at (315) 349-6766.

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

Sincerely,

Michael J. Colomb

MC/CA/jo

Attachment: James A. FitzPatrick – Diverse and Flexible Coping Strategies (FLEX) Overall Integrated Implementation Plan

cc: Mr. Mohan Thadani, Senior Project Manager, NRC NRR DORL
Mr. William M. Dean, Regional Administrator, NRC Region 1
NRC Resident Inspectors Office
Mr. Francis J. Murray, Jr., President and CEO, NYSERDA
Ms. Bridget Frymire, New York State Dept. of Public Service

Enclosure to JAFP-13-0025

James A. FitzPatrick –

Diverse and Flexible Coping Strategies (FLEX) Overall Integrated Implementation Plan

(55 pages)

General Integrated Plan Elements (JAF)

Determine Applicable Extreme External Hazard **Ref: NEI 12-06 Sections 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 extreme external hazards were grouped into five classes in NEI 12-06, Section 4.1. The classes of hazards determined to be applicable to the James A. FitzPatrick Nuclear Power Plant (JAF) are seismic, extreme cold, high winds and high temperature as detailed below:

Seismic Hazard Assessment:

The seismic design for Class I structures and equipment is based on dynamic analysis using acceleration response spectrum curves normalized to a ground motion of 0.08g for the Operating Basis Earthquake and 0.15g for the Design Basis Earthquake. The basis for these criteria is presented in the JAF Final Safety Analysis Report (FSAR) (Reference 1) Section 2.6. Per NEI 12-06 (Reference 2, Section 5.2), all sites will consider the seismic hazard.

Thus the seismic hazard is **applicable** to JAF.

External Flood Hazard Assessment:

JAF is built above the design basis flood level. Per JAF FSAR (Reference 1, Sections 2.4.3.2 and 2.4.3.7), the Probable Maximum Flood (PMF) elevation at the screenwell is 255 ft. This is based on a maximum lake level of El 250', and considers the setup (4.1') and maximum precipitation (0.35').

The maximum probable flood lake level is determined considering the maximum lake level, a maximum wind setup of 4.1 feet, the maximum rainfall of 0.35 feet and a maximum wave run-up height of 7.5 feet; this results in a maximum probable flood lake level of just under 262'. The grade elevation at JAF is 272 ft (Reference 1, Section 2.4.3.7). Therefore, JAF is built above the design basis flood level and is considered a "dry" site by the NEI guidance (Reference 2, Section 6.2.1) and "dry" sites are not required to evaluate flood-induced challenges.

Thus external flood hazard screens out as **not applicable** to JAF.

Extreme Cold Temperature Hazard Assessment:

JAF is located above the 35th parallel at coordinates North 4,819,545.012 m, East 386,968.945 m on the Universal Transverse Mercator system (Reference 1, Section 2.1.1) (43.503° N latitude, 76.435° W longitude (Reference 4)) and is subject to the extreme cold hazards, including snow and ice. The site is located within the region characterized by NOAA as subject to significant accumulations during three-day snowfalls (see Reference 2, Figure 8-1.) The site is located within the region characterized by EPRI as ice severity level 5 (Reference 2, Figure 8-2.) As such, the JAF site is subject to severe icing conditions that could also cause catastrophic destruction to electrical transmission lines.

Thus the extreme cold hazard, including snow and ice, is **applicable** to JAF.

General Integrated Plan Elements (JAF)

High Wind Hazard Assessment:

JAF is located above the 35th parallel. As indicated in NEI 12-06 Figure 7-1, hurricane winds in excess of 130 mph are not expected to occur at JAF. However, per the NEI 12-06 Figure 7-2, a recommended design tornado wind speed of 169 mph is identified.

Thus the high wind hazard (169 mph tornado winds) is **applicable** to JAF.

Extreme High Temperature Hazard Assessment:

Per NEI 12-06 Section 9.2, all sites will address high temperatures. 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 high temperature hazard is **applicable** to JAF.

Summary of the extreme external hazards assessment:

The hazards applicable to JAF are seismic, extreme cold, high wind and high temperature.

References:

1. JAF Final Safety Analysis Report, updated 2011
2. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, August 2012 (NRC Accession No. ML12242A378)
3. NRC JLD-ISG-2012-01, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0, dated August 29, 2012 (NRC Accession No. ML12229A174)
4. Worldatlas.com search for JAF (address: 277 Lake Road, Scriba, NY)

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.*

General Integrated Plan Elements (JAF)

Key assumptions considered in the development and implementation of FLEX Strategies for JAF 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.
- The following conditions exist for the baseline case:
  - Seismically designed DC battery banks are available.
  - Seismically designed AC and DC distribution systems are available.
  - Plant initial response is the same as Station Blackout (SBO) event.
  - Best estimate analysis and decay heat is used to establish operator time and action.
  - No single failure of SSC assumed (except those defined in the Order, i.e., EDG operation and motive force for the Ultimate Heat Sink pumps.) Therefore, RCIC will perform either via automatic control or with manual operation capability per the guidance in NEI 12-06.
- Portable FLEX components will be procured commercially.
- The designed 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.
- FLEX components will be designed to be capable of performing in response to screened in hazards in accordance with NEI 12-06.
- Margin will be added to the design of the FLEX components and hard connection points to address future requirements as re-evaluation warrants. This margin will be determined during the detailed design or evaluation process.
- Phase 2 FLEX components stored at the site will be protected against the applicable hazards in accordance with NEI 12-06. At least one set of FLEX equipment will be available after the event they were designed to mitigate. Backup Phase 2 FLEX equipment will be provided by the Regional Response Center.
- Phase 3 FLEX equipment will be provided by the Regional Response Center (RRC).
- 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 accessibility or equipment availability are based on NUMARC 87-00 (Reference 1) guidance if other design basis information or industry guidance is not available.

General Integrated Plan Elements (JAF)

- This plan defines strategies capable of mitigating a simultaneous loss of all AC power and loss of normal access to the UHS resulting from a beyond design basis external event (BDBEE) by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at all units on a site. Though specific strategies are being developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety will be incorporated into the unit guidance. The plant TSs contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design-basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the BDBEE may place the plant in a condition where it cannot comply with certain TSs and/or with its Security Plan, and, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p). (Reference 2).

  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 their identification.

There are two OPEN ITEMs for which Entergy does not have clear guidance to complete an action related to this submittal, as noted below:

1. Beyond-design-basis external event impact on requirements in existing licensing documents will be determined based on input from the industry groups and direction from the NRC.
2. The structure, content and details of the Regional Response Center playbook will be determined.

<u>References</u>:

1. NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, Revision 1
2. Task Interface Agreement (TIA) 2004-04, "Acceptability of Proceduralized Departures from Technical Specifications (TSs) Requirements at the Surry Power Station," (TAC Nos. MC4331 and MC4332)," dated September 12, 2006. (Accession No. ML060590273).

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.*

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Entergy has no known deviations to the guidelines in JLD-ISG-2012-01 and NEI 12-06 for the FLEX implementation at JAF. If deviations are identified in the future, they will be communicated in a future 6-month update following identification.

Provide a sequence of events and identify any time constraint required for success including the technical basis for the time constraint. **Ref: NEI 12-06 section 3.2.1.7** **JLD-ISG-2012-01 section 2.1**	*Strategies that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walkthrough of deployment).* *Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment 1A.* *See attached sequence of events timeline (Attachment 1A).* *Technical Basis Support information, see attached NSSS Significant Reference Analysis Deviation Table (Attachment 1B).*

A sequence of events during the FLEX scenario is provided in Attachment 1A. Those events for which a new extended loss of AC power (ELAP) time constraint is noted are discussed further below.

- 1 hour – Determination that situation is a BDBEE. The Shift Manager or Control Room Supervisor determines that the plant condition is a FLEX scenario and enters the appropriate procedures. A time period of one (1) hr has been conservatively selected to allow assessment of plant conditions and determine that the Station Blackout situation could be an extended loss of AC power event (ELAP), which will drive the implementation of certain strategies designed to preserve key event response resources like the batteries and make-up water. This includes consideration of the availability of the emergency diesel generators. One hour is a reasonable assumption for system operators to perform initial evaluation of the EDGs. Entry into ELAP procedures provides guidance to operators to perform ELAP actions, including deployment of FLEX resources.
- 90 minutes - DC Load shed complete. FLEX response procedures will detail the actions necessary. DC buses are readily available for operator access and breakers will be appropriately identified (labeled) to show which are required to be opened to affect a deep load shed. Based on engineering judgment, it is reasonable to expect that operators can complete the shedding of loads from the DC bus in approximately 30 minutes.
- 5 hours – Take action to avoid operation in the Unsafe Region of the heat capacity temperature limit (HCTL) curve (Reference 2). The action involved is to take manual control of the SRVs and depressurize the reactor pressure vessel, and achieve a pressure band of between approximately 200 psig and 400 psig. This event is predicted to occur at about 5 hours by analysis (Reference 8); it will be driven by actual plant response during the

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event. It becomes time critical at the point of entering the Unsafe Region of the HCTL curve. Manual control of the SRVs is performed from the control room with sufficient DC power and pneumatic pressure to operate the SRVs throughout Phase 1.

- 10 hours – Re-power a battery charger to maintain the DC Power System. Deployment of the FLEX DG will be initiated shortly after the BDBEE is declared in recognition of the potential for battery depletion. The event is time critical at battery depletion; both the A and the B batteries (71SB-1 and 71SB-2) have been calculated to last more than 10 hours in the FLEX scenario (Reference 11). The FLEX DG will be maintained in on-site FLEX storage buildings. The FLEX DG will be transferred and staged via haul routes and staging areas evaluated for impact from external hazards (Reference 4). Modifications required to facilitate repowering DC buses will be determined during the detailed design process and will follow NEI 12-06 guidance. Modifications to DC Buses and to the exterior of appropriate buildings will be implemented to facilitate the connections and operational actions required to re-power the battery charger (71BC-1A or 71BC-1B) (Reference 5). Programs and training will be implemented to support operation of FLEX DGs.
- 23 Hours - Initiate use of the Reliable Hardened Vent System (RHVS). This action will be accomplished in accordance with EOPs to maintain containment parameters within acceptable limits and within the limits that support continued use of the RCIC system. The operators will open the wetwell vent and the RHVS to relieve pressure conditions in the wetwell/drywell. Operation of RHVS is performed from the Relay Room and can be accomplished because the RHVS is seismically rugged, DC-powered (backed by batteries), and provided with adequate nitrogen Containment Atmospheric Dilution (CAD) system, backed up by portable gas bottles for the ELAP event. Critical instruments associated with containment and the RHVS are DC-powered and can be read in the Relay Room. (Reference 7)
- 34 hours – As the CST volume is depleted, the seismically qualified diesel-driven fire pump will be aligned to continue providing makeup to the RPV. This timing is based on the minimum qualified volume of water in the CST; this event may be later if additional volume in the CST survives the event. This flow path is established using a temporary hose at an existing cross-connect between the fire protection system and the RHR Service Water system (at valve 10RHR-432.) See the Maintain Core Cooling Phase 2 discussion below.

<u>Technical Basis Support information</u>

1. On behalf of the Boiling Water Reactor Owners Group (BWROG), GE-Hitachi (GEH) developed a document (NEDC-33771P, Revision 0 (Reference 4)) to supplement the guidance in NEI 12-06 by providing additional BWR-specific information regarding the individual plant response to the BDBEE (i.e., Extended Loss of AC Power (ELAP) and loss of Ultimate Heat Sink (LUHS).) The document includes the identification of the generic event scenario and expected plant response, the associated analytical bases and recommended actions for performance of a site-specific gap analysis. In the document, GEH utilized the NRC-accepted SUPERHEX (SHEX) computer code methodology for the BWR 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 generic BWR 4/Mark I containment

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analysis is generally applicable to the JAF (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 and containment integrity. The guidance provided in the BWROG report was utilized as appropriate to develop coping strategies and for prediction of the plant's response.

2. JAF containment integrity for Phases 1 through 3 was evaluated by analysis using the computer code MAAP 4.05 (References 8 and 12).
3. A bounding decay heat management analysis considered the fuel decay heat load curve in both the reactor vessel and the fuel moved to the spent fuel pool. (JAF-CALC-MISC-02373 (Reference 6))
4. Environmental conditions within the station areas were evaluated utilizing methods and tools in NUMARC 87-00 (Reference 10) or Gothic 7.2b (EPRI software) (Reference 13).
5. Per the guidance in 10 CFR 50.63 and Regulatory Guide 1.155, JAF is a 4-hr coping plant for Station Blackout (SBO) considerations. Applicable portions of supporting analysis have been used in ELAP evaluations (Reference 9, JAF FSAR Section 8.11).

References:

1. EOP-02, RPV Control, Revision 9
2. EOP-11, EPG SAOG Graphs, Revision 4
3. EOP-04, Primary Containment Control, Revision 8
4. NEDC-33771P, Project Task Report BWROG GEH Evaluation of FLEX Implementation Guidelines, Revision 0
5. ENERCON Report ENTGFTZ022-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) and Conceptual Design in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0
6. JAF-CALC-MISC-02373, Decay Heat Management Calculation with New SFP Volume and Heat Load, Revision 2
7. Submittal for NRC Order EA-12-050, Hardened Containment Vent System
8. ENERCON Calculation ENTGFTZ022-CALC-002, Containment Analysis of FLEX Strategies (MAAP Calculation), Revision 0
9. James A FitzPatrick Nuclear Power Plant Final Safety Analysis Report, updated 2011
10. NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, Revision 1
11. ENERCON Calculation ENTGFTZ022-CALC-003, Station Service Batteries A and B Discharge Capacity during Extended Loss of AC Power, Revision 1
12. MAAP 4 Modular Accident Analysis Program for LWR Power Plants, Computer Code Manual, June 2005, prepared under MAAP Users Group's MAAP Maintenance Contract QA3068-10 Amendment 12 for EPRI

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13. GOTHIC Containment Analysis Package User Manual, Version 7.2b(QA), March 2009	
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.*
Phase 1 of the FLEX strategies for core cooling, containment integrity, and spent fuel cooling will be implemented using installed equipment and on-shift personnel resources. Phase 2 of the strategies will involve the use of portable FLEX equipment that will be identified, procured, suitably stored, and whose deployment will be appropriately described in FLEX response procedures. Routes from equipment storage locations to equipment deployment locations have been identified as shown in Figure 3. Phase 3 equipment, brought in from off-site storage or procurement, will utilize the same pathways employed for the Phase 2 equipment once they are brought inside the JAF protected area. The identified paths and deployment areas will be accessible during all modes of operation. In addition the clearing of these paths following any significant external event or hazard will be handled on a priority basis. This deployment strategy will be included within an administrative program in order to keep pathways clear or actions to clear the pathways. References: 1. ENERCON Report ENTGFTZ022-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) and Conceptual Design in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0	

General Integrated Plan Elements (JAF)

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

A milestone schedule is provided 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.*

JAF will implement an administrative program for implementation and maintenance of the FLEX strategies in accordance with NEI 12-06 guidance.

- Installed structures, systems and components currently designed and installed meet augmented quality guidelines (e.g., equipment installed to address 10CFR50.48, Fire Protection, or 10CFR50.63, Station Blackout) will continue to meet the augmented quality guidelines.
- JAF will utilize the standard EPRI industry PM process for establishing the maintenance actions for FLEX components. Preventive maintenance procedures will be established for portable components that directly perform in the mitigating strategy for the key FLEX safety functions (i.e., core cooling, containment integrity, and spent fuel cooling.) These procedures will consider NEI 12-06 guidance, vendor recommendations, and applicable industry standards.
- Testing procedures will be developed and performed at frequencies established based on

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type of equipment and considerations made within EPRI guidelines.

A description of the programmatic controls related to the storage and protection of FLEX equipment is provided later in this plan document.

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

New training of general station staff and the Emergency Response Organization will be performed in 2016 prior to design implementation. These programs and controls will be implemented in accordance with the Systematic Approach to Training and NEI 12-06 guidance.

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 has selected a vendor to manage two (2) Regional Response Centers (RRC) to provide large equipment in support of the response to beyond design-basis external events (BDBEE). Each RRC will store and maintain five (5) sets of equipment, four (4) of which are expected to be fully deployable upon request. The fifth set is provided to account for equipment that may be unavailable due to its maintenance and testing cycle. As currently envisioned, the two RRC facilities will be located in Memphis, TN and Phoenix, AZ.

JAF will utilize the industry Regional Response Centers (RRC) for Phase 3 equipment. In an actual event, communications would be established between JAF and the industry Strategic Alliance for FLEX Emergency Response (SAFER) team and required equipment mobilized as needed. JAF will enter into a contractual agreement with the SAFER team. Equipment will initially be moved from an RRC to a local staging area, established by the SAFER team and JAF. 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.

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Notes:

Maintain Core Cooling

Determine Baseline coping capability with installed coping modifications (i.e., modifications installed to increase initial coping time) 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.

<u>Power Operation, Startup, and Hot Shutdown</u>

The primary strategy for core cooling is to supply high quality water via RCIC with suction from the torus and the CST. The design of the Condensate Storage Tanks ensures that at least 200,000 gallons of water is available to RCIC for injection into the reactor vessel (Reference 11, Section 10.9.3). Based on Reference 3, the combination of the torus and the CST volumes are expected to be able to support reactor pressure vessel make-up for at least 35 hours without any replenishment of the CST.

At the initiation of the BDBEE, main steam isolation valves (MSIVs) automatically close, feedwater is lost, and safety relief valves (SRVs) automatically open to control pressure, causing reactor water level to decrease. When reactor water level reaches 126.5 inches, low-low level 2, injection from Reactor Core Isolation Cooling (RCIC) and High Pressure Coolant Injection (HPCI) systems is initiated (Reference 1, Tables 3.3.5.1-1 (Function 3a) and 3.3.5.2-1 (Function 1), and References 7 and 8). The RCIC and HPCI pumps start with suction from the Condensate Storage Tanks (CST) and operate to inject makeup/cooling water to the reactor vessel. This injection will recover the reactor level to the high level setpoint of 222.5 inches (Reference 1, Tables 3.3.5.1-1 (Function 3c) and 3.3.5.2-1 (Function 2)). The SRVs ensure the reactor pressure vessel pressure will not exceed its design limits.

In a typical SBO event (and in the Extended loss of AC Power (ELAP) BDBEE), RCIC is able to provide make-up and maintain reactor pressure vessel (RPV) level. On that basis, at approximately 20 minutes into the event, the operator takes action to override auto-initiation of HPCI. This helps to preserve the ‘B’ battery and also reduces the heat-up of the crescent area where the HPCI pump is located.

Once it has been confirmed that the Emergency Diesel Generators (EDGs) cannot be started, the Shift Manager determines the event is a beyond-design-basis event; it has been assumed this decision is made within approximately one hour. Once it is determined that a BDBEE is occurring, RCIC suction will be swapped to the torus. This will enable the use of the available water in the torus before it becomes too hot to support RCIC operation. RCIC suction will be maintained on the SP until the SP temperature reaches about 170°F when it will be swapped back to the CST. This occurs approximately 5 hours into the event (Reference 3.) Based on the experience derived from Fukushima, the RCIC system can run at a much higher lube oil

Maintain Core Cooling

temperature and suction source temperature (Reference 6) than that originally assumed for the operation of RCIC. This strategy of drawing from the torus early is intended to optimize the use of qualified available water sources during the BDBEE. RCIC valves and controls that are required to reposition during this event are powered by station DC power.

Select RCIC trip signals and isolation signals that could possibly prevent RCIC operation when needed during the ELAP will be overridden in accordance with procedural direction. Additionally, the automatic depressurization system (ADS) will either be 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 that would prevent operation of RCIC.

As stated above, the primary method of reactor pressure control is by operation of the SRVs. All the safety/relief valves can be either automatically actuated by excess steam pressure or the valves can also be opened manually through remote switches. The safety/relief valves are equipped with a nitrogen accumulator and check valve arrangement (note that 2 valves (RV-71E and RV-71F) share one accumulator and two check valves.) In addition to the accumulators, a pneumatic supply system for the ADS valves provides a reliable, safety-related, seismically qualified, 100-day supply following a design basis accident to enable long-term cooling. (Reference 11, Sections 4.4 and 5.2.3.8.4)

The torus continues to heat up due to RCIC exhaust and SRV cycling. During the time that torus temperature is increasing the operators will reduce reactor pressure to a pressure range that provides margin to the Unsafe Region of the heat capacity temperature limit (HCTL) curve. When the temperature reaches the Unsafe Region of the HCTL, an emergency depressurization must be performed (References 9 and 10). Per recent BWR Owners Group (BWROG) guidance (Reference 2), EOPs will be revised to allow termination of RPV emergency depressurization and allow pressure to be controlled in a range that supports continued RCIC operation; the steam-driven RCIC is the preferred means of core cooling.

Regarding net positive suction head (NPSH) for RCIC, the approach currently planned for JAF draws suction from the torus only while it is relatively cool. While the BWROG is evaluating operation of the RCIC pump using fluid at temperatures of up to 230 °F, incorporating this into the strategy must consider available NPSH at those conditions. At about 10 hours into the event, the average make-up flow rate is approximately 180 gpm; at about 30 hours into the event, the average make up flow needed is about 80 gpm (based on Reference 3). The required suction head for the RCIC pump is 20.25 feet at 416 gpm (Reference 12); the required head decreases at lower flow rates. Manual flow control may provide some opportunity to utilize the torus as a suction source later in the event. The containment analysis (Reference 3) indicates the NPSH available while the RCIC pump is drawing on the torus is sufficient and that RCIC can provide adequate make up. The use of the torus at elevated temperatures will be considered based on BWROG findings.

Figure 1 provides a simplified FLEX flow diagram.

<u>Cold Shutdown and Refueling</u>

The overall strategy for the Maintain Core Cooling function during Cold Shutdown and Refueling (Modes 4 and 5, respectively) are generally similar to those for Power Operation, Startup, and Hot Shutdown.

Maintain Core Cooling

If an ELAP occurs during Cold Shutdown, water in the vessel will heat up. When the temperature reaches 212 °F (i.e., Hot Shutdown conditions), 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 reactor pressure vessel pressure will be controlled by SRVs.

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 designed to cool the core available. 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 a BDBEE (i.e., ELAP/LUHS) were to occur during this condition, then (depending on the time after shutdown) boiling in the core may occur quite rapidly (possibly within an hour). In such a situation, JAF does have a seismic-qualified diesel-driven fire pump (76P-1) available. In addition, there are staged hoses (4”-diameter) that can be used to establish a cross-connection between the fire protection system and the RHR Service Water system; there are also installed cross-connections from there to the RHR system. Thus a flow path can be established to provide make-up flow to the reactor pressure vessel. The fire pump draws suction on the intake bay of the Ultimate Heat Sink (Lake Ontario.)

Deployment and implementation of response strategies during Mode 5 must commence immediately after the time of the event. A rapid response during a Mode 5 scenario is plausible based on the availability of additional resources on-site to support the outage activities. 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.

References:

1. James A FitzPatrick Nuclear Power Plant Technical Specifications, through Amendment 302
2. BWROG EPG Issue Number 1103, 3/1/12
3. ENERCON Calculation ENTGFTZ022-Calc-002, Containment Analysis of FLEX Strategies (MAAP Calculation), Revision 0
4. ENERCON Report ENTGFTZ022-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) and Conceptual Design in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0
5. NEDC-33771P, GEH Evaluation of FLEX Implementation Guidelines, Revision 0
6. 0000-0155-1545-R-0, BWROG Project Task Report, RCIC Pump and Turbine Durability Evaluation - Pinch Point Study, February 2013
7. OP-15, High Pressure Core Injection System, Revision 59
8. OP-19, Reactor Core Isolation Cooling System, Revision 49
9. EOP-4, Primary Containment Control, Revision 8
10. EOP-11, EPG and SAOG Graphs, Revision 4
11. JAF Updated Final Safety Analysis Report, updated 2011.
12. Calculation 98-019, Emergency Core Cooling and Reactor Core Isolation System Pump

Maintain Core Cooling	
Suppression Pool NPSH, Revision D	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
JAF will utilize the industry-developed guidance from the Owners Groups, EPRI and NEI Task team to develop site-specific procedures and guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications*
• Implement a change to the power supply of AC-powered critical instrumentation (e.g., torus temperature, pressure and level, drywell temperature and pressure) to move it from the AC instrument bus to a station battery-backed source. This will provide continuous power to critical instruments so that critical containment parameters can be monitored throughout the event. • 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 (02-3LI-85A, 02-3LR-85B)	RPV inventory and core heat removal
RPV Pressure (06PI-61A, B)	RPV integrity and pressure control
Containment Essential Instrumentation	**Safety Function**
Drywell Pressure (27PI-115A1, 2, 27PI-115B1, 2)	Containment integrity
Torus Pressure (27PR-101A, B)	Containment integrity
Drywell Temperature (16-1TR-107, -108)	Containment integrity
Torus Temperature (16-1TR-131A, B)	Containment integrity
Drywell Water Level (23LI-203A, B)	Containment integrity
Torus Water Level (23LI-202A, B)	Containment integrity
Spent Fuel Pool Essential Instrumentation	**Safety Function**
SFP Level (Component # TBD)	SFP inventory

Maintain Core Cooling
JAF will have the following key instruments remain available following load stripping due to their power sources: • RPV Level – NR (06-LI-94A, B, C) • RPV Level – Fuel Zone (02-3LI-91, 02-3LR-98) • Condensate Storage Tank Level - 33LI-101A
References: 1. JAF UFSAR, Tables 7.3-3, -4, -5, -7, -9 and -10 and Table 7.19-1

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 or the torus. Based on Reference 3, the initial CST volume, in conjunction with the volume of water in the torus used during hours 2 through 5 of the event, will enable RCIC to provide make-up for at least 35 hours without replenishment. Prior to the depletion of the CST, JAF will establish the flow path from the seismically-qualified diesel-driven fire pump 76P-1 to provide make up to the reactor pressure vessel. A pre-staged hose will be used to connect the fire protection system to the RHR Service Water system at valve 10RHR-432 (see Figure 1). RHR Service Water system is then connected to the RHR system through the cross-connect flow path by opening valves 10MOV-148A and 10MOV-149A. The reactor pressure vessel is then de-pressurized to less than 50 psig. The LPCI injection valves, 10MOV-27A and 10MOV-25A are then opened to provide the makeup flow into the reactor pressure vessel. (References 1, 2) This is also the alternate strategy described below in the event the RCIC system is unavailable. During Phase 2, reactor pressure is controlled by operation of SRVs as described in Phase 1. The 125 VDC batteries are available for up to 10 hours without recharging (Reference 4). A modification will provide new connection points for a portable diesel generator unit to re-power the Battery Chargers 71BC-1A (or 71BC-1B), which charge the batteries and supply DC loads. The FLEX 600 VAC, 200 kW DG will be connected at approximately 6 hours and is sized to power the battery charger and fans (about 90 kw). Figure 1 provides a simplified FLEX flow diagram and Figure 2 is a simplified FLEX one-line diagram. *Alternate Strategy* Providing defense-in-depth for RCIC, the seismically-qualified diesel-driven fire pump (76P-1) can be used to provide makeup to the reactor pressure vessel as described for the Phase 1, Cold Shutdown and Refueling response and also above for the primary strategy as the CST is depleted. This alternate strategy would be implemented as described above. As a backup to this alternate strategy, a portable FLEX pump can be used to draw water from the intake bay and pump it through a temporary hose connected to the RHR Service Water (RHRSW) system (also at valve 10RHR-432). The FLEX pump would be lowered through a hatch at El 255' of the Screenwell and pump into a temporary hose to the RHRSW connection (at valve 10RHR-432) to provide make up to the reactor pressure vessel through the same flow path described above. This portable FLEX pump can also be used to make up to the CST, providing additional defense in depth for this strategy. Replenishment of the CST will be accomplished either through a new underground pipe or above ground through approximately 600' of hose. This same pump is

Maintain Core Cooling
BWR Portable Equipment Phase 2:

also used to provide the make up to the spent fuel pool, which will be discussed below in the Maintain Spent Fuel Pool Cooling function.

As an alternate strategy to that of powering the battery chargers from their Class 1E 600 VAC electrical buses, connections will be provided to enable power to be provided directly to the battery chargers. This will enable the use of a 90 kw FLEX 600 VAC DG to power the battery charger. Permanently installed cables will be run to facilitate the use of this alternative power arrangement (Reference 5).

For Cold Shutdown and Refueling strategies see the discussion in the Phase 1 section above.

Diesel fuel to support operation of the portable Phase 2 FLEX equipment for at least 15 hours will be stored with the FLEX equipment. Additional diesel fuel is available in the underground EDG fuel storage tanks. The Division I & II EDG fuel oil storage tanks contain more than 128,000 gallons of fuel oil (Reference 6, Table B3.8.3-1). The underground EDG fuel oil storage tanks contain sufficient fuel oil to support all Phase 2 strategies. If the normal procedure for transferring fuel from the underground storage tanks is not possible, the fuel oil can be obtained from the underground storage tanks using a manual, air, or battery operated pump to pump the fuel into a transfer tank.

References:

1. FM-20A, Flow Diagram, Residual Heat Removal System, Revision 72
2. FM-20B, Flow Diagram, Residual Heat Removal System, Revision 71
3. ENERCON Calculation ENTGFTZ-022-Calc-002, FitzPatrick Nuclear Plant Containment Analysis of FLEX Strategies, Revision 0
4. ENERCON Calculation ENTGFTZ022-CALC-003, Station Service Batteries A and B Discharge Capacity During Extended Loss of AC Power, Revision 1
5. ENERCON Report ENTGFTZ022-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) and Conceptual Design in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0
6. JAF Technical Specifications (through Amendment 302) and Bases (through Revision 30)

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

JAF 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 2:	
Identify modifications	*List modifications*
• Add connection points on the structure and install cabling to selected buses and transfer switches to facilitate the connection of the 200 kw FLEX 600 VAC diesel generators to re-power a battery charger and critical AC components. (Primary strategy) • Install new piping to be used to facilitate replenishing the CST with the FLEX pump. It will run from just outside of the Screenhouse to the CST area. (Note – the objective of this modification can alternatively be performed with temporary hose.) (Alternate strategy) • Install new connections at CST for makeup from the FLEX pump. "(Note – the objective of this modification can alternatively be performed with temporary hose and existing tank openings such as manways) (Alternate strategy) • Add connection points on the exterior of the structure and install connecting cables and transfer switches locally at a battery charger to provide for direct connection from the 90 kw FLEX 600 VAC DGs. (Alternate strategy) • Install a new manually operated jib crane to facilitate the deployment of the portable FLEX pump in the Screenhouse.	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same as instruments listed in above section, Core Cooling Phase 1. Phase 2 FLEX equipment will include installed local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.	
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment will be protected or schedule to protect*
Locations / structures to provide protection of the FLEX equipment will be fabricated / constructed to meet the requirements identified in NEI 12-06 Section 11. JAF procedures and programs are being developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the hazards applicable to JAF.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level	*List how equipment will be protected or scheduled to protect*
Not applicable per NEI 12-06 as outlined within the first section of this Integrated Plan.	

Maintain Core Cooling	
BWR Portable Equipment Phase 2:	
Severe Storms with High Winds	*List how equipment will be protected or schedule to protect*
See response for the Seismic hazard above.	
Snow, Ice, and Extreme Cold	*List how equipment will be protected or schedule to protect*
See response for the Seismic hazard above.	
High Temperatures	*List how equipment will be protected or schedule to protect*
See response for the Seismic hazard above.	

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 will be protected*
Tentative storage locations have been identified; structure details have not yet been decided. 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 and tentative storage areas to the Screenhouse and FLEX diesel generator staging areas near the Administrative / Control Building.	See above modifications regarding connection points.	• New FLEX piping shall be installed to meet necessary seismic requirements. • Connection points for the FLEX pump discharge will be outside the Screenhouse and designed to withstand the applicable hazards. • Electrical connection points for the FLEX 600 VAC DGs will be 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 (10P-3A or -3B) or II (10P-3C or -3D) RHR pump from the Class 1E emergency 10500 or 10600 bus, respectively, utilizing a 4160 VAC FLEX portable diesel generator supplied by the RRC. Re-powering either bus can power an RHR pump that can provide flow to either RHR heat exchanger (HX). A modification will be implemented to provide a cross-connection between the fire protection system and one train of the RHRSW system. The seismically qualified diesel-driven fire pump (76P-1) will be used to provide lake water to the tube side of the appropriate RHR HXs (i.e., either 10E-2A or -2B). The diesel-driven fire pump provides 2500 gallons per minute at a nominal discharge pressure of 125 psig (Reference 2).

The 4160 VAC RRC FLEX diesel generator will be capable of carrying approximately 2000 kW load which is sufficient to carry all of the loads on the Class 1E 4160 VAC bus 10500 or 10600 necessary to support the Phase 3 FLEX strategies which includes an RHR pump and its support equipment (i.e., MOVs, room coolers, etc.) (about 1600 kw). In order to prevent pipe damage due to water hammer, the 'keep full' pumps will be repowered to allow proper venting prior to RHR shutdown cooling operation. The primary strategy is to re-power Class 1E bus 10500 feeding either the RHR A or B pump, each capable of using its respective HX. An alternative strategy re-powers Class 1E bus 10600 feeding either the RHR C or D pump, each capable of using its respective HX. The selection of which pump would be used will depend on which RHRSW train is selected for the fire protection-to-RHRSW cross-connect modification.

Figure 1 provides a simplified FLEX flow diagram and Figure 2 is a simplified FLEX one-line diagram.

Alternative Strategy

An alternate means of providing power to the RHR pumps for SDC operation is to run cable from the 4160 VAC RRC FLEX 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.

<u>References</u>:

1. ENERCON Report ENTGFTZ022-PR-002, Engineering Report, Diverse and Flexible Coping Strategies (FLEX) and Conceptual Design in Response to NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, Revision 0
2. DBD-076-1, Fire Protection System, Water Supply and Distribution System, Revision 4

Maintain Core Cooling	
BWR Portable Equipment Phase 3:	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
JAF 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*
• Add connection (10”-diameter) between the fire protection system and one train of the RHRSW piping in the Screenhouse. This will be used during the Phase 3 response to the BDBEE to support cooling of an RHR HX. The specific HX to be serviced by the fire protection-to-RHRSW cross-connect will be determined during detailed design. Note that re-powering either Class 1E 4160 VAC bus enables the use of an RHR pump that can provide flow. (Primary and alternate Strategy) • Modification for connection of 4160 VAC FLEX DG supplied by the RRC to Class 1E 4160 VAC buses 10500 or 10600. Specifics of modification to be determined during detailed design. (Primary Strategy)	
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.*
Same as Phase 1. Phase 3 FLEX equipment will include the installed, commercial local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.	

Deployment Conceptual Modification **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection will be protected*
Equipment to support the Phase 3 strategy will be provided from the nearest Regional Response Center (RRC). Equipment transported to the site will be	• Add permanent connection (10”-diameter) between the fire protection system and one train of the RHRSW piping in the	• New connection between fire protection system and RHRSW piping located in Seismic Class I

Maintain Core Cooling		
BWR Portable Equipment Phase 3:		
either immediately staged at the point of use location (pumps and generators) or temporarily stored at the lay down area shown on Figure 3. Deployment paths identified on Figure 3 will be used to move equipment as necessary.	Screenhouse. • Modification for connection of 4160 VAC FLEX DG supplied by the RRC to Class 1E 4160 VAC buses 10500 or 10600	Screenwell House. • Electrical connection points for the RRC 4160 VAC DGs will be designed to withstand the applicable hazards.
Notes: None		

Maintain Containment
Determine Baseline coping capability with installed coping modifications (i.e., modifications installed to increase initial coping time) 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 using the normal installed design features of the containment such as the containment isolation valves and the RHVS. In accordance with NEI 12-06 (Reference 2), 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 the event response analysis (Reference 3), the limiting containment parameter will be the torus design pressure. The rise in drywell pressure can be reversed before the design pressure limit is reached. This is accomplished by venting the containment. In this case, the RHVS as implemented per EA-12-050, Reliable Hardened Containment Vents (Reference 4), is used with control from the relay room.

The containment design pressure is 56 psig (Reference 1, JAF FSAR Section 5.2). The event response analysis (Reference 3) assumed that the containment is vented at about 23 hours into the event. This timing was derived from the timing of the containment response of the drywell pressure approaching the design pressure; this venting assumption was made to ensure that the containment pressure limit is not challenged.

The torus temperature is also a limiting factor for implementation of the ELAP strategy (Reference 3). The torus is utilized as a suction source for the RCIC system that serves as the primary strategy for the core cooling function, as discussed in Phase 1 Core Cooling section above. The event response analysis has assumed the RCIC suction will be swapped from the torus to the CST when the torus temperature reaches 170 °F. This occurs at about 5 hours into the event.

The primary strategy during Phase 1 of the BDBEE response relies solely on the use of permanently installed plant equipment/features. The event response analysis indicates that this strategy supports containment integrity through all Phases of the event.

An alternative strategy for containment during Phase 1 is not provided, because containment integrity is maintained using only qualified installed plant design features.

<u>References</u>:

1. JAF Final Safety Analysis Report, updated 2011.
2. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide", Rev. 0, August 2012
3. ENERCON Calculation ENTGFTZ022-Calc-002, Containment Analysis of FLEX Strategies (MAAP Calculation), Revision 0

Maintain Containment	
4. EA 12-050, Order to Modify Licenses with Regard to Reliable Hardened Containment Vents, dated March 12, 2012.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
JAF 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*
A hardened containment vent system is currently installed at JAF 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 Pressure (27PI-115A1, 2, 27PI-115B1, 2)	Containment integrity
Torus Pressure (27PR-101A, B)	Containment integrity
Drywell Temperature (16-1TR-107, -108)	Containment integrity
Torus Bulk Temperature (16-1TR-131A, B)	Containment integrity
Containment Water Level (23LI-203A, B)	Containment integrity
Torus Water Level (23LI-202A, B)	Containment integrity
RHV Rad Monitor (Component No. TBD)	RHVS effluent radioactivity
RHV valve position indication (Component No. TBD)	RHVS operability
RHV system pressure indication (Component No. TBD)	RHVS operability
RHV effluent temperature (Component No. TBD)	RHVS operability

Notes:

None

Maintain Containment	
BWR Portable Equipment Phase 2:	
Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain containment integrity. Identify methods (containment vent or alternative / Hydrogen Igniters) and strategy(ies) utilized to achieve this coping time. The primary strategy to maintain containment integrity utilizes only permanently installed plant equipment (i.e., RHVS.) See the Maintain Containment Phase 1 section for a discussion of containment integrity applicable throughout the event. The RHVS is expected to rely on DC power, which may require implementation of the FLEX strategies to re-power a battery charger. See the discussion of the Maintain Core Cooling Phase 2 strategy above. Figure 2 is a simplified FLEX one-line diagram.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
See the Maintain Containment Phase 1 discussion in this Integrated Plan.	
Identify modifications	*List modifications*
See the Maintain Containment Phase 1 discussion in this Integrated Plan.	
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*
See instrumentation listed in Maintain Containment Phase 1 section	
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment will be protected or schedule to protect*
The RHVS is expected to rely on DC power, which may require implementation of the FLEX strategies to re-power the battery chargers. This FLEX equipment is addressed in the Maintain Core Cooling Phase 2 discussion above.	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment will be protected or schedule to protect*
Not applicable per NEI 12-06 as outlined within the first section of this Integrated Plan.	

Maintain Containment		
BWR Portable Equipment Phase 2:		
Severe Storms with High Winds	*List how equipment will be protected or schedule to protect*	
See response for the Seismic hazard above.		
Snow, Ice, and Extreme Cold	*List how equipment will be protected or schedule to protect*	
See response for the Seismic hazard above.		
High Temperatures	*List how equipment will be protected or schedule to protect*	
See response for the Seismic hazard above.		
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 will be protected*
The RHVS is designed as permanently installed equipment. No deployment strategy is required.	The RHVS 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 the guidance in JLD-ISG-2012-02.	RHVS is designed as permanently installed equipment. No connection points are required.
See the Maintain Core Cooling Phase 2 discussion related to the use and protection of the FLEX DGs, modifications and connections used to re-power the batteries.	See the Maintain Core Cooling Phase 2 discussion related to the use and protection of the FLEX DGs, modifications and connections used to re-power the batteries.	See the Maintain Core Cooling Phase 2 discussion related to the use and protection of the FLEX DGs, modifications and connections used to re-power the batteries.
Notes: None		

Maintain Containment	
BWR Portable Equipment Phase 3:	
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain containment integrity. Identify methods (containment vent or alternative / Hydrogen Igniters) and strategy(ies) utilized to achieve this coping time. The primary strategy to maintain containment integrity utilizes only permanently installed plant equipment. See the Maintain Containment Phase 1 section for a discussion of containment integrity applicable throughout the event. The RHVS is expected to rely on DC power, which may require implementation of the FLEX strategies to re-power a battery charger. See the discussion of the Maintain Core Cooling Phase 3 strategy above. Figure 2 is a simplified FLEX one-line diagram.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
See the Maintain Containment Phase 1 discussion of this Integrated Plan.	
Identify modifications	*List modifications*
See the Maintain Containment Phase 1 discussion of this Integrated Plan.	
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.*
See the Maintain Containment Phase 1 discussion of this Integrated Plan.	

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 will be protected*
See the Maintain Containment Phase 2 discussion of this Integrated Plan regarding the RHVS.	See the Maintain Containment Phase 2 discussion of this Integrated Plan regarding the RHVS.	See the Maintain Containment Phase 2 discussion of this Integrated Plan regarding the RHVS.

Maintain Containment
BWR Portable Equipment Phase 3:
Notes: None

Maintain Spent Fuel Pool Cooling

Determine Baseline coping capability with installed coping modifications (i.e., modifications installed to increase initial coping time) 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 for more than 35 hours. Installed equipment available for spent fuel pool make-up is described below. Fuel in the SFP is cooled by the existing water inventory requirements (i.e., at least 21'-7" of water normally maintained over top of fuel (Reference 1, Specification 3.7.7)) .

The normal SFP water level at the event initiation provides for at least 21 feet, 7 inches (Reference 1, Specification 3.7.7) of water inventory above the top of the stored spent fuel. Using the design basis maximum heat load, the SFP water inventory will heat up from an initial 114°F to 212°F during the first 37.9 hours (Reference 2). That calculation also predicts that there would be approximately 305 hours before any uncovering of the fuel would occur. These values consider the decay heat from a fresh reload batch in the pool upon startup from a 30-day refueling outage.

SFP level monitoring is accomplished using the instrumentation installed per NRC Order EA-12-051.

<u>Cold Shutdown and Refueling</u>

During Mode 4 and prior to the fuel shuffle, the time to boil is expected to be even longer as the outage is getting underway before the recent spent fuel has been added to the pool.

During Mode 5, the maximum heat load situation in the pool could occur if a full-core was off-loaded into the pool. The heat load calculation (Reference 2) indicates the time to boil in this scenario could be as little as 8.1 hours. Even with this time to boil the fuel is expected to be protected for a substantial amount of time: the time to uncover the fuel is 65 hours and the peak required make up rate is approximately 60 gpm. This indicates there is time to deploy the planned FLEX equipment. That this scenario occurs during an outage at the plant also makes available more staffing resources (i.e., increased staffing is planned during outages to support the outage initiatives.) The deployment of portable resources is discussed in the Phase 2 section below.

During Mode 4 and following the fuel shuffle, the time to boil is expected to be somewhat longer than that described for the worst-case Mode 5 condition. A similar response strategy is used.

References:

1. JAF Technical Specifications through Amendment 302
2. JAF-CALC-MISC-02373, Decay Heat Management Calculation with New SFP Volume, dated July 3, 1997.

Maintain Spent Fuel Pool Cooling	
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 of fuel in the SFP. Water level is maintained 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.*
SFP level instrumentation installed per NRC Order EA-12-051	
Notes: References: 1. JAF Technical Specifications through Amendment 302	

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.

As noted in the Maintain Spent Fuel Pool Cooling Strategy for Phase 1, the spent fuel pool time to boil on a loss of cooling is approximately 37 hours. The normal SFP water level at the event initiation is at least 21 feet – 7 inches (Reference 2, Specification 3.7.7) over the top of the stored spent fuel. Using the design basis maximum heat load, the SFP water inventory will heat up from 114 °F to 212 °F in approximately 37 hours (in Modes 1, 2, 3, or 4) or in approximately 8.1 hours in Mode 5 full core off-load scenario. Note that JAF does not typically plan their outage to include a full-core off-load.

In addition to having plenty of time for any response actions, JAF also has permanently installed equipment that can be used to provide make up to the SFP. A flow path through the cross-connection between the fire protection system piping and the Train A of the RHRSW system can be established using a currently staged hose. Flow is then directed through the RHRSW-to-RHR cross-connect and into the RHR system piping. From there, a flow path using the SFP cooling assist piping can be established, as described in Method 1 below. This piping discharges flow through diffusers near the floor in the spent fuel pool. (References 3, 4, 5).

Thus, the transition from Phase 1 to Phase 2 for SFP cooling function will occur at approximately 37 hours in the normal condition in which fuel has been transferred to the pool after a refueling. Spent fuel pool makeup connections can also be established using portable FLEX equipment. The FLEX pump used to provide the SFP makeup function is the same FLEX pump described in the Core Cooling section to provide make up to the reactor pressure vessel and the CST. Portable equipment (i.e., provisions for makeup to the SFP) is expected to be in place for utilization at approximately 24 hours.

The required makeup rate to maintain the fuel pool filled during this time is about 32 gpm in Modes 1 through 4 or about 65 gpm in Mode 5 (Reference 1). However maintaining the SFP full at all times during the ELAP event is not key requirement; rather 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. Makeup to the SFP will be provided by one of three baseline capabilities.

Method 1 - Makeup via permanent piping

The first method uses the existing fire pump (76P-1) aligned to the fire protection system header. A staged hose will be connected between the fire protection system and the RHRSW system through valve 10RHR-432 (Reference 4). The RHRSW system cross-connection to the RHR system is established through valves 10MOV-148A and 10MOV-149A (Reference 4). Flow can then be directed to the fuel pool cooling assist piping (i.e., through 10MOV-20) (Reference 3) to the Spent Fuel Pool Cooling system (Reference 5). This provides make up flow to the SFP through seismically qualified piping to spargers located near the floor of the pool. The fire pump is capable of pumping 2500 gpm at 125 psig discharge pressure; the required flow rate for pool make up is less than 35 gpm (60 gpm during a Mode 5 full-core off-load).

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 2:

Method 2 – Makeup via hose

The second method to provide water to the SFP utilizes a portable FLEX pump. This pump will discharge into piping or hose and flow from the Screenhouse around to near the track bay of the Reactor Building, and up to the operating floor of the Reactor Building. At that point, a hose long enough to reach the SFP is connected to allow filling of the SFP utilizing lake water (primary source) via FLEX pump. The flow requirement for this strategy is also between 35 and 60 gpm, which is easily supplied by the FLEX pump.

Method 3 – Makeup via spray

Method 3 is a flow path ending in spray nozzles at the pool. NEI 12-06 guidance suggests a flow rate of consistent with 10 CFR 50.54(hh) (2). The third method of providing water to the SFP utilizes the FLEX pump and flow path described in Method 2. The hose connection at the operating floor, however, is connected to two monitor spray nozzles rather than simply pumping make up into the pool. Two 100 gpm nozzles, which satisfy the JAF 10CFR50.54(hh)(2) commitment, are currently stored in the Reactor Building. The FLEX pump will be capable of supplying 200 gpm to the refuel floor at a pressure sufficient for the spray nozzles.

Figure 1 provides a simplified FLEX flow diagram.

References:

1. JAF-CALC-MISC-02373, Decay Heat Management Calculation with New SFP Volume, dated July 3, 1997.
2. JAF Technical Specifications through Amendment 302
3. FM-20A, Flow Diagram, Residual Heat Removal System, Revision 72
4. FM-20B, Flow Diagram, Residual Heat Removal System, Revision 71
5. FM-19A, Flow Diagram, Fuel Pool Cooling and Cleanup System, Revision 43

Details:

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

JAF 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 support the transfer of water from the Screenhouse to the CST area and continuing to near the Reactor Building track bay (at grade elevation, El 272’) and up to the Reactor Building operating floor (El 369’). From that point, staged hoses will be used to run

Maintain Spent Fuel Pool Cooling		
BWR Portable Equipment Phase 2:		
over to the spent fuel pool and to spray nozzles. (Note – as an alternative to the mod, a long length of hose can also be run during the preparation activities for providing SFP makeup.)		
Key SFP Parameters	*List instrumentation credited or recovered for this coping evaluation.*	
SFP level instrumentation installed per NRC Order EA-12-051		
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**		
Seismic	*List how equipment will be protected or schedule to protect*	
FLEX pumps and generator units and equipment will be stored in storage locations / structures designed and fabricated / constructed to meet the guidance 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 will be 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 will be protected or schedule to protect*	
See response for the Seismic hazard above.		
Snow, Ice, and Extreme Cold	*List how equipment will be protected or schedule to protect*	
See response for the Seismic hazard above.		
High Temperatures	*List how equipment will be protected or schedule to protect*	
See response for the Seismic hazard above.		
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 will be protected*
• The pump used to provide the SFP makeup function is the same FLEX pump described in the Core Cooling section to provide	• See Phase 2 Core Cooling for discussion of modification necessary to deploy the FLEX pump. • See modification to	• See Phase 2 Core Cooling for discussion of protection of connection points for FLEX pumps. • New FLEX piping will be

Maintain Spent Fuel Pool Cooling		
BWR Portable Equipment Phase 2:		
make up to the CST. See Phase 2 Core Cooling for discussion of deployment strategy for FLEX pump. • The monitor spray nozzle and fire hoses needed to spray and or makeup to the SFP will be stored in an accessible and protected area of the Reactor Building.	transfer water from the Screenhouse to the Reactor Building operating floor described above.	installed to meet necessary seismic requirements. • Connection points for the FLEX pump discharge and at the Reactor Building will be designed to withstand the applicable hazards.
Notes:		

<table>
<tr><td colspan="3">Maintain Spent Fuel Pool Cooling</td></tr>
<tr><td colspan="3">BWR Portable Equipment Phase 3:</td></tr>
<tr><td colspan="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 for Maintain Spent Fuel Pool Cooling Phase 2.</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">N/A</td></tr>
<tr><td>Identify modifications</td><td colspan="2">List modifications</td></tr>
<tr><td colspan="3">Modification to install SFP level instrumentation per Order EA-12-051</td></tr>
<tr><td>Key SFP Parameter</td><td colspan="2">List instrumentation credited or recovered for this coping evaluation.</td></tr>
<tr><td colspan="3">Spent Fuel Pool Level Per Order EA-12-051</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>
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<tr><td>See Maintain Spent Fuel Pool Cooling Phase 2 discussion</td><td>See Maintain Spent Fuel Pool Cooling Phase 2 discussion</td><td>See Maintain Spent Fuel Pool Cooling Phase 2 discussion</td></tr>
<tr><td colspan="3">Notes:

None</td></tr>
</table>

Safety Functions Support
Determine Baseline coping capability with installed coping modifications (i.e., modifications installed to increase initial coping time) 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. Main Control Room Accessibility Under ELAP conditions with only simple mitigating actions taken, an analysis (Reference 1) projects the temperature in the control room will not exceed 105°F considering a loss of ventilation for three days. This is below the assumed maximum temperature for efficient human performance (110°F) as described in NUMARC 87-00 (Reference 2). The calculation conservatively assumed that all of the equipment in the room is functioning; this is conservative compared to the BDBEE scenario in which some of that equipment will no longer be powered. The calculation credited heat escaping through a damper in the floor of the kitchen. The Phase 1 FLEX strategy is to confirm the damper (70FD-8) (Reference 1) is open as well as to block open the entrance air lock when the MCR temperature reaches about 90 °F. Additionally, AOP-49 (Reference 5) requires opening all MCR panel doors in the control room within 30 minutes of the beginning of an SBO to minimize heatup of the components contained in the MCR panels. RCIC Room Accessibility and Equipment Durability The RCIC room will have a large heat load under ELAP conditions, as the steam-driven RCIC pump is utilized during the event as the primary source of core cooling. The existing calculation, JAF-CALC-08-00007 (Reference 3), explores different cases of room heatup with a loss of all cooling considering the SBO scenario. It demonstrates that the RCIC room remains at acceptable levels for the four-hour SBO scenario. A preliminary evaluation of the room temperature response for the FLEX scenario indicates the room temperature will be elevated. Further evaluation of RCIC room temperature will be performed to confirm an acceptable environment is maintained. The strategy for the RCIC room is to ensure room doors are open or utilize portable fans to ventilate the area. The BWROG has evaluated operation of the RCIC system at extreme conditions (Reference 4). One of the findings of the report was that if the EG-M control module is located in the RCIC room and the RCIC room temperature was projected to increase above 150 °F, the EG-M module could be impacted and consideration should be given to relocating the EG-M to an environmentally cooler location as an enhancement. The EG-M module is located in the RCIC pump area which has the potential of exceeding 150°F; additional analysis will be performed to determine peak RCIC room temperature during the event and, if necessary, the EG-M will be re-located to a cooler environment. The other focus of the BWROG evaluation (Reference 4) dealt with the effects of RCIC operation at pumped fluid temperature exceeding design rated temperature. The results and possible enhancements provided in the BWROG study will be considered in the coping strategy. For the purposes of NEI 12-06 it is not anticipated that continuous accessibility would be required

Safety Functions Support	
in the RCIC room. If personnel entry is required into the RCIC room, then supplemental ventilation and personnel protective measures (such as ice vests) will be taken. References: 1. JAF-CALC-CRC-02311, Control Room Heat Up Calculation, Revision 0 2. NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors, Revision 1 3. JAF-CALC-08-00007, SBO Room Heatup Analysis, Revision 0 4. 0000-0155-1545-R0, BWROG Project Task Report, RCIC Pump and Turbine Durability Evaluation - Pinch Point Study, February 2013 5. AOP-49, Station Blackout, Revision 18	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
JAF 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*
The RCIC EG-M controller module will be relocated to a cooler environment if analysis determines that the RCIC room would exceed 150°F during RCIC operation (Reference 4).	
Key Parameter	*List instrumentation credited for this coping evaluation phase.*
None.	
Notes:	

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 Accessibility

As discussed above for the Phase 1 Safety Systems Support strategy, Reference 2 evaluated loss of Main Control Room (MCR) ventilation for three days. The analysis determined that the MCR would reach 104°F in 2.5 days. Equipment in the control room is designed to withstand a maximum MCR temperature of 104°F (Reference 2); 104°F MCR temperature would lead to approaching the 122°F temperature limit for equipment located inside MCR panels (Reference 4, Input 2). AOP-49 (Reference 5) requires opening all of the MCR panel doors within 30 minutes of the beginning of an SBO to minimize the temperature difference between inside and outside the MCR panels. Portable fans powered from portable FLEX diesel generators will be provided to improve the heat removal from the MCR and maintain temperatures below 104°F for personnel accessibility and equipment availability during Phase 2.

RCIC Room Accessibility and Equipment Durability

Primary Strategy

The primary strategy for maintaining the environment of the RCIC room during Phase 2 will use the same strategy as in the Phase 1 section above.

Alternative Strategy

It is not anticipated that accessibility of the RCIC room will be required, however, if personnel accessibility becomes necessary then supplemental methods of cooling or exhausting heat from the RCIC room will be established.

Battery Room Ventilation

Hydrogen gas is produced by the batteries during the charging process that begins about eight hours into the BDBEE. A review of the battery room hydrogen generation rate calculation was performed. As demonstrated by that calculation (Reference 1), the hydrogen generation rate during charging is such that the hydrogen concentration in the room does not reach 2% for more than 5 days. This is well into the Phase 3 deployment period. Thus, battery room ventilation is not a concern for the general Phase 2 strategy period of from 8 hours to 72 hours.

DC Equipment Rooms Ventilation

The DC Equipment Rooms contain the battery chargers which are energized in Phase 2 to recharge the batteries. The method to ventilate the DC Equipment Rooms is to prop open doors and set up portable fans that will exhaust into an adjacent corridor that communicates with a roll up door to the outside. DC Equipment room actions are covered under plant procedure (Reference 3).

Safety Functions Support	
BWR Portable Equipment Phase 2	
Spent Fuel Pool Area 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. Such a pathway can be established by opening the truck bay doors (at grade elevation) and opening the airlock on El. 369'-6" to the outside of the Reactor Building. The SBO/FLEX strategy is to establish this ventilation flow path early in the event response period (e.g., before the pool begins to boil, or prior to about 37 hours.) Ventilation can be enhanced by re-powering a Standby Gas Treatment system (SGTS) fan. A modification to provide new connection points for a portable diesel generator unit to re-power a SGTS fan (e.g., 01-125FN-1A or -1B) will be considered. A FLEX 600 VAC, 200 kW DG will be connected as conditions warrant. A 200 kw 600VAC FLEX DG can power a SGTS fan and its valve. Other Areas Accessibility Other areas of the plant will require accessibility for operators or other station personnel during Phase 2 of a BDBEE. Generally, these areas are not expected to require mitigating actions or modifications for accessibility; however the areas will be evaluated to confirm accessibility. References: 1. JAF-88-024, Battery Room Hydrogen Generation, Revision 0, as revised by ECN26750. 2. JAF-CALC-CRC-02311, Control Room Heat Up Calculation, Revision 0 3. OP-59A, BATTERY ROOM VENTILATION, Revision 10 4. JAF-CALC-CRC-04276, Maximum Allowable Tube Plugging Limit For Control Room & Relay Room Air Handling Units, Revision 1 5. AOP-49, Station Blackout, Revision 18	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation*
JAF 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*
• Add connection points and install connecting cables and devices to re-power a SGTS fan using a FLEX 600 VAC DG. (Alternate strategy)	
Key Parameter	*List instrumentation credited for this coping evaluation phase.*
None	

Safety Functions Support		
BWR Portable Equipment Phase 2		
Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**		
Seismic	*List how equipment will be protected or schedule to protect*	
Structures to provide protection of the FLEX equipment will be constructed to meet the requirements identified in NEI 12-06 Section 11. The schedule to construct the structures is still to be determined.		
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment will be 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 will be protected or schedule to protect*	
See response for the Seismic hazard above.		
Snow, Ice, and Extreme Cold	*List how equipment will be protected or schedule to protect*	
See response for the Seismic hazard above.		
High Temperatures	*List how equipment will be protected or schedule to protect*	
See response for the Seismic hazard above.		
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 will be protected*
The FLEX DGs used to provide power to the SGTS fan and its valve are the same FLEX DGs described in the Maintain Core Cooling section. See Phase 2 Core Cooling for discussion of deployment strategy for FLEX DGs. The portable fans for room cooling will be stored in the	No other modifications are necessary, beyond those already identified (buildings, roads, etc.) for deployment of the strategies associated with the Phase 2 support function	Electrical connection points for the FLEX 600 VAC DGs will be established and designed to withstand the applicable hazards.

Safety Functions Support		
BWR Portable Equipment Phase 2		
FLEX Storage Building and deployed via identified haul routes to their staging areas.		
Notes: None		

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 Accessibility

The primary and alternate 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 the bus is re-energized by the RRC FLEX 4160 VAC DG.

RHR Room Accessibility

As part of Phase 3 strategies, an RHR pump is placed into service in order to perform shutdown cooling. This results in heat addition to the RHR pump area due to heat generated by the RHR pump motor as well as heat dissipated from the associated piping. For long term RHR pump operation, the RHR pump area must be cooled to maintain area temperatures within acceptable ranges (limited by maximum allowable RHR pump motor requirements). Mitigating actions will therefore be employed; this can be accomplished by ensuring that cooling support is also powered when the RRC 4160VAC FLEX DG is connected to the Class 1E 4160 VAC bus to power the RHR pump. The room cooler can be energized and cooling water supplied via the connections provided between the fire protection system piping and ESW cooling water supply piping.

An alternate means of cooling the RHR rooms if the RHR pump 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.

Battery Room Ventilation

As noted in the discussion of the Safety Systems Support Phase 2, the hydrogen gas evolves from the batteries as they are being charged. While the rate of hydrogen generation at JAF does not result in hydrogen concentrations of greater 2% for more than five days, the rooms will have to be ventilated during Phase 3. There are two strategies for venting the battery rooms. The primary strategy is to repower the existing battery room exhaust fans. This could occur after the FLEX DG has been connected to power the Class 1E 600 V bus, but will more likely not be performed until the larger portable diesel generators are delivered from the RRC. The second option is to prop open doors and set up portable fans that will exhaust into an adjacent corridor that communicates with a roll up door to the outside. Battery and DC Equipment room actions are covered under plant procedure (Reference 1).

DC Equipment Rooms Ventilation

The method for cooling the DC Equipment Rooms is the same as described in the Phase 2 section of Safety Function Support.

Other Support Requirements

<table>
<tr><th colspan="3">Safety Functions Support</th></tr>
<tr><th colspan="3">BWR Portable Equipment Phase 3</th></tr>
<tr><td colspan="3">Other areas of support required in Phase 3 are the same as described in the Phase 2 section of Safety Function Support.
<u>References</u>:
1. OP-59A, BATTERY ROOM VENTILATION, Revision 10</td></tr>
<tr><th colspan="3">Details:</th></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 Safety Systems Support Phase 2 discussion.</td></tr>
<tr><td>Identify modifications</td><td colspan="2">List modifications</td></tr>
<tr><td colspan="3">See Phase 3 Core Cooling section for discussion of modifications required to connect the RRC FLEX DG.</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">Phase 3 FLEX equipment will include the installed, commercial local instrumentation needed to operate the equipment. The use of these instruments will be described in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.</td></tr>
<tr><td colspan="3"></td></tr>
<tr><th colspan="3">Deployment Conceptual Design
(Attachment 3 contains Conceptual Sketches)</th></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 will be protected</td></tr>
<tr><td>See Phase 3, Core Cooling Section</td><td>See Phase 3, Core Cooling Section</td><td>See Phase 3, Core Cooling Section</td></tr>
<tr><td colspan="3">Notes:

None</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
Four (4) Portable Diesel Driven Pumps	**X**	**X**	**X**			450 gpm, 400 ft head; diesel-powered	Follow EPRI template requirements
Four (4) Super Duty Pickup Trucks					**X**	Super duty pickup truck with a fifth wheel that can tow the pumps and DGs.	Follow EPRI template requirements
Two (2) Portable Air Compressors – Diesel	**X**		**X**			300 cfm @ 200 psi	Follow EPRI template requirements
Four (4) 600VAC Diesel Generators				**X**		90 kW Cables – #1 AWG per Phase.	Follow EPRI template requirements
Two (2) 600VAC Diesel Generators	**X**	**X**		**X**		200 kW Cables – 3-250 MCM per Phase	Follow EPRI template requirements
Two (2) Flatbed Trailers					**X**	Means to store and transport hoses, strainers, cables, and miscellaneous equipment.	Follow EPRI template requirements
Two (2) Trailers with Fuel Tank and Portable Fuel Containers					**X**	200 gallons	Follow EPRI template requirements
Two (2) Monitor Spray Nozzles for SFP Spray and required hoses			**X**			100 gpm each (Note – Nozzles staged in Reactor Building; only one set of two nozzles provided.)	Follow EPRI template requirements
Three (2) Portable ventilation fans	**X**	**X**	**X**	**X**		N/A	Supply as required

Notes:

1. For the purposes of this table, two storage locations have been assumed. This results in the number of sets of FLEX equipment to be equal to n+1.
2. Phase 2 FLEX equipment will have installed local instrumentation and control panels needed to operate the equipment. The use of these instruments will be described in the associated manuals and procedures for use of the equipment.

BWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment *(1)*	Core	Containment	SFP	Instrumentation	Accessibility		
4160 VAC Diesel Generator	**X**	**X**	**X**	**X**		4160 VAC	To power RHR, etc.
Two (2) sets of suction / discharge hoses, strainers 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
Three (3) Portable ventilation fans	**X**	**X**	**X**	**X**		N/A	Supply as required
Two (2) Diesel Generator fuel oil transfer pumps and hoses	**X**	**X**	**X**	**X**		N/A	Supply as required. To ensure transfer capability of site fuel to portable equipment

Note: Some of the above Phase 3 FLEX equipment may have installed local instrumentation and control panels needed to operate the equipment. The use of these instruments will be described in the associated manuals and procedures for use of the 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 or Event	ELAP New Time Constraint Y/N [1]	Remarks / Applicability
	0	BDBEE Occurs	N	Plant @100% power in Modes 1, 2 or 3
1.	60 sec	RCIC/HPCI Systems start. Will inject on reactor lo-lo level.	N	Reactor operator initiates or verifies initiation of reactor water level restoration with steam driven high pressure injection. Injection predicted at under 20 minutes.
2.	20 min	Operators override further auto-initiation of HPCI.	N	With RCPB intact, RCIC can recover level.
3.	1 hr	Attempts to start EDGs have been unsuccessful. Enter BDBEE response procedure.	Y	Time critical at a time greater than 1 hour. Entry into ELAP provides guidance to operators to perform ELAP actions.
4.	1 hr	Swap RCIC suction from CST to torus / suppression pool	N	Intent is to optimize available water resources once BDBEE confirmed. RCIC will draw from SP until it heats up, preserving CST volume.
5.	90 min	DC Load shed complete.	Y	DC buses are readily available for operator access, FLEX procedures will clearly identify loads to be shed, and breakers will be appropriately identified (labeled) to show which are required to be opened.
6.	~5 hrs	Suppression pool reaches about 170 ^{O}F. RCIC suction swapped back to CST.	N	BWROG may demonstrate that pool temps up to 230 ^{O}F acceptable. Intent is to enhance RCIC reliability. The combination of the torus and the CST volumes are expected to be able to support reactor pressure vessel make-up for at least 35 hours without any replenishment of the CST.
7.	~5 hrs	Using manual control of SRVs, operators depressurize the RPV IAW EOPs (to approximately 200 - 400 psig) to remain within the Safe Region of the HCTL curve.	Y	Time critical at the point of entering the Unsafe Region of the HCTL Curve (at just over 5 hours.) EOPs require avoidance of Unsafe Region of HCTL curve.
8.	10 hrs	Re-power the station battery chargers using a FLEX 600 VAC DG.	Y	Batteries are initial weak link. Charger must be re-powered prior to battery depletion estimated at about 10 hrs (for 71SB-1 and 71SB-2.)

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

Action Item	Elapsed Time	Action or Event	ELAP New Time Constraint Y/N [1]	Remarks / Applicability
9.	~23 hr	Initiate use of Reliable Hardened Vent System in accordance with FLEX procedures and guidance to maintain acceptable containment conditions.	Y	Initiation based on approach to 56 psig. Time critical at PCPL. The constraint can be met because RHVS is seismically rugged and powered by DC buses with nitrogen supplied from storage tank or bottles to operate the RHVS valves. Operated from Relay Room.
10.	~34 hr	Transition core cooling make up flow from RCIC pump to the installed diesel-driven fire pump.	Y	Combined CST and torus volume is estimated to be sufficient source of suction for RCIC for at least 35 hours.
11.	~37 hr	Begin makeup to SFP as necessary to maintain adequate level in the SFP. Vent the refuel floor to prevent pressurization during pool boiling by opening a Reactor Building vent flowpath.	N	Boiling under design basis conditions begins at about 37.9 hours and requires make up flow of about 31 gpm. Boil-off rate is slow with a large volume of water in the SFP.
12.	72 hr	Transition from Phase 2 to Phase 3 for core cooling function by placing RHR Pump in service to begin cool-down of reactor. Requires staging and operation of 4160 VAC RRC Portable DGs to re-power RHR pumps and support equipment.	N	If RRC pumps are not available or some other reason prevents the transition to shutdown cooling, then the plant can be maintained in a stable condition with fire pump and FLEX pumps in service for injection or makeup to CST and SFP.

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

Item	Parameter of interest	NEDC-33771P value (NEDC 33771P Revision 1, January 2013)	NEDC page	Plant applied value	Gap and discussion
	NONE				

Attachment 2
Milestone Schedule

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. Full compliance planned after 2016 refueling outage (see "*")

Milestone		Milestone Date
60-day Status Update		10/29/12 - Actual
Submit Overall Integrated Plan		2/28/13 - Actual
6-month Status Update		August 2013
Refine Strategies		September 2013
Perform Staffing Analysis		December 2013
Develop Strategies / Contract with RRC		January 2014
6-month Status Update		February 2014
Develop Mods		March 2014
Draft Implementing Procedures		March 2014
Regional Response Center Operational		**TBD**
Develop Storage Plan		May 2014
Purchase FLEX Equipment		June 2014
Issue Maintenance Procedures (for FLEX equipment)		August 2014
6-month Status Update		August 2014
Develop Training Plan		October 2014
Refueling Outage 1		Fall 2014
6-month Status Update		February 2015
Implement Training		May 2015
Implement Mods (non-outage)		June 2015
6-month Status Update		August 2015
6-month Status Update		February 2016
Issue Implementing Procedures		May 2016
6-month Status Update		August 2016
Implement Mods (outage)*		Fall 2016
Implement Training updates*		Fall 2016
Refueling Outage 2*		Fall 2016

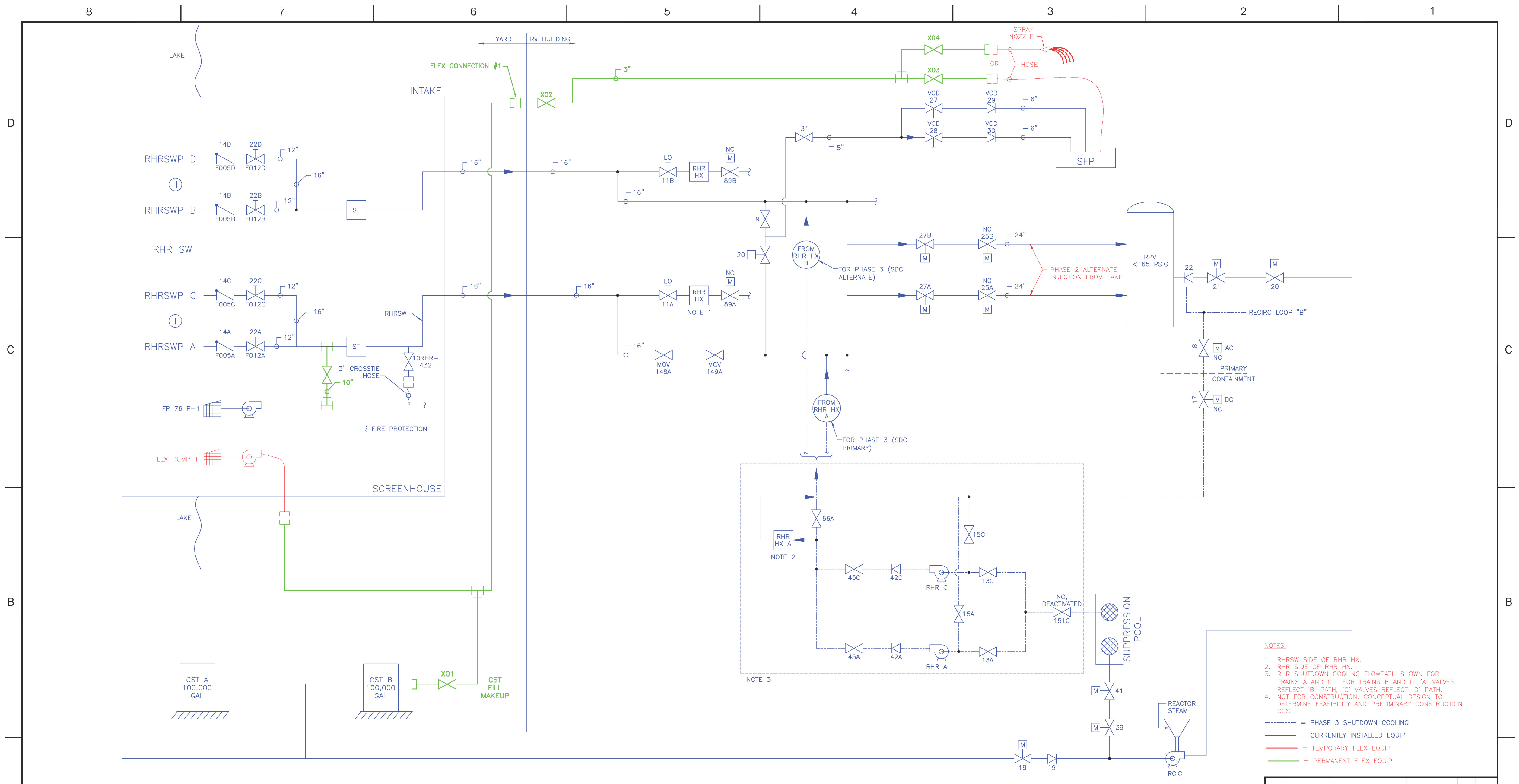
Attachment 3
Conceptual Sketches

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

Included are:

- Simplified FLEX flow diagram
- Simplified FLEX one-line diagram
- Site plan, noting potential storage and deployment location

Figure 1 –Flow Diagram for FLEX Strategies

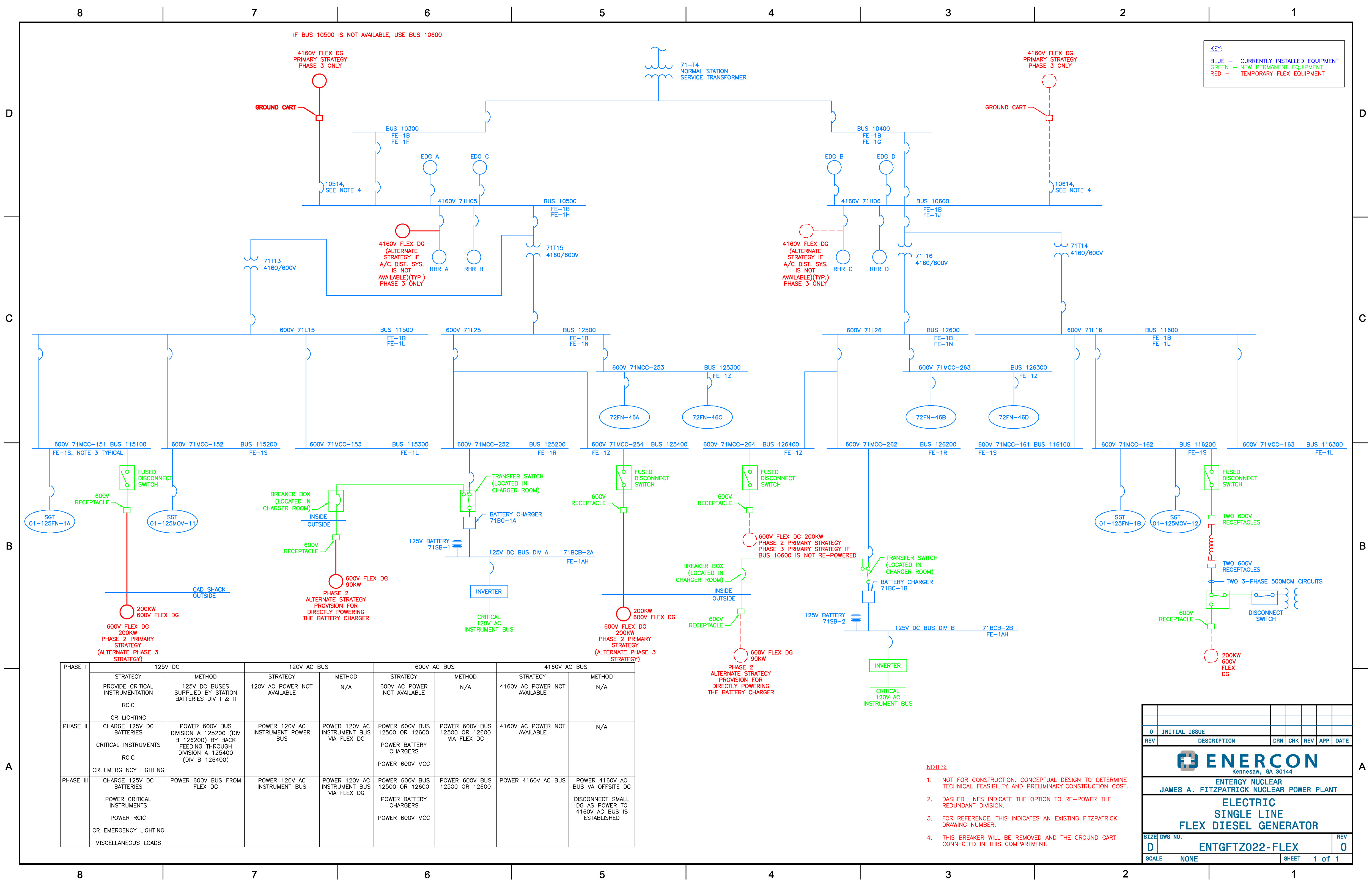


SUMMARY OF STRATEGY ATTRIBUTES FOR CORE COOLING FUNCTION (PHASES 1, 2 & 3)			
METHOD	PHASE	STRATEGY ATTRIBUTES	ADDITIONAL (NOT SHOWN ON PFD)
RCIC	1	USE OF RCIC WITH SUCTION FROM SP & CST	STEAM FLOW FROM REACTOR TO SP VIA SRVs
RCIC	2	USE OF RCIC WITH SUCTION FROM TORUS SWAPPING TO CST UNTIL IT IS EXHAUSTED	STEAM FLOW FROM REACTOR TO SP VIA SRVs
RHR	2	INJECTION VIA RHR INJECTION FLOWPATH WITH FLOW FROM FIRE PUMP 76P-1 PUMP VIA THE RHRSW CROSS-CONNECT VALVES	STEAM FLOW FROM REACTOR TO SP VIA SRVs
RHR	3	RHR SYSTEM IN SHUT DOWN COOLING MODE	COOLING WATER SUPPLIED TO RHR HEAT EXCHANGER FROM DIESEL FIRE PUMP
INITIAL SOURCE OF WATER	1	CST PROVIDES MINIMUM 200,000 GAL.	200,000 GALLONS ESTIMATED TO LAST >24 HOURS
SUSTAINED SOURCE OF WATER	2	UHS (LAKE) PROVIDES UNLIMITED SOURCE OF MAKEUP TO CST	

SUMMARY OF STRATEGY ATTRIBUTES FOR SPENT FUEL POOL COOLING FUNCTION (PHASES 2 & 3)			
METHOD	PHASE	STRATEGY ATTRIBUTES	ADDITIONAL (NOT SHOWN ON PFD)
MAKEUP FROM RHR VIA RHR SFP COOLING ASSIST	2 & 3	RHR FLOW FROM FIRE PUMP 76P-1 PUMP VIA RHRSW CROSS-CONNECT. POOL BOILING OCCURS AFTER 12 HOURS	
MAKEUP WITH PORTABLE INJECTION SOURCE	2 & 3	MAKEUP VIA FLEX PORTABLE PUMP AND HOSES TO SFP FLOOR WITH MAKEUP FROM UHS (LAKE)	
VENT PATHWAY FOR STEAM AND CONDENSATE FROM SFP	2 & 3	OPENING OF TRUCK BAY DOORS AND AIRLOCK @ EL. 369'-6"	
SPRAY CAPABILITY VIA PORTABLE MONITOR NOZZLES FROM REFUEL FLOOR	2 & 3	SPRAY FLOW FROM FLEX PORTABLE PUMP AND HOSES TO SFP FLOOR WITH MAKEUP FROM UHS (LAKE)	

SUMMARY OF STRATEGY ATTRIBUTES FOR CONTAINMENT FUNCTION			
METHOD	PHASE	STRATEGY ATTRIBUTES	ADDITIONAL (NOT SHOWN ON PFD)
RELIABLE HARDENED VENTS (RHV)	1, 2, & 3	RHV OPERATED REMOTELY FROM RELAY ROOM	CONTAINMENT VENTING NOT ANTICIPATED UNTIL PHASE 2 OR 3

Figure 2 - Electrical Diagram for FLEX Strategies



	125V DC		120V AC BUS		600V AC BUS		4160V AC BUS	
	STRATEGY	METHOD	STRATEGY	METHOD	STRATEGY	METHOD	STRATEGY	METHOD
PHASE I	PROVIDE CRITICAL INSTRUMENTATION RCIC CR LIGHTING	125V DC BUSES SUPPLIED BY STATION BATTERIES DIV I & II	120V AC POWER NOT AVAILABLE	N/A	600V AC POWER NOT AVAILABLE	N/A	4160V AC POWER NOT AVAILABLE	N/A
PHASE II	CHARGE 125V DC BATTERIES CRITICAL INSTRUMENTS RCIC CR EMERGENCY LIGHTING	POWER 600V BUS DIVISION A 125200 (DIV B 126200) BY BACK FEEDING THROUGH DIVISION A 125400 (DIV B 126400)	POWER 120V AC INSTRUMENT POWER BUS	POWER 120V AC INSTRUMENT BUS VIA FLEX DG	POWER 600V BUS 12500 OR 12600 POWER BATTERY CHARGERS POWER 600V MCC	POWER 600V BUS 12500 OR 12600 VIA FLEX DG	4160V AC POWER NOT AVAILABLE	N/A
PHASE III	CHARGE 125V DC BATTERIES POWER CRITICAL INSTRUMENTS POWER RCIC CR EMERGENCY LIGHTING MISCELLANEOUS LOADS	POWER 600V BUS FROM FLEX DG	POWER 120V AC INSTRUMENT BUS	POWER 120V AC INSTRUMENT BUS VIA FLEX DG	POWER 600V BUS 12500 OR 12600 POWER BATTERY CHARGERS POWER 600V MCC	POWER 600V BUS 12500 OR 12600	POWER 4160V AC BUS	POWER 4160V AC BUS VA OFFSITE DG DISCONNECT SMALL DG AS POWER TO 4160V AC BUS IS ESTABLISHED

Figure 3 - Site Layout