Thomas D. Gatlin
Vice President, Nuclear Operations
803.345.4342

SCE&G®
A SCANA COMPANY

February 28, 2013
RC-13-0028

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Dear Sir/Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
SOUTH CAROLINA ELECTRIC & GAS COMPANY'S OVERALL INTEGRATED PLAN AS REQUIRED BY 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)

References:

1. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012
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
3. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, dated August 2012

South Carolina Electric & Gas Company (SCE&G), acting for itself and as agent for South Carolina Public Service Authority, hereby submits the overall integrated plan as required by the March 12, 2012 Commission Order (Number EA-12-049) Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Reference 1). SCE&G utilized guidance provided in References 2 and 3 to develop the Diverse and Flexible Coping Strategies (FLEX) to be implemented at Virgil C. Summer Nuclear Station Unit 1.

This letter contains no new regulatory commitments. Actions required to address the three phase approach for mitigating beyond-design-basis external events will be tracked in our corrective action program.

Should you have questions concerning the content of this letter, please contact Mr. Bruce L. Thompson at (803) 931-5042.

A151
NRR

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

2-28-2013
Executed on

Thomas D. Gatlin

TS/TDG/wm

Attachment

c: K. B. Marsh
S. A. Byrne
J. B. Archie
N. S. Carns
J. H. Hamilton
J. W. Williams
W. M. Cherry
V. M. McCree
E. J. Leeds
E. A. Brown
NRC Resident Inspector
K. M. Sutton
NSRC
RTS (CR-12-01078)
File (815.07)
PRSF (RC-13-0028)

VIRGIL C. SUMMER NUCLEAR STATION UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12

ATTACHMENT

Mitigating Strategies (FLEX) Overall Integrated Implementation Plan

SCE&G®
A SCANA COMPANY

South Carolina Electric & Gas Company

Virgil C. Summer Nuclear Station Unit 1

Mitigating Strategies (FLEX) Overall Integrated Implementation Plan

Revision 0, February 28, 2013

Table of Contents

Introduction

The Nuclear Regulatory Commission (NRC) issued Order EA-12-049, *Issuance of Order to Modify Licenses with Regard to Mitigation Strategies for Beyond-Design-Basis External Events*, on March 12, 2012. This order imposes the need for guidance and strategies to prevent fuel damage in the reactor and spent fuel pool (SFP) with a loss of power, motive force and normal access to the Ultimate Heat Sink (UHS) which affect all units at a site simultaneously. The Order is based on Recommendation 4.2 of SECY-11-0093, *Recommendations for Enhancing Reactor Safety in the 21st Century, the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*.

NRC Order EA-12-049 requires a three-phased approach for mitigating beyond-design-basis external events. The initial phase requires the use of installed equipment and resources to maintain or restore core cooling, containment integrity, and SFP inventory. The transition phase requires providing sufficient, portable, onsite equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from offsite. The final phase requires obtaining sufficient offsite resources to sustain those functions indefinitely. The three-phased approach outlined by the NRC is consistent with the industry proposal for a Diverse and Flexible Mitigation Capability (FLEX). The Order also requires submittal of an overall integrated plan which will provide a description of how the requirements of the Order will be achieved.

The NRC provided additional details of an acceptable approach for complying with Order EA-12-049 with Interim Staff Guidance (JLD-ISG-2012-01) issued in August 2012. The ISG endorses the FLEX approach presented in NEI 12-06 Revision 0, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, with clarifications.

This integrated plan provides the Virgil C. Summer Nuclear Station Unit 1approach for complying with Order EA-12-049 using the methods described in NRC JLD-ISG-2012-01. Six month progress reports will be provided consistent with the requirements of Order EA-12-049 and the guidance in NEI 12-06.

General Integrated Plan Elements (PWR)

Section 1: Determine Applicable Hazards

Determine Applicable Extreme External Hazard **Ref: NEI 12-06 Section 4.0 -9.0** **JLD-ISG-2012-01 Section 1.0**	*Input the hazards applicable to the site; seismic, external flood, high winds, snow, ice, cold, high temps.* *Describe how NEI 12-06 sections 5 – 9 were applied and the basis for why the plant screened out for certain hazards*

Virgil C. Summer Nuclear Station Unit 1 (VCSNS) has been evaluated and the following applicable hazards have been identified:

- Seismic Events
- External Flooding (Local Intense Precipitation Only)
- Severe Storms With High Winds
- Extreme Cold (Ice Storms Only)
- Extreme Heat

VCSNS has reviewed the NEI FLEX guidance (Reference 2) and determined that FLEX equipment should be protected from all applicable hazards. VCSNS has determined the functional threats from each of these hazards and identified FLEX equipment that may be affected. The FLEX equipment is being purchased commercial grade and the storage locations will provide the protection required from these hazards. VCSNS is also developing procedures and processes to further address plant strategies for responding to these various hazards.

Seismic:

The seismic licensing basis for Seismic Category I (SC-I) structures, systems, and components (SSCs) at VCSNS is detailed in the Updated Safety Analysis Report (UFSAR) (Reference 4) Section 3.7, Seismic Design. Section 3.7.1.1, Design Response Spectra, states that the maximum horizontal ground acceleration for the Safe Shutdown Earthquake (SSE) is 0.15g at the competent rock foundation elevation and 0.25g for the soil foundation.

Site design response spectra for the SSE are provided in UFSAR (Reference 4) Figures 3.7-1 and 3.7-2. The Response Spectra for VCSNS were developed prior to Regulatory Guide (RG) 1.60 issuance based on previous investigations by Newmark and Blume. The response spectra do not directly conform to RG 1.60 curves but are considered an acceptable alternate; although non-conservative at certain frequencies. Damping used at VCSNS and listed in UFSAR Table 3.7-1 is more conservative than those listed in RG 1.61, and are considered an acceptable alternative. As defined in UFSAR Section 2.5, the maximum horizontal ground acceleration for the SSE is 0.15g at the competent rock foundation elevation and 0.25g for the soil foundation. For the Operating Basis Earthquake (OBE), the maximum horizontal ground accelerations used are 0.1g (rock) and 0.15g (soil).

In accordance with the NEI 12-06 (Reference 2) the impact of a seismic event must be considered as an applicable hazard for all nuclear plant sites. Therefore, the credited FLEX equipment will be assessed as required by NEI 12-06 to ensure the equipment remains available and deployable following the prescribed seismic event[1].

External Flooding:

The VCSNS site plan is shown on the UFSAR Figure 2.4-6. The VCSNS site is the equivalent of a dry site as defined in RG 1.102. There are no major potential external sources that could result in flooding on site. The site is protected from flooding and wave run-up on the north side from the adjacent Monticello Reservoir by a properly designed exterior revetment barrier consisting of an embankment with protective stone riprap. The normal maximum water elevation of Monticello Reservoir is 425.0 feet. Plant yard grade is raised to 438 feet directly adjacent to the embankment at Monticello Reservoir creating, in effect, a minor levee referred to as the North Berm. The North Berm, including the elevation and riprap protected embankment, are designed to protect the site at a maximum elevation of 436.5 feet from postulated storm water-related flood conditions, plus wave run-up, from Monticello Reservoir, as described in Chapter 2 of the VCSNS UFSAR.

The VCSNS site is susceptible to brief water build-up due to a local intense precipitation event. FLEX equipment will be stored either within structures designed to protect the equipment from the flood elevations or above the flood elevation of most recent site flooding analysis[2]. Local ponding onsite due to local intense precipitation (i.e. probable maximum precipitation or PMP) event will be considered when storage locations, equipment connections, and deployment routes are selected, and also when the timing of the FLEX Implementation is determined.

In summary, only external flooding as a result of local intense precipitation will be considered at VCSNS.

High Wind:

The VCSNS design and licensing basis as presented in the UFSAR Chapter 3.3 and 3.5 details wind loadings used in the design of VCSNS Category 1 (S1) structures. A hurricane wind speed of 100 mph, a tornado wind speed of 360 mph, and corresponding generated missiles were used for design of VCSNS Category 1 structures.

VCSNS is located at Latitude 34° 17' 54.1"North and Longitude 81° 18' 54.6" West. Per NEI 12-06 Figure 7.1 and Figure 7.2, VCSNS is subjected to a peak gust wind speed of 160 mph and tornado wind speeds of 200 mph, which are expected to occur at a rate of $1x10^{-6}$ per year. As defined in NEI 12-06, these values indicate that VCSNS has the potential to experience severe hurricane and tornadic winds with the capacity to do significant damage, which are generally considered to be winds in excess of 130 mph.

In summary, High Wind Hazard is applicable for VCSNS protection and deployment of FLEX equipment will be provided in accordance with requirements of NEI 12-06.

Extreme Cold:

NEI 12-06 guidance states all sites should consider the effects of extreme cold temperatures and weather conditions for their site. VCSNS is located at Latitude 34° 17' 54.1" North and Longitude 81° 18' 54.6" West. Per NEI 12-06 sites located below the 35th Parallel are not expected to experience significant snowfall with the ability to impact the deployment of FLEX equipment. Therefore the FLEX Strategies screen out of the impedances caused by extreme snowfall. NEI 12-06 assumes the same basic trend applies to extreme low temperatures; hence low temperature hazards are not applicable at VCSNS.

Figure 8.2 of NEI 12-06 provides a visual representation of the potential for ice storms across the U.S.

Per NEI 12-06, VCSNS is located within a region of a Level 5 Ice Storm Severity, which is defined as a Catastrophic destruction of power lines and/or existence of extreme amount of ice. FLEX equipment will be stored in a structure which meets either the plant design basis for snow, ice, cold conditions or the requirements of ASCE 7-10. Deployment of FLEX equipment will also consider impedances associated with ice accumulation.

In summary, VCSNS will consider the impacts of ice storms on FLEX strategies.

Extreme Heat:

As stated in the NEI FLEX Implementation Guide (Reference 2), "all sites will address high temperatures. VCSNS will address extreme heat conditions with administrative controls if temperature exceeds design basis. Extreme High Temperature Hazard Assessment: NEI 12-06 states that virtually every state in the lower 48 contiguous United States has experienced temperatures in excess of 110°F and many in excess of 120°F. In accordance with NEI 12-06, all sites will address high temperatures.

In summary, the extreme high temperature hazard is applicable for VCSNS.

Notes:

1. Assessment of installed FLEX equipment will potentially be impacted by the Expedited Seismic Approach to Fukushima NTTF 2.1-Seismic (Reference 5). Development of the expedited seismic approach is on-going.
2. Site flooding analysis is currently on-going as required by Fukushima NTTF 2.1-Flooding (Reference 5).

Section 2: Key Site Assumptions

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:*

This plan defines strategies capable of mitigating a simultaneous loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink resulting from a beyond-design-basis event by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at all units on a site. Though specific strategies are being developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety will be incorporated into the unit emergency operating procedures (EOPs) in accordance with established EOP change processes. Their impact to the design basis capabilities of the unit will be evaluated under 10 CFR 50.59.

The plant Technical Specifications contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the beyond-design-basis event may place the plant in a condition where it cannot comply with certain Technical Specifications and/or with its Security Plan, and, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR

73.55(p).

WCAP-17601-P, (Reference 7) which was sponsored by the Pressurized Water Reactor Owners Group (PWROG), provides generic reactor coolant system response analyses to an Extended loss of All AC (ELAP) scenario. An examination of key plant parameters (i.e., core thermal power, SG power-operated relief valve capacity, alternate SG feed system capability, Turbine-Driven Emergency Feedwater pump flow capacity, SG volumes, accumulator water volume) shows that VCSNS is either consistent with or bounded by those assumed in the generic analysis. The results, conclusions and recommendations contained within WCAP-17601-P are therefore assumed to be applicable to VCSNS and appropriate for use when developing VCSNS core cooling strategies to prevent core damage and not return to criticality. The results of WCAP-17601-P are applied selectively in recognition that VCSNS will use low leakage, shutdown seals, which greatly extends the core cooling coping time.

Assumptions are consistent with those detailed in NEI 12-06, Section 3.2.1 and the Executive Summary of the PWROG Core Cooling Position Paper (Reference 6). Key industry guidance and site-specific assumptions are presented here:

- 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.
- Following conditions exist:
  - Safety Related DC battery banks are available.
  - Safety Related AC and DC distribution is available.
  - Plant initial response is the same as SBO (Station Blackout) and performed in accordance with EOP-6.0 (Reference 17).
  - Best estimate analysis and decay heat is used to establish operator time and action.
- The designed-hardened connections are protected against external hazards or are established at multiple and diverse locations. Connections will be designed to Seismic Category 1 requirements. They will either be located in Seismic Category 1 structures or outside, above the ground. VCSNS is an effectively dry site, but intends to keep connections off the ground to not be impacted by runoff or pooling from local intense precipitation. The high wind and icing hazards are applicable to VCSNS. Extreme heat is not expected to affect the functionality of the connections.
- Implementation strategies and deployment routes are assessed for hazards impact.
- All Phase II components are stored at the site and available after the event they were designed to be protected against.
- Additional staff resources are expected on site beginning at 6 hours and the site will be fully staffed 24 hours after the event.

No action is required to protect containment beyond the verification of containment isolation valve closure. This includes actions to mitigate pressurization of containment due to steaming when RCS vent paths have been established or actions to mitigate temperature effects associated with equipment survivability (Reference 15).

Section 3: Deviations to JLD-ISG-2012-01and NEI 12-06

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

VCSNS has no known deviations to the guidelines in JLD-ISG-2012-01 and NEI 12-06 which have been identified for the Integrated Plan submittal.

Section 4: Sequence of Events and Technical Basis

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

General :

1. WCAP-17601-P (Reference 7) envelops our plant for thermal hydraulic issues. This is verified per PWROG Core Cooling Position Paper Revision 0, section II (Reference 6). As a plant that will have low leakage RCP seals, a cooldown is not required for up to 14 days. In order to minimize any leakage, and to lower RCS and Steam Generator feed rates, the plant will be cooled down, but the cooldown will not be a time critical evolution.
2. Further evaluation is required for boration calculations, as specified in WCAP-17601-P objective 4. This will include an improved analysis of pressurizer and head void collapse rates. Calculations for the present core indicate that Accumulator discharges will provide sufficient boration for maintaining 300 psia in the steam generators for the first 24 hours.

3. If possible, stripping of the DC buses will be avoided by powering the battery chargers from FLEX equipment within approximately one hour. If the batteries are not charging, then stripping must be initiated at approximately one hour, and completed by 2 hours after losing charging capability (Reference 8).
4. Room temperature profiles with loss of ventilation have been calculated for the Control Room (Reference 9), Relay Room (Reference 10), and the Turbine Driven Emergency Feed Pump Room (Reference 11). Further work remains to be done for maintaining habitability in these areas and in the Penetration Areas and Emergency Feed Mezzanine during the event.
5. Battery room parameters, including temperature and hydrogen generation, have been evaluated per References 12 and 13.
6. Condensate Storage Tank (CST) depletion times are documented in Reference 14, and in Technical Specification Basis.
7. Accumulator venting times will require further analysis.
8. Accumulator isolation times will require timeline development via walkthrough.
9. Containment integrity was reviewed by Reference 15.
10. A best estimated decay heat curve was developed per Reference 16.
11. Per 10 CFR 50.63 and Regulatory Guide 1.155, VCSNS is a 4 hour coping plant, with an alternate ac capability. Applicable portions of supporting analysis have been used in ELAP evaluations.

Discussion of time constraints identified in Attachment 1A

Table Item 5: Local Emergency Feed control time line requires further evaluation. Simulator shows that steam generators reach normal levels, with no throttling of the EFW flow control valves, in approximately 45 minutes. TDEFW pump steam drain operation also requires further evaluation.

Table Item 6: Step 21 of EOP 6.0 (Station Blackout.) (Reference 17), needs further review.

Table Item 7 - Entry into ELAP: Time period of one (1) hour is selected conservatively to ensure that ELAP entry conditions can be verified by control room staff, and it is validated that the alternate source AC (an underground line to XTF5052 fed from either the Parr 115 kv grid or the Parr Hydro plant) is not available. One hour is a reasonable assumption since Parr Hydro has to be manually started by local operators as it is not continuously manned. ELAP entry conditions are:

I. Loss of Offsite Power

II. Loss of all Emergency Diesels

III. Loss of Alternate AC

IV. Any doubt exists that 7200 VAC power can be restored within 4 hours of event

Table Item 8, 9 - Complete DC Load shed: DC load shed must be complete within this time constraint in order to maintain consistency with assumptions for coping time evaluations (Reference 8).Timeline verification and formal documentation needed.

Table items 12-15 - doors and temporary ventilation: While development of temporary ventilation procedures is in progress, it is probable that at least opening the doors will be a short term item. Further analysis is required.

Table Item 16 - Complete Damage Assessment Walkdowns: VCSNS will develop a post event damage assessment procedure. The damage assessment will evaluate and document the condition of plant systems, structures and components (SSCs) after an ELAP event. It is assumed that this assessment will take up to 6 hours, depending on the local site conditions.

Table Item 17 - Begin Boration: Boration is not required for VCSNS unless a cooldown is performed. If cooldown to 300 psig steam pressure is initiated, then boration is required. Boration will be completed in the timeframe between 24 hours and 36 hours. This will be evaluated and re-verified each cycle with updates to the station curve book

Table Item 23, 24 - CST Empties: If the CST empties, the low pressure Flex Transfer pump(s) must be placed in service. Per WCAP-7601-P (Reference 7), steam generator dryout time will exceed two hours. Typically the CST can be filled from onsite demineralized water or filtered water tanks or from a low pressure water source (Lake Monticello via fire service), or the Service Water Pond (ultimate heat sink) for seismic events.

Table Item 26 - Generators Installed: Battery power is depleted if the generator is not available to power chargers.

Table Item 27 - Makeup to Spent Fuel Pool: Boiling will start at 20-24 hours, with level boil off rates of approximately 2" per hour. See Reference 18.

Table Item 28 - Water processing equipment will be provided by the Regional Response Centers for Phase 3 strategies.

Section 5: Strategy Deployment

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.*

VCSNS will establish the route from a storage location to the deployment location at the source and/or supply plant connections. These routes will be followed to transport the FLEX equipment to the required deployment locations. The deployment paths will be followed to connect the FLEX equipment to the associated plant SSCs to allow the strategies to be implemented. The routes and paths will be maintained clear in all modes. Access to the portable equipment protected storage buildings will be maintained in all modes of operation. These requirements will be included in an administrative program and appropriate implementing procedure. A FLEX Support Guideline will be developed for re-flood of the refueling cavity to maintain core cooling during Mode 6 operations when the RCS is not intact and the reactor vessel level is drained for head removal or re-installation. Containment closure will be accomplished in accordance with existing procedures for refueling during shutdown conditions. The same spent fuel pool strategies will be applicable in all modes of operation and will not require any change or differentiation for Mode 5 and/or Mode 6.

Section 6: Milestone Schedule

Provide a milestone schedule. This schedule should include: • **Modifications timeline** o **Engineering** o **Implementation** • **Procedure guidance development complete** o **Strategies** o **Maintenance** • **Storage plan (reasonable protection)** • **Staffing analysis completion** • **FLEX equipment acquisition timeline** • **Training completion for the strategies** • **Regional Response Centers operational** **Ref: NEI 12-06 Section 13.1**	The dates specifically required by the order are obligated or committed dates. Other dates are planned dates subject to change. Updates will be provided in the periodic (six month) status reports. See attached milestone schedule Attachment 2

Section 7: Programmatic Controls

Identify how the programmatic controls will be met. **Ref: NEI 12-06 Section 11** **JLD-ISG-2012-01 Section 6.**	*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.*

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

- *Equipment quality*: The equipment for ELAP will have unique identification numbers. Installed structures, systems and components pursuant to 10CFR50.63(a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, Station Blackout.
- *Equipment protection*: VCSNS will construct structures to provide protection of the FLEX equipment to meet the requirements identified in NEI 12-06 section 11. The schedule to construct the structures is still to be determined.
- *Storage and deployment*: VCSNS will develop procedures and programs to address storage structure requirements and deployment/haul path requirements relative to the hazards applicable to VCSNS.
- *Maintenance and Testing*: VCSNS will utilize the standard EPRI industry PM process for

establishing the maintenance and testing actions for FLEX components. The administrative program will include maintenance guidance, testing procedures and frequencies established based on type of equipment and considerations made within the EPRI guidelines.

- *Design Control*: VCSNS will follow the current programmatic control structure for existing processes such as design and procedure configuration.

Section 8 Training Plan

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 (ERO) will be performed in 2015, prior to the final design implementation of the FLEX modifications in RF-22. The training will be developed and implemented in accordance with the requirements of NEI 12-06 Rev. 0 Section 11.6. A training needs assessment will be performed for all ERO personnel responsible for the implementation of the FLEX Support Guidelines in accordance with the Systematic Approach to Training process. The training will be integrated into existing training and qualification programs in a manner such that the training for beyond-design-basis events will not be given undue weighting in comparison with other training and qualification requirements.

Section 9: Regional Response Plan

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

The industry will establish two (2) Regional Response Centers (RRCs) to support utilities during beyond-design-basis events. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. Equipment will be moved from an RRC to a local Assemble Area, established by the Strategic Alliance for FLEX Emergency Response (SAFER) team and the utility.

Communications will be established between the affected nuclear site and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the nuclear site's "playbook" will be delivered to the site within 24 hours from the initial request.

Section 10: Maintain Core Cooling & Heat Removal

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

- **AFW/EFW**
- **Depressurize Steam Generator (SG) for Makeup with Portable Injection Source**
- **Sustained Source of Water**

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

Maintain Core Cooling & Heat Removal: PWR Installed Equipment Phase 1

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

Immediately following the ELAP event, reactor core cooling is accomplished by natural circulation of the Reactor Coolant System (RCS) through the steam generators and cooled by the Emergency Feedwater (EFW) system and steam pressure will be controlled by the Main Steam Safety Valves (MSSVs) assuming compressed air is not available for operation of the steam line Power Operated Relief Valves (PORVs). This primary core cooling strategy relies on the Turbine-Driven Emergency Feedwater (TDEFW) pump, which will be automatically actuated within 1 minute of a loss of AC power, to provide feedwater for the removal of reactor core decay heat following a loss of main feed water (Reference 17).

The TDEFW pump supplies flow to all three steam generators through individual air-operated flow control valves (FCVs). Control of the FCVs, if compressed air is available, is provided from the control room. In the event the compressed air system does not survive the event, local manual operation of the FCVs will be required throughout the ELAP. The TDEFW pump requires no support system other than steam. The turbine steam admission valves will fail open on loss of power or loss of compressed air. Flow can also be controlled by varying TDEFW speed locally with the governor setting or with the Trip and Throttle valve.

At the initiation of the event operators will enter EOP-6.0 Station Blackout. The ELAP Actions will be performed when the operating crew makes the determination delineated in the Sequence of Events section of this document (Attachment 1A). The shift electricians will be directed to align a FLEX diesel generator to power the battery chargers. If they are not successful, the electricians will be redirected to start DC electrical load shedding such that they can complete load shedding within two hours of the event; this will allow battery life to extend to 24 hours from the event.

The TDEFW pump and the CST are protected from a seismic event. The Technical Specification volume of the CST will be available to the TDEFW pump. The TDEFW pump is capable of using the CST for steam generator makeup for greater than 11 hours.

The VCSNS FLEX strategy utilizes the steam line Power Operated Relief Valves (PORVs) in the event. Control of the PORVs, if compressed air is available, is provided from the control room. In the event the compressed air system does not survive the event, local manual operation of the PORVs will be required

Section 10: Maintain Core Cooling & Heat Removal

throughout the ELAP.

Emergency Feed flow is controlled by local operator action at the flow control valves or TDEFW pump speed governor in the IB 412 and its mezzanine level, if instrument air is not available.

VSCNS has an automatically starting diesel driven air compressor, but it is not protected from high winds, and the system is not seismically constructed.

VCSNS will have Low leakage RCP seals and will not cooldown until approximately 8 hours into the event. The plant will be cooled down to approximately 300 psig, at approximately 75 degrees per hour.

Phase 1 Details:	
Provide a brief description of Procedures/Strategies/ Guidelines	VCSNS 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	• Modifications will be completed to improve accessibility for local control of the steam line PORVs. • Modifications will be completed to facilitate expedited charging of the batteries using diverse FLEX diesel generators. • Non-critical DC loads will be labeled to aid operators to readily identify the loads that will be shed during the Phase 1 deep load shedding activity.
Key Reactor Parameters	The instrumentation expected to be required for PWRs in NEI 12-06, Section 3.2.1.10 (Reference 2) are: • SG Level/Pressure • RCS Pressure/Temperature • Containment Pressure • SFP Level The list of instrumentation below will be powered by station batteries at the initiation of the event. When ELAP is declared, battery load shedding will begin, unless the FLEX diesel generators are supplying the batteries of battery chargers. These instruments will be maintained. Once the onsite FLEX diesel generator is connected and operating, batteries will be recharged to maintain a supply of power to this instrumentation. SG Level: • Steam Generator Level (WR) SG Pressure: • Steam Generator Pressure

Section 10: Maintain Core Cooling & Heat Removal	
	RCS Temperature: • Core Exit Thermocouples • Thot, Tcold • Subcooling/Sat Margin (RCS and CET) RCS Pressure: • RCS Pressure (WR) Containment Pressure: • Containment Pressure Additional Instrumentation: • Safety Injection Accumulator Pressure • Pressurizer level • Emergency Feedwater (turbine-driven pump) flow to each SG.
Notes: Seismic margin evaluations have been performed. Technical Specification CST volume is available to mitigate the event. The tank and its associated piping survive beyond-design-basis SSE level.	

Section 10: Maintain Core Cooling & Heat Removal

Maintain Core Cooling & Heat Removal: PWR Portable Equipment Phase 2

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

Primary Strategy

Actions are required during Phase 2 following the ELAP event for reactor core cooling. The main strategy will rely upon the continued operation of the TDEFW pump, which is capable of feeding the steam generators as long as there is an ample steam supply to drive the TDEFW pump turbine.

Alternate Strategy

Phase 2 requires a baseline capability for reactor core cooling strategy to connect a portable pump for injection into the steam generators in the event that the TDEFW pump fails or when ample steam is no longer available to drive the TDEFW pump's turbine. To allow for defense-in-depth actions in the event of an unforeseen failure of the TDEFW pump, the FLEX SG Makeup pump should be staged and made ready for service as resources become available following the ELAP event.

To utilize the FLEX SG Makeup pump, the coping strategy depressurizes the steam generators to below the FLEX SG Makeup pump discharge pressure. If compressed air is not available, depressurization of the steam generators will require deploying operators to locally open the steam line PORVs. The operators, coordinating with the control room will depressurize the steam generators via the PORVs to a pressure of approximately 300 psig. To conservatively envelop any scenario with an early TDEFW failure and provide the capability to restore secondary heat sink, the FLEX SG Makeup pump will be sized based on decay heat at one hour after reactor shutdown. This corresponds to a flow rate of approximately 300 gpm (Reference 2) at a discharge pressure equal to the specified steam generator injection pressure, 300 psig, in addition to all head losses (i.e., hoses, piping, connections and elevation of feed injection point) from the discharge of the FLEX SG Makeup pump to the steam generator.

SG Makeup/FLEX Feed Header

Throughout Phase 2, it is expected that the TDEFW pump or the FLEX SG Makeup pump will be in operation with suction from the CST and discharge to the steam generators. Injection using the FLEX SG Makeup Pump, requires moving the pump from its nearby protected storage location and connecting its suction to the CST (Figure 1). The discharge of the FLEX SG Makeup pump will be directed to three separate Main Feed Water connections, one per steam generator, located downstream of the Main Feed Isolation Valves (MFIVs), in the East and West penetration areas at elevation 436'. The Main Feedwater connections feed into the main feed ring in the steam generators. There are no easily plugged valves in the system (a gate valve is used, not a plug and cage valve) and the main feed ring contains over four thousand ¼" feed holes.

The SG makeup strategy at VCSNS will utilize primary and alternate diverse injection point connections above ponding level but near ground level (436' elevation) for convenience and reliability during connection of a portable pump. These diverse connections will be at either end of a seismically qualified

Section 10: Maintain Core Cooling & Heat Removal

FLEX feed header (Figures 2 and 8); the primary connection on the EAST side of the plant, the alternate on the NORTH side of the plant. If the North connection is used, a FLEX Transfer pump must be used to provide makeup water to the FLEX SG Makeup pump; no direct suction is feasible. This FLEX Feed header will be routed to the general area of the Main Feedwater system connections in the penetration areas and valved connections provided. Hoses to provide the final connections from the FLEX Feed header to the Main Feedwater piping will be stored in the vicinity of these connection points. There will be isolation valves between the penetration areas in case a portion of the header must be isolated due to a failure. Additional hose connections with isolation valves will also be provided at strategic locations along the header to ensure further flexibility of the system.

CST Makeup Strategy

To reduce the time and manpower required to reconfigure water sources, the Phase 2 strategy was developed to maintain the SG feed configuration while providing makeup water to the CST based on the quality of water and survivability of the water source. A transfer pump, identified as the FLEX Transfer pump, will be provided for CST makeup capability from the diverse sources. This strategy is summarized in Figure 3.

The makeup strategy for the CST is first to supply water from the (unqualified) Demineralized Water Storage Tank (DWST) and the (unqualified) Filtered Water Storage Tank (FWST), if they are available. The DWST and FWST are not seismically qualified, but normally contain more than 600,00 gallons of water. Water from Monticello Reservoir would be utilized as makeup using either the installed diesel driven fire pump and fire header or the FLEX Transfer pump. If none of the previously mentioned sources are available, CST makeup will be supplied by a portable FLEX UHS pump from the seismically qualified Ultimate Heat Sink (UHS) which is the Service Water Pond. The UHS contains 85 million gallons of water at 418 ft (lowest non-emergency level).

To allow for defense-in-depth actions in the event access to the CST is not available, additional diverse makeup water sources were identified and prioritized. The strategy for their use is depicted in Figures 1and 2. Because of the critical timeframe for utilizing alternate water sources upon loss of CST, strategies will be developed to provide flow directly to the FLEX SG Makeup pump from the Monticello Reservoir (utilizing the diesel fire pump or FLEX Transfer Pump), or the Service Water Pond (utilizing he FLEX UHS Pump).

Phase 2 Details:	
Provide a brief description of Procedures/Strategies/ Guidelines	VCSNS 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	• Modifications to install a FLEX Feed header so that low pressure water sources can be connected to feed the steam generators from diverse penetration areas. • Modification to allow easy connection from FLEX Feed header

Section 10: Maintain Core Cooling & Heat Removal	
	to Main Feedwater connections. • Modifications to allow the low pressure water sources to be aligned to draw from the CST, and to allow the CST to be filled from the Demineralized Water Storage Tank (DWST) and/or the Filtered Water Storage Tank,(FWST) or the Service Water Pond (UHS) using FLEX equipment. • Modification to allow a FLEX UHS Pump to supply at least 500 gpm at 150 psig from the UHS. This water can be used to fill the CST or provide a direct feed to the FLEX SG Makeup Pump.
Key Reactor Parameters	Same as Phase 1 not including instrumentation to support portable equipment.
Phase 2 Storage / Protection of Equipment : Describe storage / protection plan or schedule to determine storage requirements	
Seismic	FLEX equipment will be stored in either an existing structure meeting VCSNS seismic design basis, or a structure designed to or evaluated equivalent to seismic requirements of ASCE 7-10. FLEX Equipment will be stored in a manner to preclude damage as a result of seismic interaction from non-seismic components.
Flooding	FLEX equipment and associated connections will be stored either above the elevation of recent site flooding analysis, or in a structure designed to protect equipment from the flood elevation (e.g. existing Category 1 structure). (Note: Only applicable external flooding hazard is ponding on-site due to local intense precipitation.)
Severe Storms with High Winds	FLEX equipment will be stored in either a structure meeting the VCSNS design basis for high wind hazards (hurricane, tornado, and wind generated missiles), or in a structure designed to or evaluated equivalent to ASCE 7-10 given the limiting tornado wind speed of RG 1.76 (230 mph) or design basis hurricane wind speed (100 mph). In situations where the storage buildings do not meet the requirements for protection against tornado winds the FLEX equipment storage locations will be sufficiently separated as outlined in NEI 12-06 Section 7.3.1.1.c.

Section 10: Maintain Core Cooling & Heat Removal	
Snow, Ice, and Extreme Cold	FLEX equipment will be stored in either existing Category 1 structures (i.e. Nuclear Safety Related Structures) or structures designed to or evaluated equivalent to ASCE 7-10. FLEX equipment storage and deployment routes will consider effects of icing, and equipment will be protected as required.
High Temperatures	FLEX equipment will be stored and operated within the manufacturer limitations of the equipment. Any additional ventilation or other protection from high temperatures will be provided as required.

Phase 2 Deployment Conceptual Design

Strategy	**Modifications**	**Protection of connections**
Storage location and structure have not been decided. After the building design and locations and finalized, the deployment routes will be evaluated for external hazards to demonstrate a clear deployment path.	No modifications are needed during deployment of core cooling and heat removal strategies for Phase 2.	Piping and valves for FLEX will all be enclosed within a Seismic Category 1 structure. New FLEX piping shall be installed to meet necessary seismic requirements. All connections will be above the VCSNS flood level. Connection points for the suction and discharge will be outside and designed to withstand the applicable hazards. They will be designed to Seismic Category 1 requirements. They will either be located Seismic Category 1 structures or outside, above the ground. VCSNS is a dry site, but intends to keep connections off the ground to not be impacted by a run-off or pooling from precipitation. The high temperatures and extreme cold hazards are not applicable to VCSNS.

Section 10: Maintain Core Cooling & Heat Removal

Maintain Core Cooling & Heat Removal: PWR Portable Equipment Phase 3

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

Phase 3 for VCSNS will consist of providing makeup to the CST

Phase 2 strategies will continue; however, improved quality CST makeup will be required to ensure long term steam generator performance.

Portable water purification trailers from the Regional Response Center will be used to improve the UHS water quality before making up to the CSTs during phase 3.

Phase 3 equipment for VCSNS includes portable water processing trailer(s) and an adequately sized generator. The water processing units are capable of providing demineralized water for indefinite makeup for the SGs. Supply to the portable water processing trailer will come from the Service Water Pond.

Phase 3 Details:

Provide a brief description of Procedures/Strategies/ Guidelines	VCSNS 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	None identified or anticipated for Phase 3
Key Reactor Parameters	Same as Phase 1 not including instrumentation to support portable equipment.

Phase 3 Deployment Conceptual Design

Strategy	Modifications	Protection of connections
Insertion of water treatment equipment between FLEX UHS Pump and the CST fill connection.	No modifications are needed during deployment of core cooling and heat removal strategies for Phase 3.	Same as Phase 2

Section 11: Maintain RCS Inventory Control

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

- **Low Leak RCP Seals or RCS makeup required**
- **All Plants Provide Means to Provide Borated RCS Makeup**

Maintain RCS Inventory Control: PWR Installed Equipment Phase 1:

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

Two functions are lost during an ELAP which challenge the station's ability to maintain adequate RCS inventory and core reactivity control, which are: (1) normal charging and thus, (2) normal RCP seal injection. By the end of 2015, VCSNS will be replacing the current RCP seals with low-leakage seals. For stations with low-leakage seals, WCAP-17601-P (Reference 7) states that the RCS leakage rates may be taken as one gpm per RCP, plus one gpm of normal system leakage; this results in a total RCS leakage of 4 gpm. Given this low leakage rate, the cited reference states that core uncovery would not be expected to occur before 7 days; therefore, from an RCS inventory perspective, ample time exists for the re-establishment of a means for adding water to the RCS. From core reactivity standpoint, at the worst time in core life the station can cool to 425 °F anytime within 24 hours after reactor shutdown, and Keff will be maintained < 0.99, with no Safety Injection (SI) Accumulator injection or other boron addition, due to xenon poisoning. This provides Operations with flexibility for when to start a cooldown.

At this time, additional owners-group analytical work is being planned for better quantifying the volume added by the SI accumulators during the cooldown. Given this unknown, preliminary, conservative studies were conducted that suggest boric acid injection (from the RWST or BAT) should commence sometime between 8 and 16 hours after reactor shutdown (assuming no subsequent SI accumulator injection). The RCS coolant-shrinkage from the cooldown Hot-Full-Power to Hot-Zero-Power, following the trip, and subsequent cooldown to 425°F ensures ample available system volume for the boric acid addition (without SI accumulator injection). This is further discussed in the Phase 2 section that follows. When it is better known how much accumulators will inject, a letdown path may need to be established to preclude RCS overfill.

Given the above, there are no actions required in Phase 1 for adding water to the RCS for either inventory or core criticality concerns.

Phase 1 Details:	
Provide a brief description of Procedures/Strategies/ Guidelines	No actions are required for Phase 1.
Identify modifications	No Modifications are required for Phase 1
Key Reactor Parameters	Same as Maintain Core Cooling & Heat Removal Phase 1

Section 11: Maintain RCS Inventory Control

Maintain RCS Inventory Control: PWR Portable Equipment Phase 2:

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

The Phase 2 coping strategies for RCS inventory and reactivity control involve use of the station's installed Alternate Seal Injection (ASI) positive displacement (PD) pump or an on-site stored Reactor Makeup FLEX pump, referred to as the RXMU FLEX pump. The installed ASI pump is powered from an installed, dedicated diesel generator, which may not to be available after the event. Therefore an on-site stored, backup diesel generator can be utilized to provide power to the ASI pump or to the on-site stored electric-driven RXMU FLEX pump, as necessary. Note that further analysis regarding the volume that can be expected from the SI accumulators may change this strategy of early injection of boric acid; re-establishment of a letdown path may eventually be necessary to preclude RCS overfill.

As alluded to in the Phase 1 discussion for this topic, preliminary studies show that without crediting SI Accumulator Injection, the ASI or stored RXMU FLEX pump should be placed into service sometime between 8 to 16 hours after reactor shutdown for assurance of $K_{eff} < 0.99$. The ASI pump can supply 20 gpm at discharge pressures up to 2900 psig; the planned stored backup RXMU FLEX will be rated for no less than 20 gpm; this capacity is more than ample to add negative reactivity and to maintain RCS inventory with an assumed maximum leakage of 4 gpm.

A conceptual summary of VCSNS RCS inventory control strategies is provided in Figure 4. Station modifications will be required to add a suction connection to allow the ASI pump and stored RXMU FLEX pump to receive suction from the Boric Acid Tanks (BAT), each of which store 20,000 gal of 7000 ppm boron solution. Also the ASI system will need to be modified to add a suction connection to allow the stored RXMU FLEX pump to receive 2300 ppm boron solution from the 500,000 gal RWST (the ASI pump already receives its suction from the RWST). The existing charging pump discharge header features a flanged hydro-test connection that will be modified to accept discharge from either the ASI pump or the stored RXMU FLEX pump. This arrangement would provide a diverse source of borated water to the RCS, for both inventory and reactivity control. It is preliminarily planned to store the RXMU FLEX pump in the Auxiliary Building.

Electrical modifications will be required to allow both the ASI pump and the RXMU FLEX pump to be powered from an on-site stored backup DG; conceptually, this will entail adding electrical conductors and switches to allow either pump to be powered from the on-site stored backup DG or the currently installed ASI DG (if available, post event). These diverse power sources are shown in Figure 5.

Phase 2 Details:	
Provide a brief description of Procedures/Strategies/ Guidelines	VCSNS 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

Section 11: Maintain RCS Inventory Control	
Identify modifications	• New electrical components will be required to allow either the installed ASI DG or the on-site stored backup DG to be connected to either the installed ASI pump or the on-site stored RXMU FLEX pump via on-site stored wiring and connectors. • New permanent piping and valves will be installed to connect the discharge of the installed ASI pump to the existing charging pump discharge header. Fittings/valves will be included to allow for the on-site stored RXMU FLEX pump to be connected to the charging pump discharge header via a high pressure hose. • New permanent piping and valves will be required to provide a means for the ASI pump to take suction from the BAT tanks (the ASI pump currently takes suction solely from the RWST). • New permanent piping connection and valves will be required to allow the on-site, stored RXMU FLEX pump to take suction from the RWST or the BAT tanks via a hose.
Key Reactor Parameters	Same as Phase 1 not including instrumentation to support portable equipment.
Phase 2 Storage / Protection of Equipment : Describe storage / protection plan or schedule to determine storage requirements	
Seismic	FLEX equipment will be stored in either an existing structure meeting VCSNS seismic design basis, or a structure designed to or evaluated equivalent to seismic requirements of ASCE 7-10. FLEX Equipment will be stored in a manner to preclude damage as a result of seismic interaction from non-seismic components.
Flooding	FLEX equipment and associated connections will be stored either above the elevation of recent site flooding analysis, or in a structure designed to protect equipment from the flood elevation (e.g. existing Category 1 structure). (Note: Only applicable external flooding hazard is ponding on-site due to local intense precipitation.)

Section 11: Maintain RCS Inventory Control	
Severe Storms with High Winds	FLEX equipment will be stored in either a structure meeting the VCSNS design basis for high wind hazards (hurricane, tornado, and wind generated missiles), or in a structure designed to or evaluated equivalent to ASCE 7-10 given the limiting tornado wind speed of RG 1.76 (230 mph) or design basis hurricane wind speed (100 mph). In situations where the storage buildings do not meet the requirements for protection against tornado winds the FLEX equipment storage locations will be sufficiently separated as outlined in NEI 12-06 Section 7.3.1.1.c.
Snow, Ice, and Extreme Cold	FLEX equipment will be stored in either existing Category 1 structures (i.e. Nuclear Safety Related Structures) or structures designed to or evaluated equivalent to ASCE 7-10. FLEX equipment storage and deployment routes will consider effects of icing, and equipment will be protected as required.
High Temperatures	FLEX equipment will be stored and operated within the manufacturer limitations of the equipment. Any additional ventilation or other protection from high temperatures will be provided as required.

Phase 2 Deployment Conceptual Design

Strategy	Modifications	Protection of connections
The exact storage location and structure have yet to be decided. For this function, the RXMU FLEX pump will be stored in the Auxiliary Building. Deployment of the stored backup DG will be from a FLEX storage facility, assumed to be inside the protected area of the station. The backup DG will be transported to the west side of the station, near the installed ASI DG.	No additional modifications required for deployment of Phase 2 strategies.	All connections associated with this strategy will be located within the Auxiliary building, protected from all applicable hazards.

Section 11: Maintain RCS Inventory Control

Maintain RCS Inventory Control: PWR Portable Equipment Phase 3:

Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain core cooling. Identify methods (Low Leak RCP Seals and/or borated high pressure RCS makeup) and strategy(ies) utilized to achieve this coping time.

RCS reactivity and inventory is adequately maintained via the Phase 2 strategy. Due to low leakage seals, the 500,000 gal RWST and the two BAT tanks (20,000 gal each) would last approximately 90 days (at a required make-up rate of 4 gpm); these make-up sources are borated. A mobile boration unit would be expected to arrive from the Regional Resource Center (RCC) to borate other available water supplies, such as the 100,000 gal RX Makeup Storage Tank to ensure continued, long-term RCS make-up. Also, back-up DGs will be available from the RCC to power the ASI pump or the on-site, stored PD pump in the long-term, if required.

Phase 3 Details:

Provide a brief description of Procedures/Strategies/ Guidelines	VCSNS 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	No Modifications Required for Phase 3
Key Reactor Parameters	Same as Phase 1 not including instrumentation to support portable equipment.

Phase 3 Deployment Conceptual Design

Strategy	Modifications	Protection of connections
The mobile boration unit is expected to be provided by the RRC to the site.	No modifications are anticipated during deployment of RCS inventory control strategies for Phase 3.	All connections are within qualified safety related structures.

Section 12: Maintain Containment

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

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

Maintain Containment: PWR Installed Equipment Phase 1:

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

An analysis has been developed that models the containment response to a postulated ELAP and loss of ultimate heat sink (LUHS) event and shows that the event does not challenge the containment design pressure or temperature conditions until well after availability of RRC equipment and implementation of long term strategies to control pressure and temperature. See the Phase 3 discussion.

There are no phase 1 actions required at this time that need to be addressed.

Phase 1 Details:

Provide a brief description of Procedures/Strategies/ Guidelines	VCSNS 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. Reference 15 evaluated the Long Term Containment Response to an Extended Loss of All AC Power evaluates the containment conditions during the event for pressure and temperature.
Identify modifications	No Modifications are required for Phase 1
Key Containment Parameters	Pressure and temperatures are read on MCB panels XCP-6103, 6104, and 6105 (Reference 25). Pressure is read on PI-950, 951, 952, and 953; with 951 & 952 being PAMS instruments. Temperature is read on TI-9201A and 9203A.

Notes: Reference 15 was prepared to evaluate the long term containment response to INPO IER L1-11-4 (address the effects of an Extended Loss of All AC Power in Response to the Fukushima Daiichi event- ELAP). This calculation was prepared to determine the expected increase in containment pressure and temperature taking into account ambient heat loses with and without RC pump seal leakage. Worst case shows a pressure after ~24 hours of ~24 psia (gain of ~7.83 psi) or ~9.3 psig which is < the Spray system actuation pressure of ~12 psig per Technical Specifications.

This assumes a constant heat load (net heat load of the RCS at 100% power without motor heats) in the Reactor Building, in actuality the RCS heat loss would be constantly decreasing with time and cooldown of the RCS. The reduced heat load along with RCP assumed seal leakage would most likely be an overall heat load that is less than assumed. An RB Temperature of ~175 °F is predicted after ~24 hours.

Section 12: Maintain Containment
Pressures and temperatures are well within design capabilities of the Reactor Building.

Section 12: Maintain Containment	
Maintain Containment: PWR Portable Equipment Phase 2:	
Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (containment spray/hydrogen igniters) and strategy(ies) utilized to achieve this coping time. Analysis will be utilized to demonstrate that pressure and temperature will stay at acceptable levels throughout the ELAP event. Containment cooling will be the preferred response, and the option will be maintained to utilize the containment spray system will be maintained as part of FLEX. Monitoring of containment conditions will still occur. FLEX Support Guidelines (FSGs) will be developed for containment monitoring during a FLEX event.	
Phase 2 Details:	
Provide a brief description of Procedures/Strategies/ Guidelines	VCSNS 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 Existing guidance is identified in references 19 and 20. The existing guidance will be modified to match the finalized strategies for Phase 3. Strategy is to continue monitoring the pressure and temperature in the containment. Per Reference 15, table 16, the predicted containment pressures and temperatures at ~55 hours are ~15.4 psig and ~200 °F with ambient RCS heat loss and postulated RCP seal leakage.
Identify modifications	No modifications are required for Phase 2
Key Containment Parameters	Same as Phase 1 Details.
Phase 2 Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	FLEX equipment will be stored in either an existing structure meeting VCSNS seismic design basis, or a structure designed to or evaluated equivalent to seismic requirements of ASCE 7-10. FLEX Equipment will be stored in a manner to preclude damage as a result of seismic interaction from non-seismic components.

Section 12: Maintain Containment	
Flooding	FLEX equipment and associated connections will be stored either above the elevation of recent site flooding analysis, or in a structure designed to protect equipment from the flood elevation (e.g. existing Category 1 structure). (Note: Only applicable external flooding hazard is ponding on-site due to local intense precipitation.)
Severe Storms with High Winds	FLEX equipment will be stored in either a structure meeting the VCSNS design basis for high wind hazards (hurricane, tornado, and wind generated missiles), or in a structure designed to or evaluated equivalent to ASCE 7-10 given the limiting tornado wind speed of RG 1.76 (230 mph) or design basis hurricane wind speed (100 mph). In situations where the storage buildings do not meet the requirements for protection against tornado winds the FLEX equipment storage locations will be sufficiently separated as outlined in NEI 12-06 Section 7.3.1.1.c.
Snow, Ice, and Extreme Cold	FLEX equipment will be stored in either existing Category 1 structures (i.e. Nuclear Safety Related Structures) or structures designed to or evaluated equivalent to ASCE 7-10. FLEX equipment storage and deployment routes will consider effects of icing, and equipment will be protected as required.
High Temperatures	FLEX equipment will be stored and operated within the manufacturer limitations of the equipment. Any additional ventilation or other protection from high temperatures will be provided as required.

Phase 2 Deployment Conceptual Design		
Strategy	**Modifications**	**Protection of connections**
	No modifications are needed during deployment of strategies to maintain containment for Phase 2.	
Notes: Preparation would begin for the phase 3 containment cooling efforts.		

Section 12: Maintain Containment

Maintain Containment: PWR Portable Equipment Phase 3:

Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain core cooling. Identify methods (containment spray/hydrogen igniters) and strategy(ies) utilized to achieve this coping time.

The Phase 3 coping strategy required for maintaining containment integrity involves either using the Reactor Building Cooling Unit (RBCU) or Reactor Building Spray for containment pressure and temperature reduction.

Primary Strategy

The primary strategy is to provide cooling water flow to the B-train RBCU utilizing FLEX Transfer pumps or pumping stations along with a submersible FLEX UHS pump (Figure 7). Field routed piping to the FLEX Header (Figure 8) provides a flow supply to feed the RBCUs. A portable diesel power supply for the pump(s) along with power feed to the RBCU fan to run in slow speed will be provided.

Alternate Strategy

An alternate strategy to the building cooling is to supply flow to the Reactor Building Spray system utilizing the FLEX UHS and Transfer pump along with the piping / hose routing as noted in the primary strategy (Figure 6).

Phase 3 Details:

Provide a brief description of Procedures/Strategies/ Guidelines	A Primary strategy of providing cooling water flow to the Reactor Building Cooling Units is preferred, along with powering the associated fan in slow speed. Specific details will be prepared for FLEX application guidance. An Alternate strategy is provided in the existing Reference 19 strategies. If RB temperature continues to rise, an alternate cooling method may be a connection to the RB spray system. An existing 2 ½" B.5.b connection through XVG 3047 is near penetration 303 to the spray ring. A water supply using a FLEX Transfer pump will be supplied. Elevation requires at least 50 psi at the 463' elevation to get the water to the spray nozzles with addition pressure required for flow.
Identify modifications	An additional submersible pump (FLEX UHS Pump) may be installed in the intake tunnel thru an existing man-way opening or a new location with a discharge header providing manifold connections to the FLEX Transfer Pump. This pump would provide a source of Service Water at high flow and pressure. A temporary diesel generator source would be required for the pump.

Section 12: Maintain Containment

Key Containment Parameters	Same as Phase 1 Details.

Phase 3 Deployment Conceptual Design

Strategy	**Modifications**	**Protection of connections**
FLEX UHS and Transfer Pumps supplying water to the RBCU	Fire hose / hardened connections / manifold to B-train RBCU at the 463' penetrations near the SFP area.	Inside the Auxiliary Building. Piping connections will be added to the ASME piping with applicable seismic qualification.
Power connection to RBCU fan breaker	Electrical interface to allow temporary power to feed the RBCU fan in slow speed. Power feed to either XSW1DB1-6C or 6D to support a FAN motor of ~100 HP	Inside the Auxiliary Building and is in 1E power supply.
Installation of a Temporary submersible (FLEX UHS) pump will provide a UHS water source to the RBCUs	Install a connection point near the SW pump house for the installation of a vertical submersible pump to provide SW flow source to other pumping units	Use of existing man ways or other hardened connections on the intake tunnel above the water surface. The FLEX UHS and Transfer Pumps would be stored in a hardened structure.

Section 12: Maintain Containment

Notes:

It is preferential to cool the RB rather than flood. Temperature and pressures are all within the RB design even after ~55 hours. Fire truck to feed spray system will need to have enough pressure to go from ground 436' to the 463 connection point then to the spray header at 576'-elevation difference of 140 feet plus hose losses. Elevation pressure ~61 psi alone.

The FLEX UHS Pump sizing will depend on flow rates to be supplied and components. RBCUs are the furthest away with the highest elevation 520' from the ground piping outside of the SW pump house of ~427'. The piping scheme will include installation of surface piping from the FLEX UHS to FLEX Transfer pump near the SW pump house. Connection to an auxiliary power diesel generator and piping to a land based fire truck or FLEX Transfer pump will be used. Suction conditions and elevation will have to be considered, along with wind and seismic effects. Connections will be made to the FLEX header (Figure 8) which will allow connection to the RBCU piping.

This will also allow connection and provide pressurized flow to the RB spray piping if the alternate cooling method is used.

Section 13: Maintain Spent Fuel Cooling

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

- **Makeup with Portable Injection Source**

Maintain Spent Fuel Cooling: PWR Installed Equipment Phase 1:

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategy(ies) utilized to achieve this coping time.

The spent fuel pool and cooling system maintains a controlled water level in the pool during normal operations. The racks are designed such that a borated water source is not required to maintain a subcritical condition. The plant continuously monitors and identifies a "time to reach 200°F" in the spent fuel pool for heightened awareness. Analysis shows no challenge to boiling or inventory loss in the first 8 hours after the event as noted. At approximately 8 hours after the start of the event, temperature would be conservatively projected to be ~140 °F and level is estimated to have dropped ~1.2 feet.

There are no phase 1 actions required at this time that need to be addressed

Phase 1 Details:

Provide a brief description of Procedures/Strategies/ Guidelines	Reference 18 responded to the INPO IER as identified in the notes. This (Reference 18) assessment is conservative and identifies that NO actions are required within the first shift following the event (~12 hours). With the guideline of the plant operating ~100 days, the assessment is very conservative and assumes a max of 50 days after shutdown and refueling heat load.
Identify modifications	Modification to install reliable spent fuel pool instrumentation per EA 12-051 (Reference 29)
Key Spent Fuel Pool Parameters	Reliable spent fuel pool instrumentation per EA 12-051 (Reference 29)

Notes:

Reference 18 assessed the Spent Fuel Pool Time to Boil-Response to INPO IER L1-11-4 in response the subject INPO item on Fukushima. The results are very conservative and look at times after shutdown of 20-50 days, such that with a loss of all AC power time to boil using the 50 days from shutdown case is 24.3 hours, with a time to uncover of 193 hours. It is anticipated that time to boil after 100 days of power operations would be greater than the noted time.

Reference 18 provides SFP heat-up rates on a loss of SFP cooling with different cases assuming partial and full core off-loads much closer to the time of shutdown.

Section 13: Maintain Spent Fuel Cooling

Maintain Spent Fuel Cooling: PWR Portable Equipment Phase 2:

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategy(ies) utilized to achieve this coping time.

The primary strategy is to begin supplying water to the pool to provide level makeup and cooling. If installed equipment is available to provide clean water it will be used. Lake or UHS water is the backup source of water.

Phase 2 Details:	
Provide a brief description of Procedures/Strategies/ Guidelines	Reference 21, Loss of Spent Fuel Pool Cooling and Reference 22, Decreasing Level in the Spent Fuel Pool with the Fuel Transfer Canal Transfer Tube Valve Closed provide immediate operator actions to the respective conditions. They also provide a reference to Reference 23 which provides Spent Fuel Pool Makeup and Spray Strategies. This document provides instructions and strategies for both internal and external makeup to the pool utilizing existing installed and staged equipment.
Identify modifications	No New Modifications are required for Phase 2. Will used existing plant installed equipment and connections identified in Phase 1.
Key Spent Fuel Pool Parameters	Reliable spent fuel pool instrumentation per EA 12-051 (Reference 29). Initial conditions for this phase ~140°F and level drop of 1.2 feet.

Phase 2 Storage / Protection of Equipment : Describe storage / protection plan or schedule to determine storage requirements	
Seismic	FLEX equipment will be stored in either an existing structure meeting VCSNS seismic design basis, or a structure designed to or evaluated equivalent to seismic requirements of ASCE 7-10. FLEX Equipment will be stored in a manner to preclude damage as a result of seismic interaction from non-seismic components.
Flooding	FLEX equipment and associated connections will be stored either above the elevation of recent site flooding analysis, or in a structure designed to protect equipment from the flood elevation (e.g. existing Category 1 structure). (Note: Only applicable external flooding hazard is ponding on-site due to local intense precipitation.)

Section 13: Maintain Spent Fuel Cooling	
Severe Storms with High Winds	FLEX equipment will be stored in either a structure meeting the VCSNS design basis for high wind hazards (hurricane, tornado, and wind generated missiles), or in a structure designed to or evaluated equivalent to ASCE 7-10 given the limiting tornado wind speed of RG 1.76 (230 mph) or design basis hurricane wind speed (100 mph). In situations where the storage buildings do not meet the requirements for protection against tornado winds the FLEX equipment storage locations will be sufficiently separated as outlined in NEI 12-06 Section 7.3.1.1.c.
Snow, Ice, and Extreme Cold	FLEX equipment will be stored in either existing Category 1 structures (i.e. Nuclear Safety Related Structures) or structures designed to or evaluated equivalent to ASCE 7-10. FLEX equipment storage and deployment routes will consider effects of icing, and equipment will be protected as required.
High Temperatures	FLEX equipment will be stored and operated within the manufacturer limitations of the equipment. Any additional ventilation or other protection from high temperatures will be provided as required.

Phase 2 Deployment Conceptual Design		
Strategy	**Modifications**	**Protection of connections**
Fire hose connection (Reference 23 - Attachments II, III-internal strategy if available)	No modifications necessary. Guidance exists in reference 23 for the connection of fire service to a check valve (bonnet removed with adapter installed) on the reactor makeup water SF pool supply check valve. This is an internal connection. The fire service could come from a FLEX Transfer pump and routed hoses in the auxiliary building.	Attachments to existing seismic protected equipment in the Auxiliary Building -388' area.
Fire service makeup to SFP via Reference 23 - Attachment IV-Hoses routed to the pool.	The FLEX Header is installed (see Figure 8).	External FLEX Transfer pump and hose(s) to pool area, supply water can be UHS or other available supply.

Section 13: Maintain Spent Fuel Cooling		
Portable pump with hoses to pump water from cask pit and or transfer canal to the SFP if water is available	No modifications needed.	External pump and hose.
Notes: Reference 23 provides directions for both internal and external strategies for SFP makeup. Internal responses may not be available in ELAP. External response is the most likely solution using the FLEX UHS and Transfer pump along with the Figure 8 distribution header. A pre-emptive measure/strategy could be to store either borated or demineralized water in the cask loading pit and transfer canal as a potential local water source for SFP make-up. No modification would be required to use a portable pump to transfer water. Demineralized water would be acceptable since we would have a concentrating effect on the existing boron in the pool due to the evaporation.		

Section 13: Maintain Spent Fuel Cooling

Maintain Spent Fuel Cooling: PWR Portable Equipment Phase 3:

Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup via portable injection source) and strategy(ies) utilized to achieve this coping time.

The primary strategy is to provide makeup and cooling flow to the pool. Makeup from a FLEX Transfer or other pump to the SF pool would be used as conceptualized in Figures 6, 7, and 8. If no action has been taken, the pool may be at boiling with a reduced inventory. Additionally, elevated radiation levels may be occurring in the pool area. Spraying water from a remote area along with wall panel removal for ventilation is an existing strategy in Reference 23. More detailed FLEX guidance may be prepared for these actions replacing reference 23.

Phase 3 Details:

Provide a brief description of Procedures/Strategies/ Guidelines	Reference 23 would continue to be used. Makeup from a FLEX Transfer or other pump to the SF pool would be used. In the event makeup was delayed, Reference 23 has strategies to spray the pool area and ventilate the area to reduce heat buildup.
Identify modifications	No New Modifications are required for Phase 3
Key Spent Fuel Pool Parameters	Reliable spent fuel pool instrumentation per EA 12-051 (Reference 29) If no action was taken, the pool would be approaching the boiling point and would have lost ~3.6 feet of inventory and temperature would be approaching boiling (conservative analysis as previously noted would have the pool at the boiling point of 212F).

Phase 3 Deployment Conceptual Design

Strategy	Modifications	Protection of connections
FLEX UHS / Transfer pumps / fire trucks to supply lake, UHS, or other water source to the SFP. Reference 23, Attachment VII- Spray rate of ~200-350 gpm which would provide a cooling effect along with level recovery.	No modification required	Fire hoses from lake or UHS pond source to the SFP area.
Reference 23, attachment VIII describes actions to provide spray flow to the SFP area. It involves opening wall panels and spraying	No Modification required	This action utilizes existing equipment.

Section 13: Maintain Spent Fuel Cooling		
into the area		
Additional air cooling for the area is described in attachment IX of Reference 23. Translucent panels are removed to provide a ventilation path	No modification required	No new equipment or connections
Notes: The actions for phase 3 involve different strategies for cooling and makeup to the SFP when previous actions are not affective. If power is restored, normal makeup can be supplied utilizing the Reactor Water Makeup Tank inventory, or other water sources, using transfer pumps provided the flow path is confirmed to be intact.		

Section 14: Safety Function Support

Determine Baseline coping capability with installed coping modifications not including FLEX modifications.

Safety Function Support: PWR 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.

Station 125VDC Batteries supplying DC and 120VAC vital AC

During Phase 1, VCSNS requires vital instrumentation power to cope with an ELAP/LUHS event. All vital instrumentation is powered from the 125VDC Class 1E power system. The 125V DC Class 1E power system batteries are C&D LCR lead-acid batteries and consist of two Trains: "A" & "B". Each train consists of a battery charger, battery, DC bus, inverter, and respective vital loads. The battery coping time with no load shedding is 4+ hours (Reference 24). If load shedding, as described in Reference 28, is completed within two hours of the initiation of the ELAP event the battery coping period is extended to greater than 24 hours.

Primary Strategy for Extending DC Power Availability

The primary strategy for extending DC power availability is to connect a FLEX Diesel Generator (DG) to a pair of cables to provide power to the normal battery chargers (Figure 9). Thus, extending the life to the "A" & "B" batteries to an indefinite period without load shedding. The connection of portable power is expected to be completed in approximately one hour of the initiation of the ELAP event.

Backup Strategy for Extending DC Power Availability

Load shedding will be required to begin approximately one hour after the initiation of the ELAP event if connection and operation of portable power to the battery chargers has not been successfully completed. Load shedding is to be completed within two hours following the ELAP event in order to extend battery life to beyond 24 hours. Initial timeline evaluations for load shedding indicate that the manual actions can be completed within 30 minutes. This will be further documented as procedure revisions are developed.

Alternate Strategy for Extending DC Power Availability

The "A" and "B" DC buses share a swing battery charger. Although the swing charger provides a connection between trains, a mechanical interlock prevents the paralleling of buses. The VCSNS coping study (Reference 28) describes the methodology for defeating the interlock on the shared swing charger to cross tie (parallel) batteries "A" and "B". This can extend the coping time to 45 hours.

Main Control Room and Plant DC Powered Lighting

The lighting strategy is to provide LED lighting for all phases of the FLEX response. The LED lighting will be provided either through temporary installations or replacement of current lighting LED bulbs. This will decrease the DC load requirements and enhance the expected DC battery life.

Section 14: Safety Function Support

Main Control Room and Plant Ventilation

Forced ventilation for cooling and habitability is not required during Phase 1. Doors will be propped open to alleviate high temperatures in the main control room, electrical equipment rooms and the area of the turbine driven emergency feed water pump. Strategies for the deployment of temporary ventilation for hydrogen control during battery charging activities will be necessary during Phase 1 implementation. These strategies will utilize portable fans, flexible ducting and portable diesel generators for the powering the fans.

Plant and Site Communications

VCSNS will utilize portable satellite phones for communications that will have sufficient charge and battery replacement for at least 24 hours of service until a normal communication system is repowered. Battery chargers and temporary diesel generators are provided to extend the communications capability beyond the 24 hour service time. Site portable radio communications capability is similarly supported with replacement batteries, chargers and portable diesel generator power for the radios. A portable radio repeater tower is also available to support the radio system. This tower is self-contained and powered by a portable diesel generator mounted on the tower trailer.

The installed radio communications system for operations, maintenance, fire protection and emergency response will be an upgraded radio communications network located in a protected structure, Electrical Equipment Building (EEB) meeting the design requirements of NEI 12-06. The radio communications system will have a 24 hour battery located in the EEB and will be backed by a dedicated diesel generator.

Phase 1 Details:	
Provide a brief description of Procedures/Strategies/ Guidelines	• EOP 6.0 "Loss of All AC Power" with supporting DC calculations (References 24 to 28) will direct the implementation of FLEX Support Guidelines implementing the strategies outlined above. • Additional instructions will be added to EOP 6.0 Step 5 to direct implementation of FLEX Support Guidelines for deployment and operation of the FLEX DG supplying power to the normal "A" & "B" train battery chargers. This would allow operators to remain in the Control Room with full availability of instrumentation /annunciators and control of equipment powered from the 125VDC batteries and 120V vital AC.
Identify modifications	Modifications will include installed and protected cable connections for use of FLEX DG to power station Battery Chargers for indefinite use. Install permanent cable from XSW1DA2X & XSW1DB2X Motor Control Centers to location of FLEX DG with 2 breakers per cable (1 per end).

Section 14: Safety Function Support	
	Operations/Maintenance/Fire Brigade/Emergency Response specific Radio System will be installed in the protected Electrical Equipment Building with 24 hour battery backup and dedicated diesel generator backup.
Key Safety Function Support Parameters	Battery voltage kept >105VDC on Main Control Board indication.

Section 14: Safety Function Support

Safety Function Support: PWR Portable Equipment Phase 2:

Provide a general description of the coping strategies using on-site portable equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy(ies) utilized to achieve coping times.

Power Requirement for Safety Function Support During Phase 2

Electrically powered equipment required during Phase 2 is vital instrumentation, Alternate Seal Injection (ASI) pump and RXMU FLEX pump aligned for reactor coolant system (RCS) inventory control, lighting, and alternate battery charger. Energizing these loads will be accomplished using a 250 KW FLEX generator connected to 480 VAC Panel #2 breakers in the EEB.

The portable 250 KW FLEX generator will be stored on site within a protected storage structure. The backup 250 KW is maintained within the EEB. Within 8 hours after the initiation of the ELAP event the portable FLEX generator will be deployed from a storage area to the staging area east of the EEB (if the backup EEB DG is not operational). A set of FLEX cables will be stored with each generator and will be deployed on the generator trailer. The FLEX generator will be grounded via a flexible cable to a ground plant ground grid connection at the EEB.

Alternate Portable Battery Charger for Extending DC Power Availability

An alternate portable battery charger stored in protected EEB will provide back up to the FLEX DG (Phase 1) providing power to XBA-1A & XBA-1B batteries via permanently installed separation breakers and cables. The alternate battery charging strategy will repower the DPN1HA2 & DPN1HB2 Class 1E 125VDC load centers on Train "A" & "B". Repowering these load centers will allow the vital batteries "A" & "B" to be recharged, thus allowing for indefinite vital battery coping time (assuming Phase 1 actions were unsuccessful). The portable charger will be either a dual output 200 ADC 135 VDC portable battery charger or two 200 ADC 135 VDC battery chargers with quick disconnect 480 VAC input. A single breaker in EEB Panel #2 can provide 480 VAC for the charger(s). Separate output breakers with quick disconnect will route the 135VDC-200 ADC power to DPN1HA2 and DPN1HB2 (this will allow back feed to batteries and other loads). The 480 VAC FLEX generators must be deployed and operational at T+24 hours. To ensure that 480 V power is restored at T+24 hours, FLEX generator deployment will begin no later than T+20 hours. Since the battery coping with load shedding is 26+ hours, and the battery chargers will be re-energized at T+24 hours, providing 2+ hours of margin.

Alternate Power for Backup of Reactor Coolant System Inventory Control and Boration

Alternate power to the (ASI) pump and the RXMU FLEX pump is provided through a pair of Manual Transfer Switches from a 480 VAC power panel in the protected EEB. This strategy is depicted in Figure 5.

The FLEX cables will provide a positive locking mechanism to ensure a tight waterproof connection,

Section 14: Safety Function Support

but have permanent cover to prevent ice accumulation. Instructions to align the color coding and labeling on all FLEX cables and connectors will be necessary. The external FLEX generator will be connected to EEB 480 VAC Panel #2 via FLEX connection junction box. The primary strategy is to repower the 480 VAC ASI pump and/or RXMU FLEX pump via a manual transfer switch (MTS).

Alternate Power for the Backup Protected Technical Support Center (TSC)

Alternate power will be provided through the distribution system located in the EEB backed by the 250 KW FLEX generators. This will enable the use of the backup TSC for response to the ELAP event. The backup TSC is located in the area next to the Main Control Room and will be capable of providing communications, habitable conditions, lighting and plant information services in support of emergency response.

Refueling of FLEX Diesel Generators

The FLEX generators will be stored on site with fuel for the 80KW units (approx 12 hours), built-in fuel of 24 hours for one 250 KW units. Once deployed to the staging area, the FLEX generators will be fueled as needed from a refueling truck or from a FLEX fuel tanker. The strategy to transfer fuel is to use a portable 120V, 10 gpm pump to transfer fuel from the safety related 7-day tanks to a refueling truck that delivers to each of the FLEX diesels (pumps and generators). The FLEX fuel tanker trailer is equipped with a portable diesel generator for powering the transfer pump motor.

Phase 2 Details:	
Provide a brief description of Procedures/Strategies/ Guidelines	• EOP 6.0 & Associated FLEX Support Guidelines will support the implementation and operation of ASI pump and/or RXMU FLEX pump via FLEX power source. • FLEX Support Guidelines will be utilized to implement the strategies associated with the alternate charging of XBA-1A & XBA-1B batteries. • Emergency Plan Procedures will direct the use of the Backup TSC.
Identify modifications	• The alternate portable battery charger will be staged in EEB to provide alternate power to XBA-1A & XBA-1B batteries via DPN1HA2 & DPN1HB2 busses through permanently installed separation breakers and cables. • A modification will install a pair of Manual Transfer Switches for ASI DG power to Bus 2 of EEB and from ASI pump to the backup RXMU FLEX pump power supply. • A modification will provide a power cable from EEB to the Backup TSC to either an existing panel or a new panel. • A modification may be required to address changes in the

Section 14: Safety Function Support	
	lighting provided by permanent or temporary LED lighting components.
Key Safety Function Support Parameters	None
Phase 2 Storage / Protection of Equipment : Describe storage / protection plan or schedule to determine storage requirements	
Seismic	FLEX equipment will be stored in either an existing structure meeting VCSNS seismic design basis, or a structure designed to or evaluated equivalent to seismic requirements of ASCE 7-10. FLEX Equipment will be stored in a manner to preclude damage as a result of seismic interaction from non-seismic components.
Flooding	FLEX equipment and associated connections will be stored either above the elevation of recent site flooding analysis, or in a structure designed to protect equipment from the flood elevation (e.g. existing Category 1 structure). (Note: Only applicable external flooding hazard is ponding on-site due to local intense precipitation.)
Severe Storms with High Winds	FLEX equipment will be stored in either a structure meeting the VCSNS design basis for high wind hazards (hurricane, tornado, and wind generated missiles), or in a structure designed to or evaluated equivalent to ASCE 7-10 given the limiting tornado wind speed of RG 1.76 (230 mph) or design basis hurricane wind speed (100 mph). In situations where the storage buildings do not meet the requirements for protection against tornado winds the FLEX equipment storage locations will be sufficiently separated as outlined in NEI 12-06 Section 7.3.1.1.c.
Snow, Ice, and Extreme Cold	FLEX equipment will be stored in either existing Category 1 structures (i.e. Nuclear Safety Related Structures) or structures designed to or evaluated equivalent to ASCE 7-10. FLEX equipment storage and deployment routes will consider effects of icing, and equipment will be protected as required.
High Temperatures	FLEX equipment will be stored and operated within the manufacturer limitations of the equipment. Any additional ventilation or other protection from high temperatures will be provided as required.
Phase 2 Deployment Conceptual Design	

Section 14: Safety Function Support

Strategy	Modifications	Protection of connections
Portable Battery Charger in EEB to recharge station safety related batteries.	No modifications will be needed during deployment of strategies for Safety Function Support for Phase 2.	All connectors, cables, panels and breakers will be underground or located in Control Building or EEB.
Power either the ASI or Backup FLEX RXMU pump for boron injection and RCS inventory control	No modifications will be needed during deployment of strategies for Safety Function Support for Phase 2.	All connectors, cables, panels and breakers will be underground or located in Aux Building or EEB.
Repowering of the Backup TSC	No modifications will be needed during deployment of strategies for Safety Function Support for Phase 2.	All connectors, cables, panels and breakers will be underground or located in Control Building or EEB.

Section 14: Safety Function Support

Safety Function Support: PWR Portable Equipment Phase 3:

Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy(ies) utilized to achieve coping times.

The Phase 3 strategy for Safety Function Support provides a single point connection for a 250 KW portable diesel generator from the Regional Response Center. This diesel generator will provide power to multiple FLEX functions on the site (Alternate Battery Charger, ASI pump and /or RXMU FLEX pump power and Backup TSC power). The FLEX diesel generator will be connected through an installed breaker to 480 VAC Distribution Panel #2 in the EEB with ground and neutral to a NEI 12-06 compliant quick disconnect (5 lead) located on the east side of the EEB. Connectors will be provided with covers to preclude icing from interference connection functionality.

Phase 3 Details:

Provide a brief description of Procedures/Strategies/ Guidelines	• EOP 6.0 & Associated FLEX Support Guidelines will support the implementation and operation of ASI pump and/or RXMU FLEX pump via FLEX power source. • FLEX Support Guidelines will be utilized to implement the strategies associated with the alternate charging of XBA-1A & XBA-1B batteries. • Emergency Plan Procedures will direct the use of the Backup TSC.
Identify modifications	Install a breaker to 480 VAC Distribution panel #2 in the EEB with sized cabling (ground and neutral) to a FDR compliant quick disconnect (5 lead) located on the east side of the EEB (Cover connectors to preclude icing from interference with connection functionality).
Key Safety Function Support Parameters	No specific instrumentation will be powered by this modification.

Phase 3 Deployment Conceptual Design

Strategy	Modifications	Protection of connections
Provide an alternate method of powering Bus 2 of EEB	No modifications will be needed during deployment of strategies for Safety Function Support for Phase 3.	Cover over connectors to preclude icing from interference with connection functionality.

References

1. NRC EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," March 12, 2012. [ADAMS Accession Number ML12056A045]
2. NEI 12-06, Revision 0, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, August 2012.
3. NRC JLD-ISG-2012-01, Revision 0, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," August 2012.
4. V.C. Summer Nuclear Station Updated Final Safety Analysis Report (UFSAR) Docket 50-395, January 2013.
5. U. S. Nuclear Regulatory Commission (NRC), "Request for Information Pursuant to Title 10 of the Code of Federal Regulations (10 CFR), Section 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," March 12, 2012
6. PWROG PSC - ELAP Core Team, "Core Cooling Management Interim Position Paper", Revision 0, November 2012, PA-PSC-0965
7. WCAP-17601-P, Revision 1, "Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs," January 2013.
8. VCSNS Calculation DC08320-005, ESF Battery 1A and 1B Capacity Under Load Shedding
9. VCSNS Calculation DC00020-227, Control/TSC/Cable Spreading Separate Room Heat-up Calculation-Complete Loss of HVAC
10. VCSNS Calculation DC00020-228, Relay/Cable Spreading Room CB-425 Heat-Up Calculation
11. VCSNS Calculation DC00020-238, EFW/TDEFW Room Heat-up Calculation
12. VCSNS Calculation DC00020-233, Battery and Charging Room Heat-up Calculation
13. VCSNS Calculation DC07290-001, Hydrogen Evolution Rates Intermediate BLD Battery Rooms
14. VCSNS Calculation DC00020-246, Condensate Storage Tank Depletion Time-Response to INPO IER L1-11-4
15. VCSNS Calculation DC00020-245 Long-Term Containment Response-Response to INPO IER L1-11-4
16. VCSNS Calculation DC00070-001, SG Depressurization and Low Pressure Feed for BDMG
17. VCSNS EOP 6.0, Loss of All ESF AC Power
18. VCSNS Calculation DC00020-244 Spent Fuel Pool Time to Boil-Response to INPO IER L1-11-04
19. VCSNS BDMG-10.0 Containment Integrity Control
20. VCSNS BDMG-7.0 Containment Flooding with Fire Service

21. AOP-123.4 Loss of Spent Fuel Pool Cooling
22. AOP-123.5 Decreasing Level in the Spent Fuel Pool with the Fuel Transfer Canal Transfer Tube Valve Closed
23. BDMG-1.0, Spent Fuel Pool Makeup and Spray Strategies
24. VCSNS Calculation DC08320-001, Battery Sizing 1A & B
25. VCSNS Drawing 201-322, Main Control Board Instrumentation Control Panel XCP6103, 6104, and 6105.
26. VCSNS Calculation DC08320-010, Determine Class 1E 125 V DC Main Distribution System Voltages During 4-hour Battery Duty Cycle.
27. VCSNS Calculation DC08320-017, ESF Battery Load Profile.
28. VCSNS Calculation DC08320-019, EOP-6/BDMG Ultimate Battery Life Under Load Shedding
29. NEI 12-02, Revision 1, Diverse Industry Guidance for Compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation", August 2012.

Attachment 1A: Sequence of Events Timeline

Action Item	Elapsed Time (hours)	Action	Time Constraint Y/N	Time Constraint (hours)	Reference	Remarks/Applicability
	0	Event Starts	N/A			
1	0.017	TDEFW starts, blowdown isolates	N			Automatic on Blackout
2	0.25	SBO Procedure (EOP 6.0) Entered	N			
3	0.5	Start Aligning Flex Generator to Battery Charger	N			If battery chargers are powered do not have to strip DC loads.
4	0.5	Operators Control Steam PORVs	N		Reference 2	In Seismic and Tornado will lose the Auto Started Diesel Air Compressor and must use local. One operator.
5	0.5	Operators Control Emergency Feed and isolate TDEFW steam drains	Y	Additional 0.5		Can cycle valves for first .5 hour, then need one local operator.
6	1	Open Relay Room Doors	Y	T+1	Reference 10	Needs further review.
7	1	Begin ELAP Actions	Y			Decision made by SS that an ELAP exists.
8	1	Begin DC load stripping.	Y	1.0	Reference 28	Required to be completed within 2 hours of event start, if Battery chargers are not powered.
9	2	DC loads stripped or Batteries Charging	Y	T+2.0	Reference 28	Required to ensure batteries last 24 hours

Attachment 1A: Sequence of Events Timeline

Action Item	Elapsed Time (hours)	Action	Time Con-straint Y/N	Time Con-straint (hours)	Reference	Remarks/Applicability
10	2.0	Start Low Pressure Feed preps	N			Next ELAP priority after batteries, just as a precaution.
11	2.0	Begin Flex Boration Prep	N			Boration is not needed unless we cooldown, then within T+36 hrs
12	2.0	Open Doors to cool IB 412	Y			
13	2.0	Open Control Room Doors	Y		Reference 9	
14	2.0	Open Relay Room Doors	Y		Reference 10	
15	4.0	Open Battery &Charger room doors	Y		Reference 12	
16	6	Complete Walkdown	Y			
17	6	Begin Flex pump boration	Y	24-36		Needed for boration, if cooled down.
18	8.0	Start Cooldown ~ 75degF/hr to ~300 psig steam	N		Reference 7	With Low Leakage RCP seals, not a constraint
19	9	SI Accumulators Begin injecting	N			Approximate time to reach 650 psig steam pressure.
20	10	Complete Cooldown	N			With low leakage seals cooldown is not required per WCAP-17601-P.
21	8	Begin CST refill	N			Must be either refill CST or go on alternate low pressure feed by T=11

Attachment 1A: Sequence of Events Timeline

Action Item	Elapsed Time (hours)	Action	Time Con-straint Y/N	Time Con-straint (hours)	Reference	Remarks/Applicability
22	11	Close Accumulator valves or Vent	N		needs to be done before further cooldown.	This time may change as better evaluations are done. Pressurizer void is collapsed.
23	11	Earliest CST depletion, loss of TDEFP			Reference 14	Without fill, 11 hours if at minimum Technical Specification level, 36+ if at normal
24	13	Begin Low Pressure SG feed	Y	~Loss of TDEFP + 2 hours	Reference 2	Required only if unable to fill CST, or other loss of TDEFP
25	24	Boration begins	Y	To meet Reactiv ity needs at T+36 hours		Required if cooled down and no credit given for Accumulator Injection
26	24	Battery Chargers powered	Y	By T=26	Reference 28	Batteries will be exhausted even if DC stripped, with no charger.
27	24	Begin SF Pool makeup	Y		Reference 18	Very conservative time; less than a foot below normal level.
28	36	Begin demin water production				

Attachment 1B:NSSS Significant Reference Analysis Deviation Table

Item	WCAP-17601-P Value	WCAP page	Plant applied value	Gap and discussion
Seal Leakage	21 gpm/pump	Page 4-32	< 1 gpm/pump	Use the low leakage safe shutdown seals is not a deviation. It is included only to highlight VCS's planned departure from the normal Westinghouse seal package.
Cool down	75°F/hr @ 2-hrs to 300 psig SG Pressure	Page 4-14	75°F/hr @ 8-hrs to 300 psig SG Pressure	Although RCS makeup is not needed for greater than 7-days, a plant cool down will be initiated due to unknowns such as the ability to maintain a secondary heat sink.
Makeup Capacity	30-40 gpm @ 1500 psia	Page 3-3	20 gpm for RCS pressures up to 2900 psig	The lower volumetric flow capacity is sufficient when using the low leakage, safe shutdown seals.

Attachment 2: Milestone Schedule

Task	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15
Submit Integrated Plan	■																																	
6-Month Status Update Report							■						■						■						■						■			
Develop FLEX Strategies	■	■	■	■	■	■	■																											
Develop Modification Engineering			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■										
Implement Online Modifications								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
Implement Outage Modifications															RF 21	■																	RF 22	■
Develop FSGs		■	■	■	■	■	■	■	■	■	■	■	■																					
Develop Maintenance Procedures										■	■	■	■	■	■	■	■	■	■	■	■													
Perform Staffing Analysis											■	■	■	■	■	■	■	■																
Implement Staffing Plan																	■	■	■	■	■	■	■	■										
Develop Training Plan																	■	■	■	■	■	■	■	■										
Implement Training Plan																							■	■	■	■	■	■	■	■				
RRCs Operational	■	■	■	■	■	■	■	■	■	■	■																							
Identify Off-Site Staging Area					■	■	■	■	■																									
Develop Off-Site Staging Area											■	■	■	■	■	■	■	■	■	■	■	■												
Purchase FLEX Equipment	■	■	■	■	■	■	■	■	■	■	■	■	■																					
Procure FLEX Equipment					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■													

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.

Attachment 3: FLEX Portable Equipment

PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core Cooling	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Two (2) 480 VAC Diesel Generators	X			X		250 KW+	Will follow OEM requirements and NEI12-06 for testing. (1) in EEB & (1) in ERB
One dual output Battery charger or Two single Output Battery Chargers				X		Each output is rated for ≥200ADC @ 135VDC	Will follow OEM requirements and NEI12-06 for testing.
Two (2) Manual Transfer Switches	X					480 VAC 3Ø 100KW rated	None
LED light bulbs				X	X	As needed	As needed
Four (4) 480 VAC Diesel Generators	X			X		80KW	Will follow OEM requirements and NEI12-06 for testing.
Two (2) FLEX SG Makeup Pumps	X		X			300+ gpm at 300+ psig	Will follow OEM requirements and NEI12-06 for testing. (1) in ERB & (1) in FLEX Storage Building

Attachment 3: FLEX Portable Equipment							
PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core Cooling	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Two (2) FLEX Transfer Pumps	**X**		**X**			Portable pumps or fire truck with capacity of 500+ gpm at 150+ psig	Will follow OEM requirements and NEI12-06 for testing. (1) in ERB & (1) in FLEX Storage Building
Two (2) FLEX UHS Pumps	**X**		**X**			Portable pumps with capacity of 500+ gpm at 150+ psig	Will follow OEM requirements and NEI12-06 for testing. Stored in Services Water Pum p House
One (1) RXMU FLEX Pump	**X**					Portable pumps or fire truck with capacity of 500+ gpm at 150+ psig	Will follow OEM requirements and NEI12-06 for testing. (1) in ERB & (1) in FLEX Storage Building
Hoses, cables, fittings, and connectors	**X**	**X**	**X**	**X**	**X**	Meets rated capacity for source.	Will follow OEM requirements and NEI12-06 for testing. Some located on fire truck/SG Flex Transfer Pump skid.

Attachment 3: FLEX Portable Equipment

PWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core Cooling	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Rapidly deployable Communications Tower	X	X	X	X	X	Does not rely on the availability of either on-site or off-site infrastructure other than satellites	Will follow OEM requirements and NEI12-06 for testing. Some located on fire truck/SG Flex Transfer Pump skid.
Fuel Tanker and Portable Containers	X	X	X	X	X	Provides diesel fuel to FLEX equipment from survivable tanks.	Will follow OEM requirements and NEI12-06 for testing.
Spray Nozzles for SFP Spray and required hoses			X				Will follow EPRI template requirements

Notes: This table provides N +1 (two) sets of FLEX equipment as required to be protected to comply with NEI 12-06. The actual quantity of equipment that will be purchased and stored in site structures will be determined based using the guidance in NEI 12-06 once the decision on storage structures is determined.

Attachment 3: FLEX Portable Equipment

PWR Portable Equipment Phase 3

	Use and (potential / flexibility) diverse uses					*Performance Criteria*	*Maintenance*
List portable equipment	Core Cooling	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
One (1) 480 VAC Generator	X			X		250 KW+ (prefer 500)	Portable 480 VAC generator will power EEB Bus #2 FLEX loads.
One (1) 480 VAC Generator		X		X		250KW+ (prefer 500)	Portable 480 VAC generator will power loads on one (1) ESF 480 VAC bus.
Diesel fuel	X	X	X	X	X		Supply as required
Cables for connecting portable generators	X	X	X	X	X		Supply as required
Portable ventilation fans				X	X		Supply as required
Radiation protection equipment					X		Survey instruments, dosimetry, off-site monitoring and sampling

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

Figures: Conceptual Sketches of Strategies

Figure 1 – Conceptual Phase 1&2 Coping for SG Feed Makeup

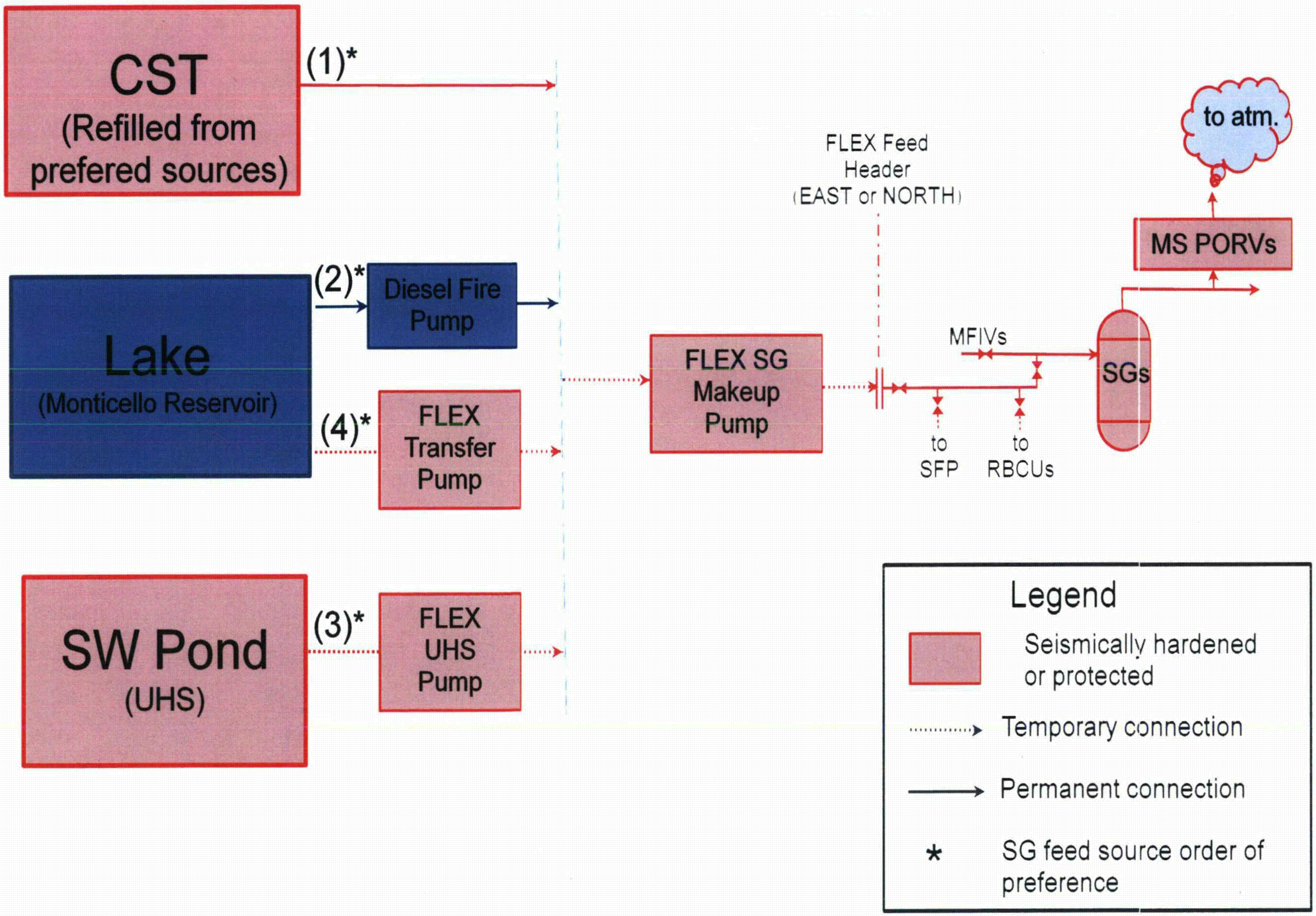


Figure 2 – Conceptual Diverse Strategy for Supplying the FLEX Feed Header

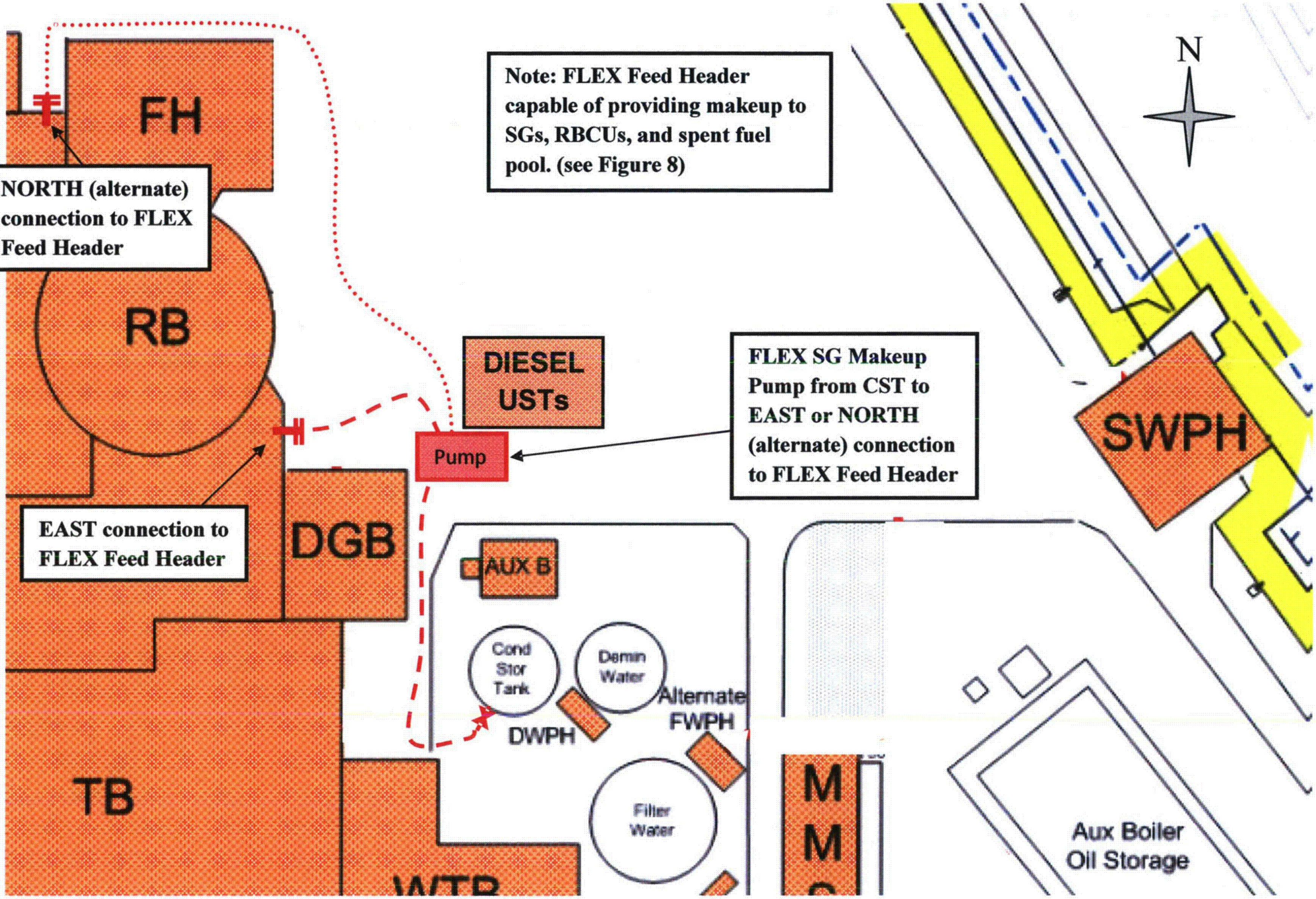


Figure 3 – Conceptual Phase 2 Coping for Refilling of CST

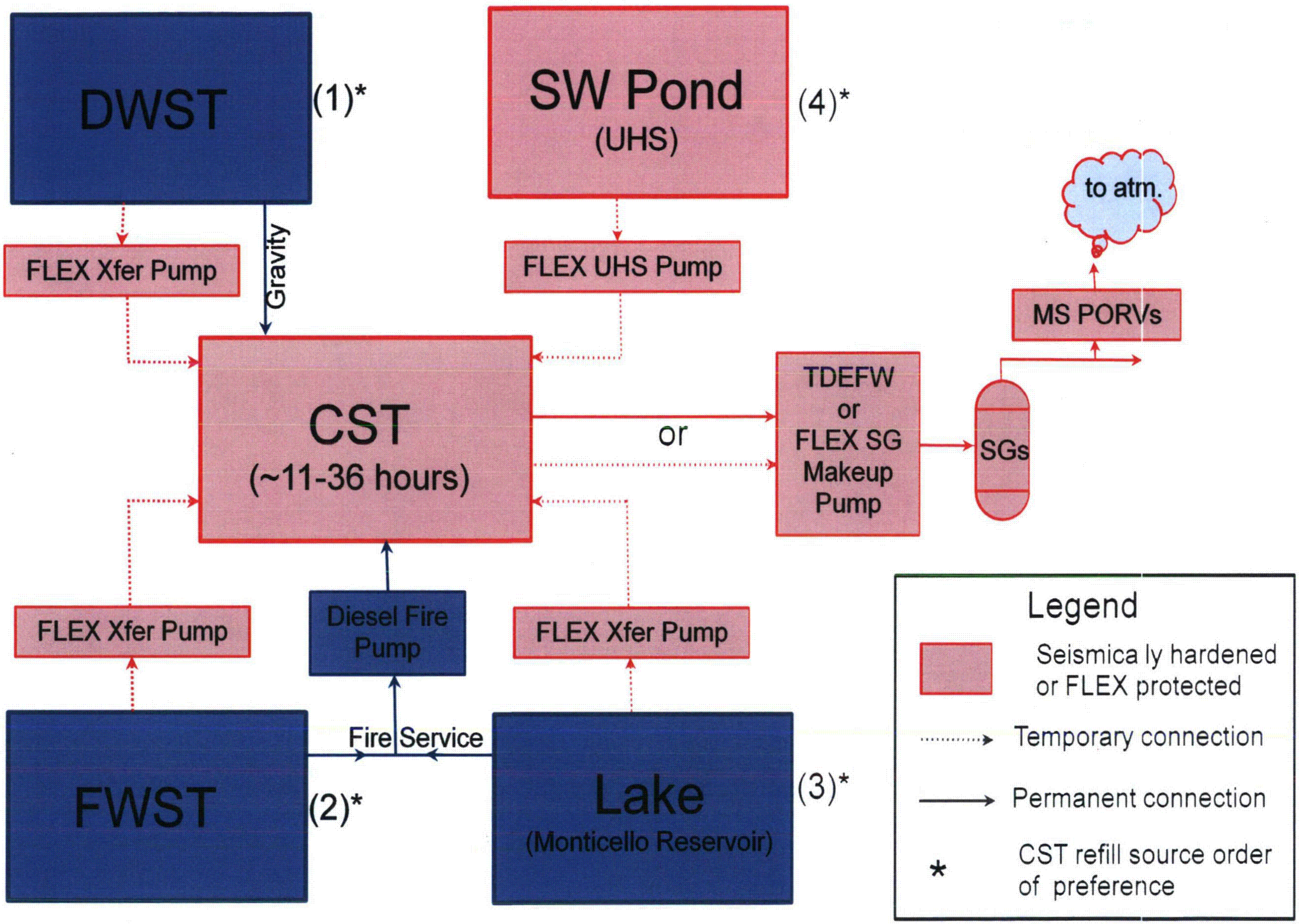
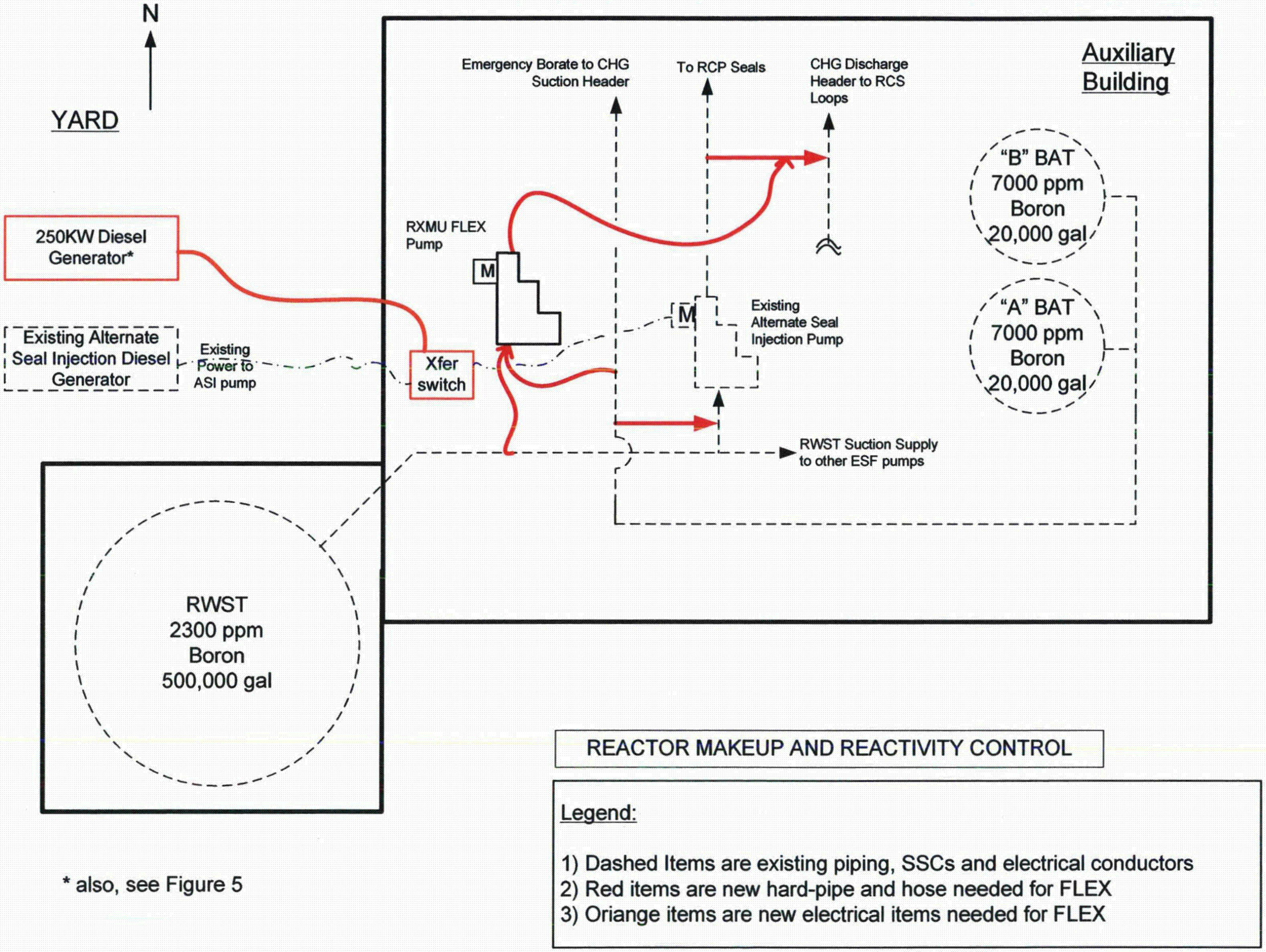


Figure 4 –Conceptual Strategy for Reactor Makeup and Reactivity Control



* also, see Figure 5

Figure 5 –Conceptual Coping Strategies for Support Functions from EEB

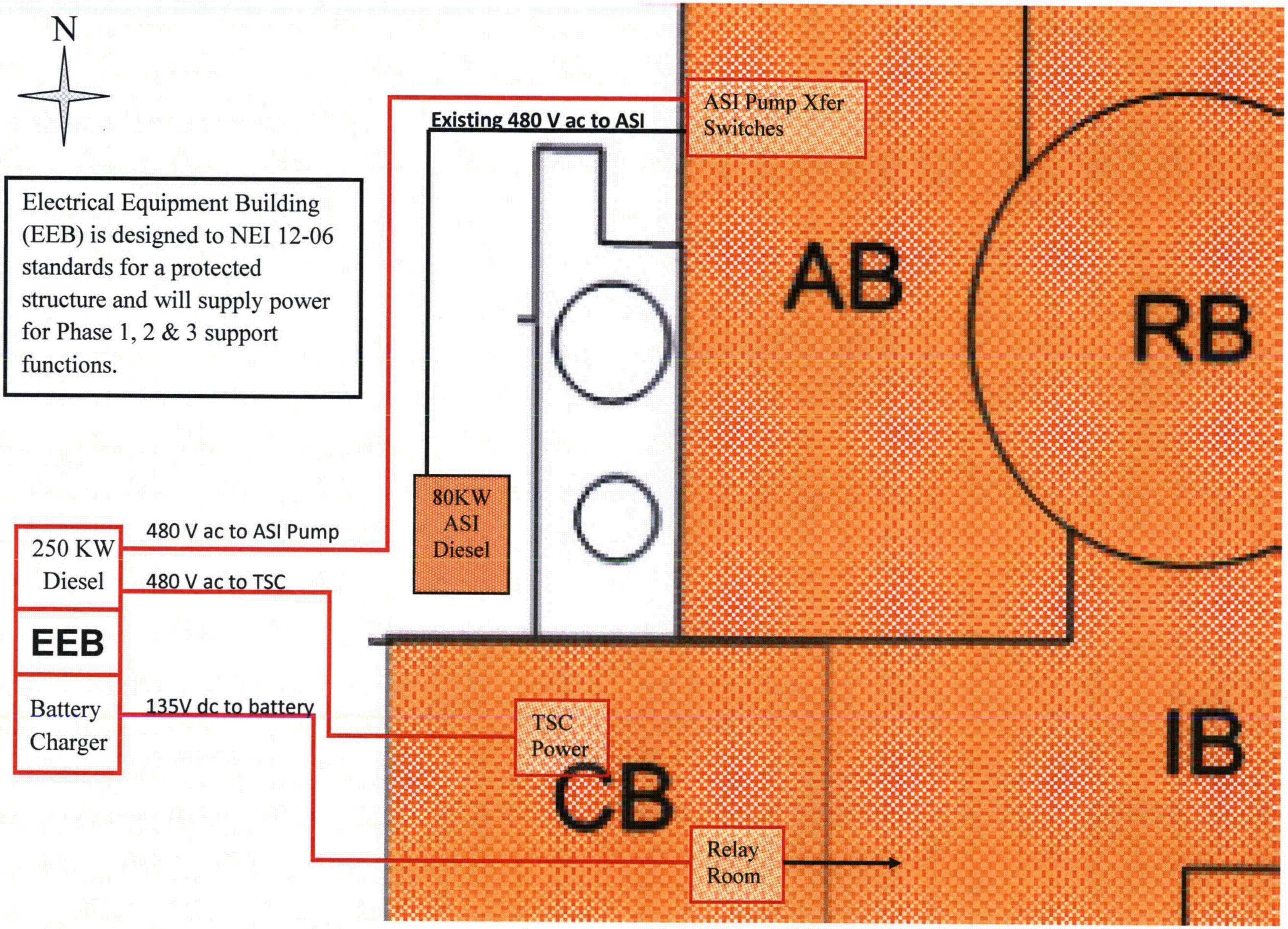


Figure 6 –Conceptual FLEX UHS Water Supply Routing to Spent Fuel Pool / Containment Cooling

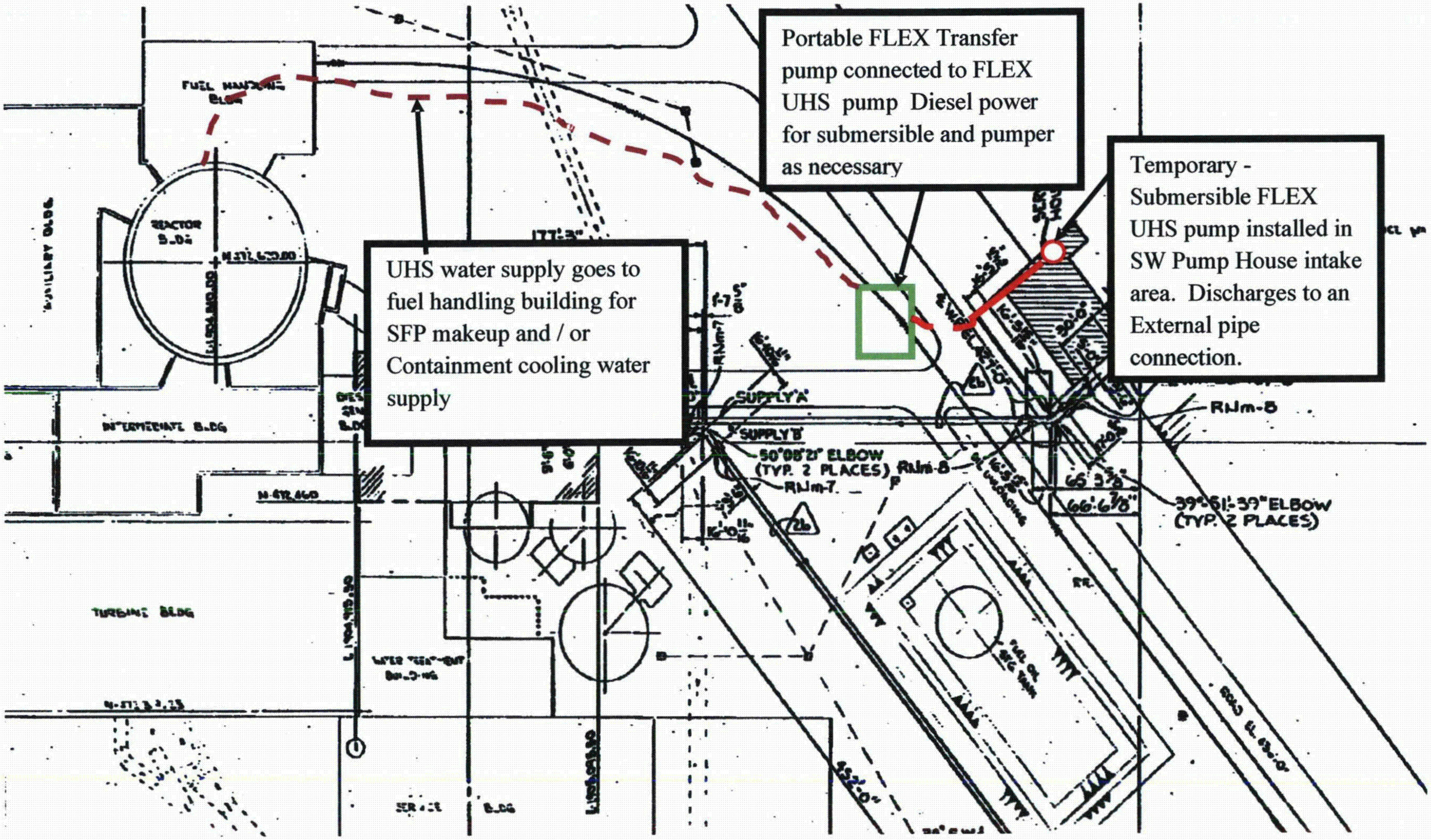


Figure 7 – Conceptual FLEX UHS Pump

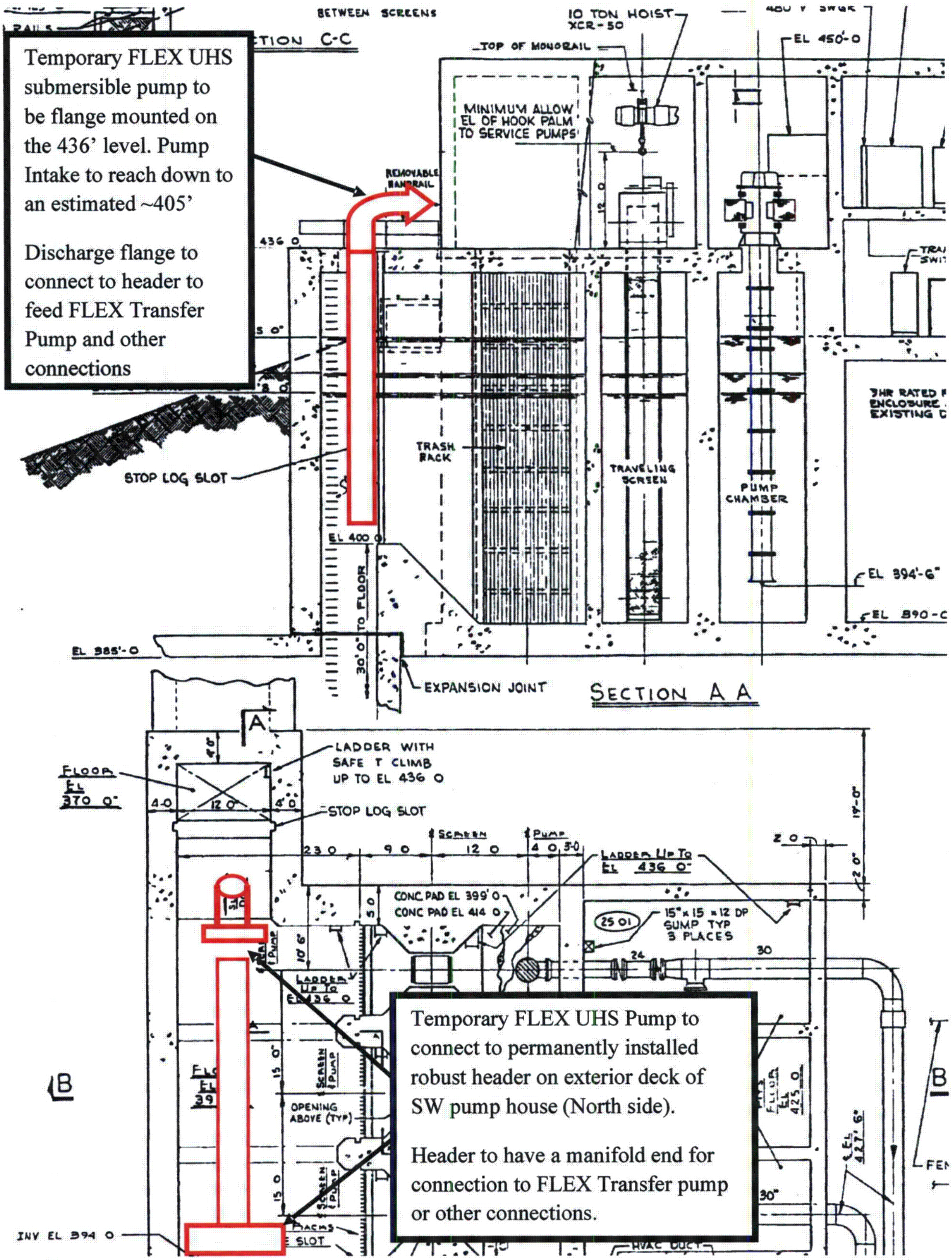


Figure 8 – Conceptual FLEX Feed Header Layout

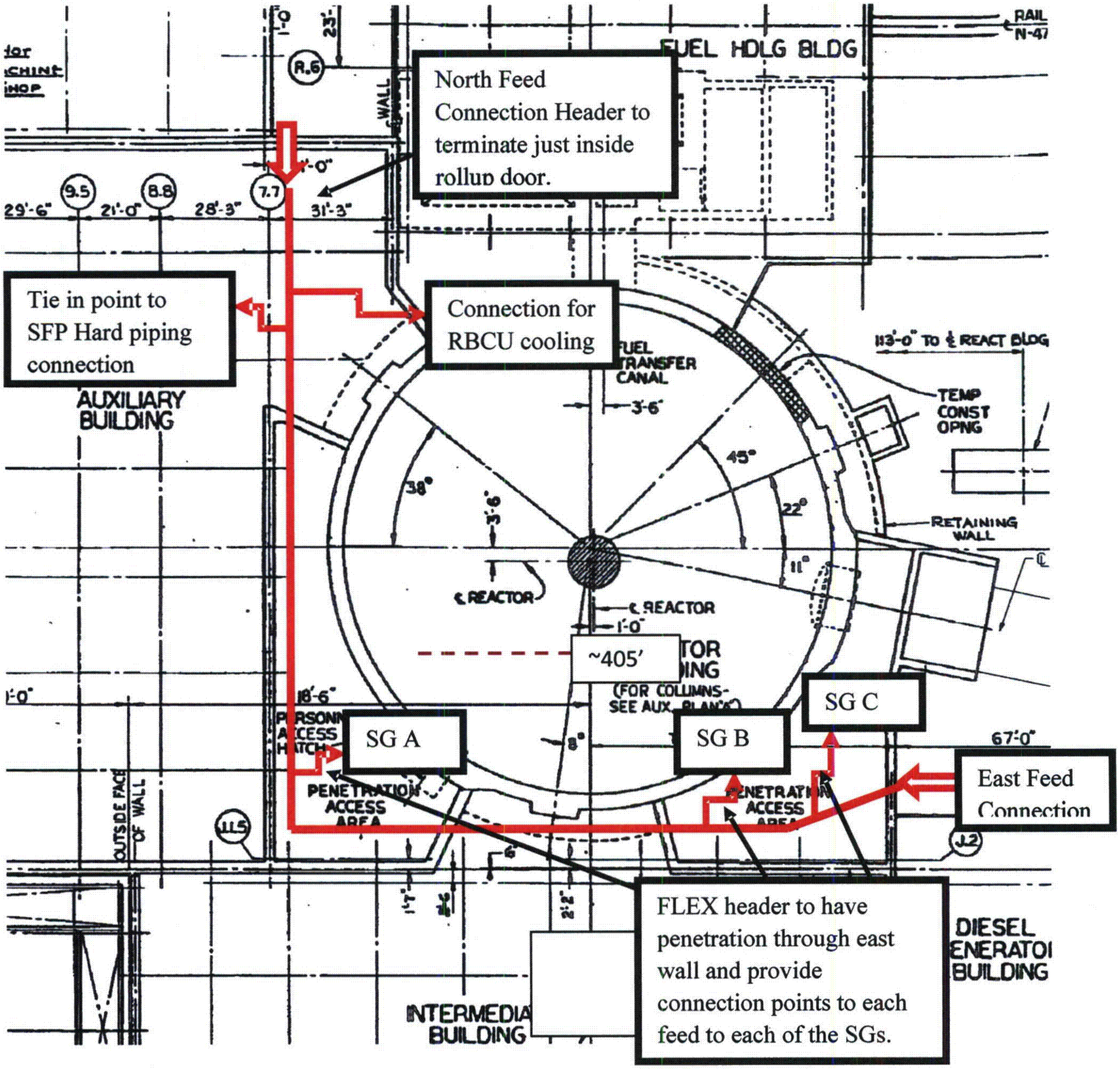


Figure 9 – Conceptual Phase 1 Coping Strategy to Repower Battery Chargers