VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

10 CFR 2.202
EA-12-049

February 28, 2013

Attention: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Serial No.: 12-163B
NL&OS/MAE: R2
Docket Nos.: 50-280/281
License Nos.: DPR-32/37

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
OVERALL INTEGRATED PLAN IN RESPONSE TO MARCH 12, 2012 COMMISSION ORDER MODIFYING LICENSES WITH REGARD TO REQUIREMENTS FOR MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS (ORDER NUMBER EA-12-049)

Reference:

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

4. Virginia Electric and Power Company's Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated October 25, 2012 (Serial No. 12-163A)

On March 12, 2012, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order (Reference 1) to Virginia Electric and Power Company (Dominion). Reference 1 was immediately effective and directs Dominion to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 requires submission of an Overall Integrated Plan by February 28, 2013. The NRC Interim Staff Guidance (ISG) (Reference 2) was issued August 29, 2012 which endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 3 provides direction regarding the content of this Overall Integrated Plan.

Reference 4 provided the Dominion initial status report regarding mitigation strategies, as required by Reference 1.

The purpose of this letter is to provide the Overall Integrated Plan pursuant to Section IV, Condition C.1, of Reference 1. This letter confirms Dominion has received Reference 2 and

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has an Overall Integrated Plan developed in accordance with the guidance for defining and deploying strategies that will enhance the ability to cope with conditions resulting from beyond-design-basis external events.

The information in the enclosure provides the Dominion Overall Integrated Plan for mitigation strategies pursuant to Reference 3. The enclosed Integrated Plan is based on conceptual design information. Final design details and associated procedure guidance, as well as any revisions to the information contained in the enclosure, will be provided in the 6-month Integrated Plan updates required by Reference 1.

If you have any questions, please contact Ms. Margaret Earle at (804) 273-2768.

Sincerely,

David A. Heacock
President and Chief Nuclear Officer
Virginia Electric and Power Company

Enclosure

Commitments made by this letter: No New Regulatory Commitments

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by David A. Heacock who is President and Chief Nuclear Officer of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of the Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 28TH day of February, 2013.

My Commission Expires: May 31, 2014.

Vicki L. Hull
Notary Public

(SEAL)

VICKI L. HULL
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NRC Senior Resident Inspector
Surry Power Station

Enclosure

Surry Units 1 & 2 Overall Integrated Plan

Mitigation Strategies For Beyond-Design-Basis External Events

Surry Power Station

Virginia Electric and Power Company (Dominion)

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LIST OF ACRONYMS

AC	Alternating Current
AFW	Auxiliary Feedwater
AOT	Allowed Outage Times
AP	Abnormal Procedure
ATWS	Anticipated Transient Without Scram
BDB	beyond-design-basis
CFR	Code of Federal Regulations
CSPH	Containment Spray Pump House
DC	Direct Current
DG	Diesel Generator
ECA	Emergency Contingency Action
ECMT	Emergency Condensate Make-Up Tank
ECST	Emergency Condensate Storage Tank
EDG	Emergency Diesel Generator
ELAP	Extended Loss of AC Power
EOP	Emergency Operating Procedure
EPRI	Electric Power Research Institute
ESGR	Emergency Switchgear Room
FLEX	Diverse and Flexible Coping Strategies
FP	Fire Protection
FSG	FLEX Support Guidelines
INPO	Institute of Nuclear Power Operations
ISFSI	Independent Spent Fuel Storage Installation
LER	Licensee Event Report
LHSI	Low Head Safety Injection
LOOP	Loss of Off-Site Power
LUHS	Loss of normal access to the Ultimate Heat Sink
MCR	Main Control Room
MSVH	Main Steam Valve House
MSL	Mean Sea Level
NEI	Nuclear Energy Institute
NPSH	Net Positive Suction Head
NR	Narrow Range
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
OBE	Operating Basis Earthquake
PEICo	Pooled Equipment Inventory Company

LIST OF ACRONYMS

PMH	Probable Maximum Hurricane
PORV	Power-Operated Relief Valve
PWROG	Pressurized Water Reactor Owners Group
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RRC	Regional Response Center
RVLIS	Reactor Vessel Level Indication System
RWST	Refueling Water Storage Tank
SAFER	Strategic Alliance for FLEX Emergency Response
SAT	Systematic Approach to Training
SBO	Station Blackout
SFP	Spent Fuel Pool
SG	Steam Generator
SG PORV	Steam Generator Power-Operated Relief Valve
SSE	Safe Shutdown Earthquake
TDAFW	Turbine Driven Auxiliary Feedwater
UHS	Ultimate Heat Sink
UFSAR	Updated Final Safety Analysis Report
VAC	Volts AC
VDC	Volts DC
WR	Wide Range

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A. General Integrated Plan Elements

A.1 - Determine Applicable Extreme External Hazard **Ref: NEI 12-06 section 4.0 -9.0 JLD-ISG-2012-01 section 1.0**	*Input the hazards applicable to the site; seismic, external flood, high winds, snow, ice, cold, high temps. Describe how NEI 12-06 sections 5 – 9 were applied and the basis for why the plant screened out for certain hazards.* The design basis of Surry Power Station provides protection against a broad range of external hazards. A site-specific assessment for Surry provides the development of strategies, equipment lists, storage requirements, and deployment procedures for the conditions and consequences of the following five classes of external hazards: • Seismic events • External flooding • Storms such as hurricanes, high winds, and tornadoes • Snow and ice storms, and cold • Extreme heat <u>Seismic Events</u> The Surry seismic hazard is considered to be the earthquake magnitude associated with the design basis seismic event. Per the Surry Updated Final Safety Analysis Report (UFSAR) Section 2.5.6, a safe shutdown earthquake (SSE) for Surry produces ground motion 0.15g for horizontal ground motion, and two-thirds of that value for vertical ground motion. The operating basis earthquake (OBE) produces ground motion of 0.07g and two-thirds of that value for vertical ground motion. For diverse and flexible coping strategies (FLEX), the earthquake is assumed to occur without warning and result in damage to non-seismically designed structures and equipment. Non-seismic structures and equipment may fail in a manner that would prevent accomplishment of FLEX-related activities (normal access to plant equipment, functionality of non-seismic plant equipment, deployment of beyond-design-basis (BDB) equipment, restoration of normal plant services, etc.)

	<u>External Flooding</u> Surry Power Station is located on the James River approximately 40 nautical miles from the mouth of the Chesapeake Bay where it enters the Atlantic Ocean. The sources of flooding in the James River at the Surry site are flood discharges due to watershed runoff and surge due to severe storms. Flooding in the James River upstream of the site has not resulted in flooding at the site due to the wide flood plain at the site. An analysis of the probable rise in mean water level at the site associated with the flood discharges indicates that even for a flood discharge recurrence interval of only once in 50 years, the water level at the site would rise no more than 1 foot above normal mean river level, if not accompanied by unusual meteorological tides. There are no known or planned river control structures on the James River. Several small impoundments on tributaries in the upper reaches do exist; however, their size and location would preclude any effect or danger to the safety related structures at the site. The Probable Maximum Hurricane (PMH) is the most severe meteorological event at the Surry site and results in the most limiting flood level elevations at both the site and the intake structure. During a PMH, the James River stillwater level is 22.7 feet mean sea level (MSL) at the site. Accounting for maximum wave run-up, the flood level of a PMH at the east end of the site (i.e., the intake structure) is approximately 28.6 feet MSL. The east face of the intake structure is protected against this wave action. The intake structure is located more than a mile from the main site (power block) structures and has no role in the FLEX strategies for Surry. Maximum run-up due to storm surges at the west side of the main site is 24 feet MSL. Critical equipment in this area is protected against flooding to Elevation 26.5 feet MSL, which is the typical site grade (UFSAR Section 2.3.1.2). It is highly unlikely that the formation of ice on the James River would obstruct the flow and cause flooding, due to the salinity of the river below the site. Tsunami flooding is not a concern for the site because of its inland location.

	Seiche-related flooding is not addressed in the UFSAR; however, it is addressed in the Surry Independent Spent Fuel Storage Installation (ISFSI) FSAR. The ISFSI FSAR Section 2.4.5 states that the seiche event is bounded by the PMH flood surge. The Surry ISFSI FSAR is a more recent evaluation of flooding on the Surry site and is applicable per Nuclear Energy Institute (NEI) 12-06, Section 6.2.3.1. <u>Storms Such As Hurricanes, High Winds, and Tornadoes</u> Plant design bases address the storm hazards of hurricanes, high winds and tornadoes. For hurricanes, the Surry UFSAR states that from 1886 through 1987, there have been 34 passages of tropical storms and 10 passages of hurricanes within 100 nautical miles of the Surry plant site. The characterization of hurricanes includes the fact that significant notice will be available in the event that a severe hurricane will impact the site (UFSAR Section 2.2.2). For extreme straight winds through 1987, the fastest mile wind recorded at Norfolk was a southerly wind with a speed of 78 mph, and at Richmond, was a southeasterly wind with a speed of 68 mph, both occurring in October 1954 during the passing of Hurricane Hazel (UFSAR Section 2.2.2.2). For tornadoes and tornado missiles, the Surry UFSAR, Section 2.2.2, indicates that the tornado model used for design purposes has a 300 mph rotational velocity, a 60 mph translational velocity, and a pressure drop of 3 psi in 3 seconds. Wind generated missiles include a utility pole and a 1 ton vehicle traveling at 150 mph. The characterization of tornadoes is such that little warning is available, and pre-deployment of equipment is not practical, nor is it likely to be effective. On April 16, 2011, a tornado struck the Surry Power Station switchyard. Damage to equipment in the switchyard resulted in a loss of offsite power and automatic shutdown of the Unit 1 and 2 reactors, as reported in Surry LER 2011-001. <u>Snow and Ice Storms, and Cold</u> The climatic characteristics of the region in which Surry

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	Power Station is located are influenced by the Atlantic Ocean, the Chesapeake Bay, and the Appalachian Mountains. The Atlantic Ocean has a moderating effect on the temperature for the Surry region, whereas the Appalachians act as a barrier to deflect Midwest winter storms to the northeast of the Surry region. Snow is not common during winter in the Tidewater area of Virginia. A snowfall of 10 inches or more in a month in the Tidewater area is expected to occur once every 4 years. In general, the total accumulated snow for the Tidewater region is approximately 10 inches each year. Precipitation occurs mostly as rain in the site area (UFSAR Section 2.2.2). The maximum monthly snowfall in Norfolk was 18.9 inches occurring in February 1980 and the maximum monthly snowfall for Richmond was 28.5 inches occurring in January 1940 (UFSAR Table 2.2-1). The lowest temperature recorded in Norfolk was minus 3°F in January 1985, and in Richmond it was minus 12°F in January 1940. The BDB equipment will be stored in a BDB Storage Building that will be maintained at a temperature range to ensure equipment readiness at extreme temperature when called upon. Extreme Heat The Atlantic Ocean has a moderating effect on the temperature for the Surry region. The peak temperature recorded in Norfolk was 104°F in August 1980 and in Richmond was 105°F in July 1977 (UFSAR Table 2.2-1). The BDB equipment will be stored in a BDB Storage Building that will be maintained at a temperature range to ensure equipment readiness at extreme temperature when called upon.
A.2 - Key Site assumptions to implement NEI 12-06 strategies. **Ref: NEI 12-06 section 3.2.1**	*Provide key assumptions associated with implementation of FLEX Strategies:* • *Flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes.*

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	• *Exceptions for the site security plan or other (license/site specific) requirements of 10CFR may be required.* • *Deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours.* • *Certain Technical Specifications cannot be complied with during FLEX implementation.* Key assumptions associated with implementation of FLEX Strategies: • Flood and seismic re-evaluations pursuant to Title 10 of the Code of Federal Regulations (CFR) Part 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes. • Exceptions for the site security plan or other (license/site specific) requirements of 10CFR may be required. • Deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours. • This plan defines strategies capable of mitigating a simultaneous extended loss of alternating current (AC) power (ELAP) and loss of normal access to the ultimate heat sink (LUHS) resulting from a BDB event by providing adequate capability to maintain or restore core cooling, containment, and spent fuel pool (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, and their impact to the design basis capabilities of the unit evaluated under 10 CFR 50.59. The plant Technical Specifications contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the BDB 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). (Reference Task Interface Agreement (TIA) 2004-04) Boundary conditions are established to support development of FLEX strategies, as follows: • The BDB external event occurs impacting both units at the site. • Both reactors are initially operating at power, unless there are procedural requirements to shut down due to the impending event. The reactors have been operating at 100% power for the past 100 days. • Each reactor is successfully shut down when required (i.e., all rods inserted, no Anticipated Transient Without Scram (ATWS)). Steam release to maintain decay heat removal upon shutdown functions normally, and reactor coolant system (RCS) overpressure protection valves respond normally and reseat. • On-site staffing is at site administrative minimum shift staffing levels. • No independent, concurrent events, e.g., no active security threat. • All personnel on-site are available to support site response. • The reactor and supporting plant equipment are either operating within normal ranges for pressure, temperature and water level, or available to operate, at the time of the event consistent with the design and licensing basis. The following plant initial conditions and assumptions are established for the purpose of defining FLEX strategies: • No specific initiating event is used. The initial condition is assumed to be a loss of off-site power (LOOP) with installed sources of emergency on-site AC power and station blackout (SBO) alternate AC power sources unavailable with no prospect for recovery. • Cooling and makeup water inventories contained in systems or structures with designs that are robust with respect to seismic events, floods, and high winds and associated missiles are available. Permanent plant equipment that is contained in structures with designs

	that are robust with respect to seismic events, floods, and high winds and associated missiles, are available. The portion of the fire protection (FP) system that is robust with respect to seismic events, floods, and high winds and associated missiles is available as a water source. • Normal access to the ultimate heat sink (UHS) is lost. For Surry, the water inventory in the UHS (Intake Canal) is unavailable, due to the plant design for gravity flow through the main condenser waterboxes and service water flowpaths, since power is lost to close the motor-operated isolation valves. • Fuel for BDB equipment stored in structures with designs that are robust with respect to seismic events, floods and high winds and associated missiles, remains available. • Installed Class 1E electrical distribution systems, including inverters and battery chargers, remain available since they are protected. • No additional accidents, events, or failures are assumed to occur immediately prior to or during the event, including security events. • Reactor coolant inventory loss consists of unidentified leakage at the Technical Specification limit, reactor coolant letdown flow (until isolated), and reactor coolant pump (RCP) seal leak-off at normal maximum rate. • For the SFP, the heat load is assumed to be the maximum design basis heat load. In addition, inventory loss from sloshing during a seismic event does not preclude access to the pool area.

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A.3 - Extent to which the guidance, JLD-ISG-2012-01 and NEI 12-06, are being followed. Identify any deviations to JLD-ISG-2012-01 and NEI 12-06. **Ref: JLD-ISG-2012-01 NEI 12-06 13.1**	*Include a description of any alternatives to the guidance, and provide a milestone schedule of planned action.* The Surry Power Station FLEX Program will fully implement the guidance of NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" and Nuclear Regulatory Commission (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." There are no known deviations to the guidance.
A.4 - Provide a sequence of events and identify any time constraint required for success including the technical basis for the time constraint. **Ref: NEI 12-06 section 3.2.1.7 JLD-ISG-2012-01 section 2.1**	*Strategies that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walkthrough of deployment).* *Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment 1A* *See attached sequence of events timeline (Attachment 1A).* *Technical Basis Support information, see attached NSSS Significant Reference Analysis Deviation Table (Attachment 1B)* The sequence of events timeline is provided in Attachment 1A. Preliminary estimates of response times have been developed based on plant simulator runs and table-top walkthroughs of planned actions. A 2 hour duration is assumed for deployment of equipment from the BDB Storage Building(s) based on a 'sunny day' validation for implementation of 10 CFR 50.54(hh)(2) time sensitive actions. The validation included deploying a portable high capacity pump from its storage location to a location near the station discharge canal (staging location) and routing hoses to provide flow to the SFP. Time to clear debris to allow equipment deployment is assumed to be 2 hours and will depend on the location of the BDB Storage Building(s). This time is considered to be reasonable based on site reviews and proposed locations of the BDB Storage Building(s). Debris removal equipment will be stored in the BDB Storage Building(s).

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	Validation of estimated response times included in Attachment 1A will be completed once FLEX Support Guidelines (FSG) procedures have been developed and will include a staffing analysis. **[Open Item 1]** The following items correspond to time constraint Action Items listed in Attachment 1A: Action Item 6: DC bus load stripping completed – 75 minutes Plant-specific analysis for extension of Class 1E battery life assumed that stripping of non-critical direct current (DC) bus loads would be complete within 75 minutes of the occurrence of a loss of all AC power. With completion of load stripping in 75 minutes, the Class 1E battery life was calculated to be 14 hours for Unit 1 and 14 hours for Unit 2. **[Open Item 2]** Within 45 minutes of the initiating event, an ELAP condition would be diagnosed and DC bus load stripping would be initiated. Load stripping is required to be completed within 30 minutes. The vital 120 volts AC (VAC) panels and 125 volts DC (VDC) panels required to be accessed by the operator to perform load stripping are located either in the main control room (MCR) or directly below in the Emergency Switchgear Room (ESGR). The panels are readily accessible based on the close proximity to the normal duty station for the operator assigned this action and load stripping is an uncomplicated task requiring opening the distribution panel door and opening the specified breakers. Therefore, completing the load stripping action within 30 minutes is reasonable, and the 75 minute time constraint can be met. Load stripping is discussed further in Section F1.1. Action Item 7: Control auxiliary feedwater (AFW) flowrate to Steam Generators (SGs) to prevent overfill – 2.3 hours Following a reactor trip caused by an ELAP event, the turbine driven auxiliary feedwater (TDAFW) pump would automatically start and provide AFW flow to all SGs. The loss of all AC power procedure directs Operations personnel to locally throttle AFW flow from the TDAFW pump to all three SGs to prevent overfilling of the SGs. Analysis shows that this action is required within 2.3 hours after TDAFW

	pump start. **[Open Item 3]** It is estimated that an operator could be dispatched to the TDAFW pump location within 20 minutes and successfully reduce AFW flow within an additional 10 minutes. Therefore, it is reasonable to conclude that the action to control AFW flowrate could be completed within the 2.3 hour time constraint. See Section B.1 for additional information related to controlling AFW flowrate to the SGs. <u>Action Item 8:</u> Align Emergency Condensate Make-Up Tank (ECMT) to TDAFW pump suction – 4.4 hours Based on a conservative analysis of reactor decay heat removal and RCS cooldown requirements, the 96,000 gallons usable volume of the emergency condensate storage tank (ECST) provides water to the TDAFW pump for SG injection for 4.4 hours. **[Open Item 3]** The 4.4 hours is a time constraint to provide a supplemental water source to the TDAFW pump. Analysis has determined that the ECMT can be aligned to the TDAFW pump suction and provide 72,000 gallons usable capacity without operation of the AFW booster pumps. (Reference Calculation ME-0963) The alignment is accomplished by opening manual valves located in the AFW pump room, which are in close proximity to the TDAFW pump where operators are located to control AFW flowrate to the SGs. The operators are capable of performing the realignment of the suction supply from the ECST to the ECMT within the time constraint before the ECST is depleted. See Section B.1 for additional information related to alignment of the ECMT water source to the TDAFW pump suction. <u>Action Item 10</u>: Initiate BDB High Capacity pump flow to refill the ECST – 13.1 hours Conservative analysis of reactor decay heat removal and RCS cooldown requirements concludes that ECST and ECMT usable volume will be depleted in 13.1 hours. **[Open Item 3]** Prior to this time, the BDB High Capacity pump must be deployed to provide water from the station discharge canal to the ECST Refill Connection. As discussed above, deployment assumes 2 hours for debris

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	removal and additional 2 hours to transport the BDB High Capacity pump to the staging location and route temporary hoses to supply water to the ECST. When supplemental staff arrives after 6 hours, deployment of the BDB High Capacity pump is expected to start. Therefore, ECST refill is anticipated to begin in approximately 10 hours, providing a considerable margin to the required time constraint of 13.1 hours. See Section B.2 for additional information related to refill of the ECST using the BDB High Capacity pump. <u>Action Item 11:</u> Repower 120 VAC Vital Buses – 14 hours Based on the Class 1E DC battery loading analysis discussed in Action Item 6 above, stripping non-essential AC and DC loads will extend the battery life to 14 hours. Prior to battery depletion, backup power must be provided for continued availability of essential instrumentation and controls powered from the 120 VAC vital buses. Portable diesel generators (DGs) will be utilized to provide backup power to selected 120 VAC vital buses associated with essential instrumentation circuits. The portable 120/240V DGs will be deployed from the protected storage location to the staging location and pre-made cables will be connected to pre-installed BDB electrical receptacles near the staging location to provide required backup power. As an alternate backup power supply, a 480V DG can be deployed from the BDB Storage Building(s). A separate BDB electrical receptacle will be pre-installed, and pre-made cables will be available, to allow the 480V DG to provide required power to Class 1E 480 VAC buses. When supplemental staff arrives after 6 hours, deployment of the 120/240V or 480V DGs is expected to begin. Assuming 2 hours for debris removal and an additional 2 hours for transport and connection of the DGs at the staging location, backup power is expected to be available within approximately 10 hours. Therefore, there is considerable margin to the required time constraint of 14 hours for this action. See Section F1.2 for additional information related to repowering the 120 VAC vital buses. <u>Action Item 14:</u> Initiate RCS injection for inventory make-up / reactivity control using the BDB RCS Injection pump –

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	33 hours A conservative site-specific assessment of the generic WCAP-17601 evaluation showed that for a Westinghouse Nuclear Steam Supply System (NSSS) with Westinghouse RCP seals, natural circulation flow could be sustained for 33 hours without RCS inventory makeup considering the approximately 21 gpm/seal initial leakage rate. (Reference ETE-NAF-2012-0150) However, the Surry RCP seals have been upgraded to Flowserve N-9000 seals, including the abeyance seal feature, which reduces seal leakage compared to Westinghouse RCP seals, extending the time to loss of natural circulation and allowing sufficient time to deploy equipment from offsite. A conservative time constraint of 33 hours is being used for RCS inventory makeup. A site-specific analysis of core reactivity following an ELAP/LUHS concluded that for a RCS cooldown to conditions corresponding to the emergency procedure minimum SG pressure of 300 psig, no boration is required for the first 72 hours to maintain adequate shutdown margin ($K_{eff} < 0.99$). (Reference Calculation MISC-11789) To support the RCS injection strategy, two BDB RCS Injection pumps (one for each unit) are required to be obtained from the Regional Response Center (RRC). The first pump is expected to arrive on site in approximately 26 hours, followed by the second pump approximately 4 hours later. The BDB RCS Injection pump will be staged near the plant system connections for pump suction and discharge. Assuming approximately 2 hours for BDB RCS Injection pump connection and setup after arrival on site, initiation of water injection into the RCS is expected within approximately 28 hours for the first installation and 32 hours for the second. Thus, the conservatively established time constraint for RCS injection of 33 hours will be met. Although the refueling water storage tank (RWST) is the primary source of water to the BDB RCS Injection pump, an alternate water supply contingency plan has been developed. A portable tank, stored in the BDB Storage Building(s), will be deployed to the area near the BDB RCS Injection pump staging location. A borated water solution can be mixed within the tank using dry boric acid and water supplied by the BDB High Capacity pump. The borated

	water solution from the tank will provide the suction source for the BDB RCS Injection pump. Since the portable tanks are stored in the BDB Storage Building(s), setup could precede the receipt of the BDB RCS Injection pumps from the RRC and does not affect the deployment of RCS injection capability within the time constraint of 33 hours. See Section C.3 for additional information related to RCS injection for inventory make-up and reactivity control using the BDB RCS Injection pump. <u>Action Item 15:</u> Initiate makeup flow to the SFP – 51 hours Conservative analysis has shown that without cooling and based on the limiting fuel storage scenario resulting in maximum design heat load, boiling could occur in the SFP in 12 hours and the water level in the pool could decrease to 10 feet above the fuel in 51 hours. (Reference Calculation MISC-11792) The strategy for make-up to the SFP is to pump water from the station discharge canal to the pool via the pre-installed SFP Makeup connection using the BDB High Capacity pump. Alternate flowpaths include routing the BDB High Capacity pump discharge flexible hose directly over the edge of the SFP and supplying portable spray nozzles. The BDB High Capacity pump will already have been deployed to the staging location at the discharge canal as described in Action Item 10. The BDB High Capacity pump has adequate capacity to provide SFP makeup flowrate requirements simultaneously with the flowrate requirements for AFW uses as described in Section B.2. Actions required within the Fuel Building to align the flowpath to the SFP can be accomplished prior to potential inaccessibility caused by pool water boiling, which is expected to be significantly later than the 12 hour calculated onset of boiling based on the large volume of the Fuel Building and presence of significant heat sinks (large mass of concrete floors, walls, and ceiling and fuel handling equipment). Routing of flexible hose from the pump discharge to the BDB SFP Makeup connection is a short duration task. Therefore, makeup flow to the SFP can reasonably be provided with considerable margin to the time constraint of 51 hours. Refer to Section E for additional information related to providing makeup flow to the SFP.

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	Action Item 16: Reduce pressure and temperature in Containment – 7 days Conservative analysis concludes that containment temperature and pressure response will remain below design limits and that key parameter instrumentation subject to the containment environment will remain functional for at least seven days. (Reference Calculation MISC-11793 and MISC-11794) Therefore, action to reduce containment pressure and temperature will not be required for a minimum of seven days following the ELAP event initiation. Further analysis is required to determine the strategy and time requirements for actions beyond seven days to reduce containment pressure and temperature, if any. **[Open Item 4]** See Section D for additional information related to containment pressure and temperature following an ELAP/LUHS event.
A.5 - 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.* To ensure FLEX strategies can be deployed in all modes, areas adjacent to the equipment storage and equipment deployment locations on both units will be administratively controlled to maintain access for BDB use. Sufficient margins will be included in hydraulic calculations to allow for hose routing around permanent plant equipment and temporary equipment staged in the Protected Area during maintenance activities, to both the primary and alternate connection points for each strategy. **[Open Item 5]** Mode-specific impacts on FLEX strategies are described below. Power Operation - this is the limiting condition for FLEX strategies and provides the basic assumptions for sizing and selection of equipment (e.g., >100 days of full power operation).

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	Reactor Critical (Power < 2%) - operation in this mode occurs the least amount of time, with lower levels of decay heat than Power Operation. Power Operation equipment design assumptions bound Reactor Critical impacts on FLEX strategies. No additional or modified strategies are necessary for this mode. Hot Shutdown - operation in this mode occurs for relatively short periods with lower levels of decay heat than Power Operation. Power Operation equipment design assumptions bound Hot Shutdown impacts on FLEX strategies. No additional or modified strategies are necessary for this mode. Intermediate Shutdown - operation in this mode occurs for relatively short periods with lower levels of decay heat than Power Operation. Power Operation equipment design assumptions bound Intermediate Shutdown impacts on FLEX strategies. No additional or modified strategies are necessary for this mode. Cold Shutdown – operation in this mode occurs for relatively short periods. Dominion will have provisions as required in NEI 12-06 Appendix D as follows: 1. Primary and alternate RCS injection connections will be installed, as described in Section C.3, that can provide feed and spill cooling capabilities 2. The connections will be designed for, and hydraulic analyses will be performed to confirm, makeup rates to support core cooling requirements (175 gpm) (Reference ETE-NAF-2012-0159) **[Open Item 5]** 3. The BDB AFW Pumps and associated equipment will be maintained available for deployment with makeup from the RWST to the primary or alternate RCS injection connections; and 4. Procedures will direct usage of the equipment as applicable. Refueling Shutdown/Refueling Operation - operation in this mode occurs for relatively short periods of time. As described for Cold Shutdown mode, the BDB AFW Pumps will be available to add water from the RWST to the RCS via the primary or alternate RCS injection connections.

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A.6 - Provide a milestone schedule. This schedule should include:
• **Modifications timeline**
  o **Phase 1 Modifications**
  o **Phase 2 Modifications**
  o **Phase 3 Modifications**
• **Procedure guidance development complete**
  o **Strategies**
  o **Maintenance**
• **Storage plan (reasonable protection)**
• **Staffing analysis completion**
• **FLEX equipment acquisition timeline**
• **Training completion for the strategies**
• **Regional Response Centers operational**
 	
Ref: NEI 12-06 section 13.1
	The dates specifically required by the order are obligated or committed dates. Other dates are planned dates subject to change. Updates will be provided in the periodic (six month) status reports.
	
	• Modifications timeline.
	  o Phase 1: The small number of modifications that are anticipated for Phase 1 are included in the timeline for Phase 2. Phase 1 modifications are described in the sections to Maintain Core Cooling & Heat Removal (B.1), and for Safety Functions Support (F1.1 [electrical]).
	  o Phase 2: Modifications will occur per the schedule indicated on Attachment 2A.
	  o Phase 3: Modifications will occur per the schedule indicated on Attachment 2A.
	
	• Procedure guidance development for Strategies and Maintenance.
	  o Strategies: Shown on Attachment 2A as "Issue FSGs."
	  o Maintenance: Shown on Attachment 2A as "Create Maint. Procs."
	
	• Storage plan: Storage planning is included with the time segment identified as "Develop Mods" on Attachment 2A. Implementation is included with the time segment identified as "Implement Mods" on Attachment 2A.
	
	• Staffing Analysis: **[Open Item 1]**
	
	• FLEX equipment acquisition timeline: Shown on Attachment 2A as "Procure Equipment".
	
	• Training completion for the strategies: Shown on Attachment 2A as "Implement Training".
	
	• Regional Response Center operational: Anticipated to occur by August 30, 2014.

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A.7 - Identify how the programmatic controls will be met. **Ref: NEI 12-06 section 11** **JLD-ISG-2012-01 section 6.0**	*Provide a description of the programmatic controls for 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.* 1) Quality Attributes Equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in this section. If the equipment is credited for other functions (e.g., FP), then the quality attributes of the other functions apply. 2) Equipment Design Design requirements and supporting analysis will be developed for portable equipment that directly performs a FLEX mitigation strategy for core cooling, RCS inventory, containment function, and SFP cooling. The design requirements and supporting analysis provide the inputs, assumptions, and documented analysis that the mitigation strategy and support equipment will perform as intended. Manufacturer's information is used in establishing the basis for the equipment use. The specified portable equipment capacities ensure the strategy can be effective over a range of plant and environmental conditions. This design documentation will be auditable, consistent with generally accepted engineering principles and practices, and controlled within Dominion's document management system. The basis for designed flow requirements considers the following factors: a) Pump design output performance (flow/pressure) characteristics. b) Line losses due to hose size, coupling size, hose length, and existing piping systems. c) Head losses due to elevation changes, especially for spray strategies. d) Back pressure when injecting into closed/pressurized spaces (e.g., RCS, containment, SGs). e) Capacity, temperature, boron concentration, water quality (suspended solids content, etc.) and availability of the suction sources given the specific

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	external initiating events (ECST/RWST/fire main/discharge canal, etc.) to provide an adequate supply for the BDB pumps. f) Potential detrimental impact on water supply source or output pressure when using the same source or permanently installed pump(s) for makeup for multiple simultaneous strategies. g) Availability of sufficient supply of fuel on-site to operate diesel powered pumps and generators for the required period of time. h) Potential clogging of strainers, pumps, valves or hoses from debris or ice when using the discharge canal as a water supply. i) Environmental conditions (e.g., extreme high and low temperature range) in which the equipment would be expected to operate. 3) Storage of Equipment - a study is in progress to determine the design features, site location(s), and number of equipment storage facilities. The final design for BDB equipment storage will be based on the guidance contained in NEI 12-06, Section 11.3, Equipment Storage. A supplement to this submittal will be provided with the results of the equipment storage study. **[Open Item 6]** 4) Procedure Guidance **[Open Item 7]** a) FSGs will be developed in accordance with Pressurized Water Reactor Owners Group (PWROG) guidance. b) Interface with EOPs i) EOPs will be revised to the extent necessary to implement FSGs. ii) 1- ECA-0.0, "Loss of All AC Power" iii) 2-ECA-0.0, "Loss of All AC Power" c) Interface with abnormal procedures (APs) The APs listed below will be revised to the extent necessary to implement FSGs. i) 0-AP-22.02, "Malfunction of Spent Fuel Pit Systems" ii) 0-AP-37, "Seismic Event" iii) 0-AP-37.01, "Abnormal Environmental Conditions" d) FSG Maintenance Process FSG maintenance will be performed using the

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	administrative process for procedure control. e) Regulatory Screening/Evaluation NEI 96-07, Revision 1, and NEI 97-04, Revision 1 will be used to evaluate the changes to existing procedures as well as to the FSG to determine the need for prior NRC approval. Changes to procedures that perform actions in response to events that exceed a site's design basis should, per the guidance and examples provided in NEI 96-07, Rev. 1, screen out. Therefore, procedure steps that recognize the BDB ELAP/LUHS has occurred and that direct actions to ensure core cooling, SFP cooling, or containment integrity should not require prior NRC approval. 5) Maintenance and Testing **[Open Item 8]** a) Periodic testing and preventative maintenance of the BDB equipment will follow guidance provided in Institute of Nuclear Power Operations (INPO) AP-913. The testing and maintenance recommendations will be developed by Electric Power Research Institute (EPRI) and these EPRI guidance documents will be used to develop testing frequencies and maintenance schedules. b) The unavailability of equipment and applicable connections that directly perform a FLEX mitigation strategy for the core, containment, and SFP will be managed such that risk to mitigating strategy capability is minimized. Maintenance / risk guidance will be developed as follows: i) Portable BDB equipment may be unavailable for 90 days provided that the site FLEX capability (N) is available. ii) If portable equipment becomes unavailable such that the site FLEX capability (N) is not maintained, initiate actions within 24 hours to restore the site FLEX capability (N) and implement compensatory measures (e.g., use of alternate suitable equipment or supplemental personnel) within 72 hours. iii) Work Management procedures will be revised to reflect Allowed Outage Times (AOT) as outlined above. 6) Training (See section A.8)

	7) Staffing A review of FLEX response strategies and minimum on-site staffing will be performed to validate staffing needs. **[Open Item 1]** 8) Configuration Control **[Open Item 9]** a) The FLEX strategies and their bases will be maintained in an overall program document. The program document will address the key safety functions to: i) Provide reactor core cooling and heat removal, ii) Provide RCS inventory and reactivity control, iii) Ensure containment integrity, iv) Provide SFP cooling, v) Provide indication of key parameters, and vi) Provide reactor core cooling (shutdown modes). b) In addition to the key safety functions listed above, support functions have been identified that provide support for the implementation of the FLEX strategies. Those support functions include: i) Providing load stripping of 125 VDC and 120 VAC vital buses to extend battery life, ii) Re-powering AC and DC electrical buses, iii) Providing ventilation for equipment cooling and area habitability, iv) Providing lighting, v) Providing communications capability, vi) Providing for fueling of portable equipment, and vii) Providing plant and area access. c) The program document will also contain a historical record of previous strategies and their bases. The program document will include the bases for ongoing maintenance and testing activities for the BDB equipment. d) Existing design control procedures will be modified to ensure that changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies. Changes for the FLEX strategies will be reviewed with respect to operations critical documents to ensure no adverse effect. e) Future changes to the FLEX strategies may be made without prior NRC approval provided: i) The revised FLEX strategies meet the

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	requirements of NEI 12-06. ii) An engineering basis is documented that ensures that the change in FLEX strategies continues to ensure the key safety functions (core and SFP cooling, containment integrity) are met.
A.8 - Describe training plan	*List training plans for affected organizations or describe the plan for training development* The Dominion Nuclear Training Program will be revised to assure personnel proficiency in the mitigation of BDB events is developed and maintained. These programs and controls will be developed and implemented in accordance with the Systematic Approach to Training (SAT). **[Open Item 10]** Initial and periodic training will be provided to site emergency response leaders on BDB emergency response strategies and implementing guidelines. Personnel assigned to direct the execution of mitigation strategies for BDB events will receive necessary training to ensure familiarity with the associated tasks, considering available job aids, instructions, and mitigating strategy time constraints. Operator training for BDB event accident mitigation will not be given undue weight in comparison with other training requirements. The testing/evaluation of Operator knowledge and skills in this area will be similarly weighted. Operator training will include use of equipment from the RRC. "ANSI/ANS 3.5, Nuclear Power Plant Simulators for use in Operator Training" certification of simulator fidelity (if used) is considered to be sufficient for the initial stages of the BDB external event scenario until the current capability of the simulator model is exceeded. Full scope simulator models will not be upgraded to accommodate FLEX training or drills. Where appropriate, integrated FLEX drills will be organized on a team or crew basis and conducted periodically; with all time-sensitive actions to be evaluated over a period of not more than eight years. It is not required to connect/operate

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	permanently installed equipment during these drills.
A.9 - Describe Regional Response Center plan	The industry will establish two (2) RRCs to support utilities during BDB events. Dominion has established contracts with the Pooled Equipment Inventory Company (PEICo) to participate in the process for support of the RRCs as required. 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. In addition, on-site BDB equipment hose and cable end fittings are standardized with the equipment supplied from the RRC. Equipment will be moved from an RRC to a local Assembly Area, established by the Strategic Alliance for FLEX Emergency Response (SAFER) team and the utility. Communications will be established between the affected nuclear site and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the nuclear site's playbook, will be delivered to the site within 24 hours from the initial request.

Notes:

The information provided in this section is based on the following reference(s):

Surry Updated Final Safety Analysis Report, Revision 44.

Surry Independent Spent Fuel Storage Installation (ISFSI), Final Safety Analysis Report, Revision 19.

Surry Licensee Event Report, LER 2011-001-00, dated June 14, 2011. (Accession No. ML11178A032)

Task Interface Agreement (TIA) 2004-04, "Acceptability of Proceduralized Departures from Technical Specifications (TSs) Requirements at the Surry Power Station," (TAC Nos. MC4331 and MC4332)," dated September 12, 2006. (Accession No. ML060590273)

Calculation ME-0963, "NPSH Analysis for the TD AFW Pump Taking Suction from the Emergency Condensate Makeup Tank (ECMT) Through Idle AFW Booster Pumps," Revision 0.

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Engineering Technical Evaluation, ETE-NAF-2012-0150," Evaluation of Core Cooling Coping for Extended Loss of AC Power (ELAP) and Proposed Input for Dominion's Response to NRC Order EA-12-049 for Dominion Fleet," Revision 1, January 10, 2013.

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

Calculation MISC-11789, "Investigation of Reactivity Control During Extended Station Blackout – Surry Units 1 and 2," Revision 0, February 18, 2013.

Calculation MISC-11792, "Extended Loss of AC Power, Spent Fuel Pool Heatup Times and Water Makeup for Dominion Nuclear," Revision 0, February 8, 2013.

Calculation MISC-11793, "Evaluation of Long Term Containment Pressure and Temperature Profiles Following Loss of Extended AC Power (ELAP)," Revision 0, February 18, 2013.

Calculation MISC-11794, "Evaluation of North Anna, Surry, and Millstone Containment Instrumentation Following Extended Loss of AC (ELAP)," Revision 0, February 18, 2013.

Engineering Technical Evaluation, ETE-NAF-2012-0159, "Beyond Design Basis Mode 5 and 6 Core Cooling Requirements," Revision 0, December 18, 2012.

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B. Maintain Core Cooling & Heat Removal

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

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

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

B.1 - 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.

Following the occurrence of an ELAP/LUHS event, the reactor will trip and the plant will initially stabilize at no-load RCS temperature and pressure conditions, with reactor decay heat removal via steam release to the atmosphere through the SG safety valves and/or power-operated relief valves (SG PORVs). Natural circulation of the RCS will develop to provide core cooling and the steam turbine driven AFW pump will provide flow from the ESCT to the SGs to make-up for steam release.

Operators will respond to the event in accordance with EOPs to confirm RCS, secondary system, and containment conditions. A transition to Emergency Contingency Action (ECA)-0.0, Loss of All AC Power, procedure will be made upon the diagnosis of the total loss of AC power. This procedure directs isolation of RCS letdown pathways, confirmation of natural circulation cooling, verification of containment isolation, reducing DC loads on the station batteries, and establishment of electrical equipment alignment in preparation for eventual power restoration. The operators confirm AFW flow to the SGs, establish manual control of the SG PORVs, and initiate a rapid cooldown of the RCS to minimize inventory loss through the RCP seals. ECA-0.0 directs local manual control of AFW flow to the SGs and local manual control of the SG PORVs to control steam release to control the RCS cooldown rate, as necessary.

Core Cooling and Heat Removal Phase 1 Strategy

The Phase 1 strategy for reactor core cooling and heat removal relies upon installed plant equipment and water sources for AFW supply to the SGs and steam release to the atmosphere.

The TDAFW pump automatically starts on the loss of offsite power condition and does not require AC or DC electrical power to provide AFW to the SGs. In the event that the TDAFW pump does

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

not start on demand or trips after start, the operator will locally reset the turbine and restart the pump. Sufficient time (approximately 50 minutes **[Open Item 3]**) will be available to restart the TDAFW pump to prevent SG dry-out. The AFW system is pre-aligned for flow to all three SGs, and the AC motor operated flow control valves fail as-is (open) to maintain flow to all three SGs. Local manual control of TDAFW pump flowrate to the SGs will be required within approximately 2.3 hours to prevent overfill. **[Open Item 3]**

Steam release from the SGs will be controlled by local manual operation of the SG PORVs. The SG PORVs will be modified to add a manual control handwheel to the valve operator to support this local control action. **[Open Item 11]** In accordance with the existing procedure for response to loss of all AC power, a RCS cooldown will be initiated at a maximum rate of 100°F/hr to a SG pressure of 300 psig minimum. The rapid RCS cooldown minimizes adverse effects of high temperature coolant on RCP shaft seal performance and reduces SG pressure to allow for eventual feedwater injection from a portable pump in the event the TDAFW pump is not available. The minimum SG pressure is established to prevent safety injection accumulator nitrogen gas from entering the RCS.

Initially, AFW water supply will be provided by the installed ECST. The tank has a minimum usable capacity of 96,000 gallons and will provide a suction source to the TDAFW pump for a minimum of 4.4 hours of RCS decay heat removal assuming a concurrent RCS cooldown at 100°F/hr to a minimum SG pressure of 300 psig. **[Open Item 3]** After depletion of the inventory in the ECST, the TDAFW pump suction will be aligned to the installed ECMT, which provides an additional 72,000 gallons of water for SG injection. (Reference Calculation ME-0963) The water volume from the ECMT extends the time to depletion of AFW water supply to a minimum of 13.1 hours. **[Open Item 3]**

Since AC power will not be available to support operation of the installed AFW booster pumps, water will be provided to the suction of the TDAFW pumps from the ECMT by gravity flow initially and through limited suction lift capability of the TDAFW pump as the tank level decreases. The resulting reduction in available net positive suction head (NPSH) requires controlling the TDAFW pump flowrate to maintain NPSH margin. The following additional actions are required to be completed to qualify the ECMT as a source of water to the TDAFW pump in response to an ELAP/LUHS event: **[Open Item 12]**

(1) Upgrade the piping system from the ECMT to the TDAFW pump suction to Seismic Category I
(2) Modify the TDAFW pump discharge piping to install local AFW flowrate indication
(3) Confirm adequate TDAFW pump NPSH with flow from the ECMT through the idle AFW booster pumps

Vital AC and DC bus load stripping will be implemented to preserve battery life as described in Section F1.1. Selected vital AC circuits remain energized following load stripping to provide power to necessary instrumentation, in order to provide the key reactor parameter information, as indicated in Section B.1.3.

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Following the seismic analysis of the piping from the ECMT to the TDAFW pump suction, the equipment relied upon to provide reactor core cooling and heat removal for the Phase 1 strategy will be protected against the applicable external hazards described in Section A.1.	
Details:	
B.1.1 - Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Site specific procedural guidance governing the core cooling and heat removal strategies will be developed using industry guidance, and will address: - Control of TDAFW pump flow when aligned to the ECMT water supply. **[Open Item 7]**
B.1.2 - Identify modifications	*List modifications and describe how they support coping time.* (1) SG PORVs will be modified to add a manual control handwheel to the valve operator to support local control of valve position. **[Open Item 11]** This modification will allow control of RCS cooldown to support the reactor core cooling and decay heat removal Phase 1 strategy. (2) The TDAFW discharge piping will be modified to install local AFW flowrate indication. **[Open Item 12]** This modification will allow local control of the TDAFW pump flowrate to support operation with suction aligned to the ECMT and extend the time to align alternate water sources from 4.4 hours to 13.1 hours. (3) A pressure gauge will be installed on the ECST fill line for local indication of ECST level to support operation of the TDAFW pump while aligned to the ECST and refill of the tank. **[Open Item 11]**
B.1.3 - Key Reactor Parameters	*List instrumentation credited for this coping evaluation phase.* Instrumentation providing the following key parameters is credited for Phase 1: <u>AFW Flowrate</u> - AFW Flowrate indication is available in the MCR, and will initially be available for SG 'A', 'B', and 'C'. Following electrical load stripping (Section F1.1), AFW flowrate indication

	will only be available to SG 'B'. Indication of SG 'A' wide range (WR) and narrow range (NR) and 'C' NR water level would remain available. Following re-power of vital AC circuits (Section F1.2), AFW flowrate indication will be restored for SG 'A' and 'C'. SG Water Level - SG WR and NR water level indication is available from the MCR. SG WR level indication will be available only for SG 'A' following electrical load stripping (Section F1.1). After re-power of vital AC circuits (Section F1.2), SG 'B' and 'C' WR level indication will be restored. SG Pressure - SG pressure indication is available from the MCR. SG pressure indication will be available for SG 'A', 'B', and 'C' throughout the event. RCS Temperature - RCS hot-leg and cold-leg temperature indication, and core exit thermocouple indication, is available from the MCR. Following electrical load stripping (Section F1.1), RCS hot-leg and cold-leg temperature indication will only be available for 'B' loop. Following re-power of vital AC circuits (Section F1.2), RCS hot-leg and cold-leg temperature indication will be restored for RC loop 'A' and 'C'. ECST Level - ECST water level indication is available from the MCR prior to electrical load stripping. Following load stripping, level indication will be available locally at the tank via a float level gauge and a local pressure gauge to be installed on the tank fill line. **[Open Item 11]** ECMT Level - ECMT water level indication is available locally at the tank.

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

Calculation ME-0963, "NPSH Analysis for the TD AFW Pump Taking Suction from the Emergency Condensate Makeup Tank (ECMT) Through Idle AFW Booster Pumps", Revision 0.

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B. Maintain Core Cooling & Heat Removal

B.2 - 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.

As described in Section B.1, Phase 1 coping following an ELAP/LUHS will be accomplished using the installed TDAFW pump to feed the SGs, SG PORVs for SG steam release to control RCS temperature and effect a RCS cooldown, and the ECST and ECMT to provide the AFW water source to the TDAFW pump. The Phase 1 coping strategy provides sufficient AFW water inventory for reactor core cooling and decay heat removal for a minimum of 13.1 hours **[Open Item 3]** and is sufficient to stabilize the plant at 300 psig SG pressure, which will result in RCS cold leg temperature of approximately 422°F with RCS pressure remaining greater than safety injection accumulator nitrogen injection pressure.

Core Cooling and Heat Removal Phase 2 Strategy

The Phase 2 strategy for reactor core cooling and heat removal provides an indefinite supply of water for feeding SGs and a portable, diesel driven backup AFW pump for use in the event that the TDAFW pump is unavailable. Initial evaluations indicate that the TDAFW pump will operate long-term until reactor decay heat is reduced to a point where adequate SG steam pressure and flow cannot be provided to the turbine inlet to support pump operation. **[Open Item 13]** The strategy includes repowering of vital 120 VAC buses to restore key parameters monitoring instrumentation that was down-powered for DC battery load stripping during Phase 1. Phase 2 electrical bus repowering strategies are described in Section F1.2.

a. <u>Indefinite Supply of Water for SG Injection</u>
An indefinite supply of water, as make-up to the ECST or directly to the suction of the portable, diesel driven BDB AFW pump, can be provided from the station circulating water discharge canal. The discharge canal communicates directly with the James River and will remain available for any of the external hazards listed in Section A.1. Refer to Figure 2 for a diagram of the flowpath and equipment utilized to facilitate this water supply. The portable, diesel driven BDB High Capacity Pump (Table 1) will be transported from the BDB Storage Building(s) to a location near the discharge canal. A suction hose will be routed from the pump suction to the discharge canal where water will be drawn through a strainer sized to limit solid debris size to prevent damage to the TDAFW or the BDB AFW pump. A flexible hose will be routed from the BDB High Capacity Pump discharge to the BDB ECST refill connection or to the suction of the portable BDB AFW Pump. Water from the discharge canal can be pumped to the ECST connection to refill the tank or to provide a direct suction source to the BDB AFW pump. Water from the discharge canal can also be pumped to the SFP as described in Section E.2. The BDB High Capacity Pump will be sized to provide AFW water supply of 300 gpm each to Unit 1 and Unit 2 and 500 gpm SFP make-up simultaneously.

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B. Maintain Core Cooling & Heat Removal

B.2 - PWR Portable Equipment Phase 2

Hydraulic analysis of the flowpath from the discharge canal to the ECST and to the BDB AFW Pump suction will be performed to confirm that applicable performance requirements are met. **[Open Item 5]**

b. Back-up SG Water Injection
Consistent with NEI 12-06, Appendix D, backup SG water injection capability will be provided using a portable AFW pump through a primary and alternate connection. The portable, diesel-driven BDB AFW Pump (Table 1) will provide back-up SG injection capability in the event that the TDAFW pump can no longer perform its function due to low SG pressure. Hydraulic analyses will be performed to confirm that the BDB AFW pump is sized to provide the minimum required SG injection flowrate to support reactor core cooling and decay heat removal. **[Open Item 5]**

The BDB AFW Pump will be transported from the BDB Storage Building(s) to a location near the system connection established for discharge to the SG (described below). A suction hose will be routed from either the BDB ECST refill connection or directly to the discharge of the BDB High Capacity Pump to the BDB AFW Pump suction (Figure 2). The BDB AFW Pump discharge can be aligned to either the primary or alternate pump discharge connection for SG injection.

b.i Primary AFW Pump Discharge Connection
The primary AFW Pump discharge connection for SG injection will be located on the TDAFW pump discharge line in the AFW Pump Room (Figure 3). A flexible hose will be routed from the BDB AFW Pump discharge through the Containment Spray Pump House (CSPH) to the primary connection. The CSPH is not protected from the effects of high winds and associated missile hazard. In the event of damage to the CSPH, an alternate routing of the discharge hose through an exterior door of the main steam valve house (MSVH) is available that does not traverse the CSPH. The CSPH is protected against the other hazards listed in Section A.1. Hydraulic analysis of the flowpath from the BDB ECST refill connection to the primary AFW Pump discharge connection will be performed to confirm that applicable performance requirements are met. **[Open Item 5]**

b.ii Alternate AFW Pump Discharge Connection
In the event that the primary AFW Pump discharge connection is not available, an alternate connection will be provided. The alternate AFW Pump discharge connection for SG injection will be located in the main feedwater system in the Mechanical Equipment Room located at the 58 ft Elevation of the Service Building, which is separate from the AFW Pump Room. The connection consists of a hose adapter that replaces the valve bonnet on one of three feedwater regulating valve bypass valve inlet isolation valves (Figure 3). A flexible hose will be routed from the BDB AFW Pump discharge to the alternate connection hose adapter. The main feedwater header will be pressurized and flow will be controlled to each SG by manually operating the associated main feedwater regulating valve. This alternate connection approach relies upon the non-Seismic

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B. Maintain Core Cooling & Heat Removal	
B.2 - PWR Portable Equipment Phase 2	
Category I, non-tornado missile protected area of the Service Building and Turbine Building. Therefore, the availability of this connection is not assured following a seismic event or tornado. However, the alternate connection is protected against the other hazards listed in Section A.1. Hydraulic analysis of the flowpath from the ECST refill connection to the alternate AFW Pump discharge connection will be performed to confirm that applicable performance requirements are met. **[Open Item 5]**	
Details:	
B.2.1 - Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Site specific procedural guidance governing the core cooling and heat removal strategies will be developed using industry guidance, and will address: - the necessary steps to deploy portable pumps and hoses, establish connections, and operate the portable equipment to perform the required function. **[Open Item 7]**
B.2.2 - Identify modifications	*List modifications necessary for phase 2* (1) Install the BDB ECST refill connection. **[Open Item 11]** (2) Install BDB AFW Pump discharge primary connection located on the TDAFW pump discharge line in the AFW Pump Room. **[Open Item 11]**
B.2.3 - Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* The Phase 2 strategy utilizes the same Key Reactor Parameters and associated indications as described in Section B.1.3 for Phase 1. Portable BDB equipment will be supplied with local instrumentation needed to operate the equipment. The use of these instruments will be in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

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B.2.4 - Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from seismic events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from flooding events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from severe storms with high wind events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from snow, ice and extreme cold events while stored in the BDB Storage Building(s) or in protected areas of the plant.
High Temperatures	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from high temperature events while stored in the BDB Storage Building(s) or in protected areas of the plant.

B.2.5 - Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. a. <u>Indefinite Supply of Water for SG Injection</u> The BDB High Capacity Pump	*Identify modifications* BDB ECST refill connection -	*Identify how the connection is protected* The BDB ECST refill

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will be deployed to transfer water from the plant discharge canal to fill the ECST or directly provide the suction for the BDB AFW Pump. Figure 1 identifies the deployed location of BDB equipment and routing of hoses, relative to plant structures and other features, necessary to implement this strategy. The BDB High Capacity Pump is a trailer-mounted, diesel driven centrifugal pump that will be stored in the BDB Storage Building(s). The pump will be deployed by towing the trailer to a designated location near the discharge canal. One end of the flexible suction hose, equipped with a strainer, will be lowered into the discharge canal to below the water surface, and the other end will be attached to the pump suction via hose end connection. A flexible hose will be routed from the pump discharge hose end fitting to the BDB ECST refill connection (modification required to permanently install this connection). The pump discharge hose will be routed along the ground and access to the BDB ECST refill connection is through the ECST concrete enclosure access door. Water from the discharge canal can be pumped to the ECST connection to refill the tank or provide a direct suction source to the BDB AFW pump. As indicated in the sequence of	modification required to permanently install this connection **[Open Item 11]** The BDB ECST refill connection consists of a piping tee fitting installed in the ECST make-up line located near the tank and within the tank concrete missile shield enclosure. The connection will include a hose end fitting, isolation valve, and a pressure gauge for local indication of ECST water level.	connection will be located inside the Seismic Category I ECST concrete missile shield enclosure above grade elevation 26 ft 6 in. Portable heating will be provided in the event of an ELAP and extended extreme cold hazard to protect the connection from freezing. **[Open Item 14]** Therefore, the connection will be protected from the external hazards described in Section A.1.

events discussed in Section A.4, the back-up supply of SG injection water will be made available prior to the loss of suction source to the TDAFW pump, which occurs no sooner than 13.1 hours after the ELAP/LUHS initiation.		
b. Back-up SG Water Injection The BDB AFW Pump will be deployed to provide an alternate source of high pressure SG injection capability in the event that the TDAFW pump cannot perform its function due to low SG pressures. Figure 1 identifies the deployed location of BDB equipment and routing of hoses, relative to plant structures and other features, necessary to implement this strategy. The BDB AFW Pump will be a trailer-mounted, diesel driven centrifugal pump that will be stored in the BDB Storage Building(s). The pump will be deployed by towing the trailer to a designated location near the CSPH (primary discharge connection) or to the alleyway near the Service Building (alternate discharge connection). An appropriate length of flexible hose equipped with hose end fittings will be routed between the BDB ECST refill connection (described in Section B.2.5.a) and the pump suction connection. Alternatively, the	b.i. Primary AFW Pump discharge BDB connection - modification required to permanently install this connection. **[Open Item 11]** The AFW Pump discharge BDB connection consists of a piping tee fitting installed in the TDAFW pump discharge line located inside the MSVH in the AFW Pump Room. The connection will include a hose end fitting and an isolation valve.	b.i. The primary AFW Pump discharge BDB connection will be located within the Seismic Category I, missile protected MSVH. The connection will be protected from the external hazards described in Section A.1. b.ii. The alternate AFW Pump discharge BDB connection will be located within the non-Seismic Category I, non-missile protected portion of the Service Building. As such, this connection point may not be available following a seismic event or extreme high wind condition. The connection will be protected from the other external hazards described in Section A.1.

hose may be connected directly to the BDB High Capacity Pump discharge hose rather than the BDB ECST refill connection. Hose routing will be along the ground. For discharge to the primary AFW Pump discharge BDB connection described in Section B.2.b.i, a suitable length of high pressure flexible hose will be routed from the BDB AFW Pump to the AFW Pump Room through the CSPH. An alternative routing through an access door to the MSVH at Elev. 55 ft and down to Elev. 27 ft of the AFW Pump Room is available in the event that the CSPH is inaccessible due to tornado-generated missile or high winds damage. The hose will be attached to the BDB AFW Pump discharge nozzle via the installed hose connection. The other end of the hose will be attached to the hose fitting at the AFW Pump discharge BDB connection (modification required to permanently install this connection). Water from the ECST, or from the discharge canal via the BDB High Capacity Pump, can be pumped to the SGs via the AFW Pump discharge BDB connection through the AFW system piping. For discharge to the alternate AFW Pump discharge BDB		

connection described in Section B.2.b.ii, a suitable length of high pressure flexible hose will be routed from the BDB AFW Pump located at ground elevation in the alleyway up the exterior Service Building wall and through the door at Elev. 58 ft. The hose will be connected to the main feedwater line by disassembling a feedwater regulating valve bypass inlet isolation valve to remove the valve bonnet and installing a pre-fabricated flanged hose adapter assembly. Water from the ECST, or from the discharge canal via the BDB High Capacity Pump, can be pumped to the SGs via the main feedwater system piping as described in Section B.2.b.ii.		
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0		

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B. Maintain Core Cooling & Heat Removal	
B.3 - 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. Additional pumps will be provided from the RRC to provide backup to the BDB AFW pumps as well as the BDB High Capacity pumps. The installed TDAFW pump has the capability to operate for an extended period of time. Failure of the pump can be mitigated by the on-site BDB AFW pump. The RRC pumps provide backup capability should multiple failures occur during extended operation after several days or weeks from the event.	
Details:	
B.3.1 - Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* See Section B.2.1.
B.3.2 - Identify modifications	*List modifications necessary for phase 3* None
B.3.3 - Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* The Phase 3 strategy utilizes the same Key Reactor Parameters and associated indications as described in Section B.1.3 for Phase 1. Portable BDB equipment from the RRC will be supplied with local instrumentation needed to operate the equipment. The use of these instruments will be in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

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B.3.4 - Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. Phase 3 equipment will be provided by the RRC. Equipment transported to the site will be either immediately staged at the point of use location or temporarily stored at the designated lay down area until moved to the point of use area. Pre-determined deployment paths will be used to move equipment as necessary.	*Identify modifications* No modifications have been identified to support Phase 3 deployment activities.	*Identify how the connection is protected* See Section B.2.5.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0		

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C. Maintain RCS Inventory Control

Determine Baseline coping capability with installed coping[2] 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**

C.1 - PWR Installed Equipment Phase 1:

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

As described in Section B.1, following the occurrence of an ELAP/LUHS, the Loss of All AC Power emergency response procedure will be used to stabilize the plant at a SG pressure of 300 psig (corresponding to RCS cold leg temperature of approximately 422°F) via steam release. The emergency procedure also directs the operators to minimize RCS inventory loss through potential RCS letdown paths by closing or verifying closed the RCS letdown isolation valves, pressurizer power-operated relief valves (PORVs), RCS loop drain valves, reactor head vent valves, pressurizer vent valves, and RCP seal leak-off return isolation valves.

Plant conditions in the event of an ELAP include loss of cooling to the RCP seals, which could lead to degradation of the seal and loss of RCS inventory. Westinghouse RCP seal leakage has been evaluated, with results presented in WCAP-17601, based on a four-loop Westinghouse NSSS. A conservative site-specific assessment of the generic WCAP-17601 evaluation showed that for a Westinghouse NSSS with Westinghouse RCP seals, natural circulation flow could be sustained for 33 hours without RCS inventory makeup considering the approximately 21 gpm/seal initial leakage rate. (Reference ETE-NAF-2012-0150) However, the Surry RCP seals have been upgraded to the Flowserve N-9000 seals, including the abeyance seal feature which reduces the seal leakage compared to the Westinghouse seals, extending the time to loss of natural circulation and allowing sufficient time to deploy equipment from offsite. A conservative time constraint of 33 hours is being used for RCS inventory makeup.

A site-specific analysis of core reactivity following an ELAP/LUHS concluded that for a RCS cooldown to conditions corresponding to the emergency procedure minimum SG pressure of 300 psig, no boration is required for the first 72 hours to maintain adequate shutdown margin ($K_{eff} < 0.99$). (Reference Calculation MISC-11789)

Based on the above, the Phase 1 strategy for ensuring adequate RCS inventory and reactivity control consists of stabilizing the plant and performing the RCS letdown path isolations directed

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

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C. Maintain RCS Inventory Control	
by the emergency response procedures, and monitoring plant conditions for at least 33 hours. Actions to provide RCS inventory makeup and control of reactivity are described in Section C.3 as a Phase 3 strategy.	
Details:	
C.1.1 - Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* Existing emergency procedure for response to the loss of all AC power, ECA-0.0, provides the necessary guidance to accomplish the Phase 1 strategy for RCS inventory and reactivity control.
C.1.2 -Identify modifications	*List modifications* No modifications are required for Phase 1 response.
C.1.3 - Key Reactor Parameters	*List instrumentation credited for this coping evaluation.* Instrumentation providing the following key parameters is credited for Phase 1: <u>SG Pressure</u> - SG pressure indication is available from the MCR. SG pressure indication is available for SG A, B, and C throughout the event. <u>RCS Temperature</u> - RCS hot-leg and cold-leg temperature, and core exit thermocouple, indication is available from the MCR. Following electrical load stripping (Section F1.1), RCS hot-leg and cold-leg temperature indication will only be available for 'B' loop. Following re-power of vital AC circuits (Section F1.2), RCS hot-leg and cold-leg temperature indication will be restored for RC loop 'A' and 'C'. <u>Pressurizer Water Level</u> - Pressurizer level indication is available from the MCR. Pressurizer level indication is available throughout the event. <u>Reactor Vessel Water Level</u> - Reactor Vessel Level Indication System (RVLIS) indication is available from the MCR. RVLIS indication is available throughout the event.

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C. Maintain RCS Inventory Control	
	Reactor Power Level – Excore nuclear instruments indication is available from the MCR throughout the event.

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

WCAP-17601, "Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs," August 2012.

Engineering Technical Evaluation, ETE-NAF-2012-0150," Evaluation of Core Cooling Coping for Extended Loss of AC Power (ELAP) and Proposed Input for Dominion's Response to NRC Order EA-12-049 for Dominion Fleet" Revision 1, January 10, 2013.

Calculation MISC-11789, "Investigation of Reactivity Control During Extended Station Blackout – Surry Units 1 and 2", Revision 0, February 18, 2013.

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Maintain RCS Inventory Control

C.2 - 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 RCS inventory. Identify methods (Low Leak RCP Seals and/or borated high pressure RCS makeup) and strategy(ies) utilized to achieve this coping time.

RCS inventory makeup and reactivity control actions are not required for a minimum of 33 hours, which is adequate time to receive supporting equipment from offsite. Therefore, equipment is not required to be stored and maintained onsite.

Actions to provide RCS inventory makeup and control of reactivity are described in Section C.3 as a Phase 3 strategy.

Details:

C.2.1 - Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* See Section C.3.
C.2.2 - Identify modifications	*List modifications* See Section C.3.
C.2.3 - Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* See Section C.3.

C.2.4 - Storage / Protection of Equipment:
Describe storage / protection plan or schedule to determine storage requirements

Seismic	*List Protection or schedule to protect* Not applicable – no equipment stored onsite.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List Protection or schedule to protect* Not applicable – no equipment stored onsite.
Severe Storms with High Winds	*List Protection or schedule to protect* Not applicable – no equipment stored onsite.

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Maintain RCS Inventory Control	
C.2 - PWR Portable Equipment Phase 2:	
Snow, Ice, and Extreme Cold	*List Protection or schedule to protect* Not applicable – no equipment stored onsite.
High Temperatures	*List Protection or schedule to protect* Not applicable – no equipment stored onsite.

C.2.5 - Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. Not applicable – no equipment stored onsite.	*Identify modifications* See Section C.3.	*Identify how the connection is protected* See Section C.3.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0		

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C. Maintain RCS Inventory Control

C.3 - PWR Portable Equipment Phase 3:

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

As described in Section C.1, the Phase 1 strategy for ensuring adequate RCS inventory and reactivity control consists of stabilizing the plant and performing RCS letdown path isolations directed by the emergency response procedures, and monitoring plant conditions for up to 33 hours, allowing sufficient time to deploy equipment from offsite.

Based on the potential for the formation of reactor head voiding during RCS natural circulation cooling following an ELAP, an evaluation of the need to establish a RCS vent path in order to successfully implement the RCS inventory and reactivity control strategy was performed. The evaluation considered the anticipated void formation and size, the low leakage expected from the RCS, and the volume of borated water injection necessary for adequate shutdown margin. Based on the small volume of water to be injected, and the high pressure capability of the BDB RCS injection pump, RCS venting is not anticipated to be required. In the event that RCS venting becomes necessary or desirable, the remotely-operated reactor head vent valves have been evaluated and determined to provide adequate venting capability to reduce head voiding and allow RCS injection.

In order to provide the capability for RCS inventory makeup and to increase shutdown margin allowing further RCS cooldown, a portable, diesel powered, BDB RCS injection pump (Table 2) will be required to add borated water to the RCS at 33 hours into the event. Two portable BDB RCS injection pumps will be transported from the RRC facility and staged near the RWST for each unit (Figure 1). A flexible hose will be routed to supply water from the RWST to the pump and another portable hose will supply pump discharge to the RCS (Figure 2). The system connections that support operation of the BDB RCS injection pump are described below. The pump will be capable of injecting a minimum of 40 gpm at 2000 psi discharge pressure.

The RRC will provide two pumps capable of providing the required flow rates. The first RRC pump can be expected 24 hours after notification which is expected to occur 2 hours after the event (26 hours total). Deployment time is estimated to take approximately 2 hours from the time the BDB RCS injection pump from the RRC is available on site. The second pump from the RRC is expected to arrive on-site 30 hours from the event and be deployed in the next 2 hours. Therefore, it is reasonable to conclude that RCS injection flow will be initiated within the conservatively established time constraint of 33 hours.

Water Sources

The primary source of borated water for RCS injection will be the RWST. The BDB RCS injection pump suction connection will be installed on the suction line to the containment spray

C. Maintain RCS Inventory Control

C.3 - PWR Portable Equipment Phase 3:

pump, which is located in the CSPH (Figure 4). Each unit's RWST is located outside at grade level near the Safeguards Building and is a Seismic Category I tank, but the tank is not tornado missile protected. The tank contains a normal minimum volume of 387,100 gal of water with a boron concentration between 2300 and 2500 ppm. The RWST is the preferred borated water source for BDB RCS injection pump suction.

Backup sources of borated water – In the event that one unit's RWST is unavailable as a water source for RCS injection, the opposite unit's RWST has more than adequate capacity to supply both units RCS makeup and boration volume requirements. A flexible hose can be routed to the opposite unit's BDB RCS injection pump suction supply connection, which can supply both BDB RCS injection pumps.

In the unlikely event that both RWSTs are unavailable as borated water sources for RCS make-up, portable boric acid batching tanks and dry, bagged boric acid will be stored in the BDB Storage Building(s) (Table 1) and deployed to provide borated water supply to the BDB RCS injection pump suction. The batching tank and bags of dry boric acid would be transported from the BDB Storage Building(s) and staged near the BDB RCS injection pump. Water and powdered boric acid would be mixed in the tank to the necessary boric acid concentration. In the event that an installed source of water is not available due to damage resulting from an extreme external event, the BDB High Capacity pump taking suction from the station discharge canal (described in Section C.2) will provide the water supply to the portable batching tank. Since the portable tanks are stored in the BDB Storage Building(s), setup could precede the receipt of the BDB RCS Injection pumps from the RRC and does not affect the deployment of RCS injection capability within 33 hours.

<u>RCS Injection</u>

The BDB RCS injection pump will discharge through high-pressure, flexible hose routed to either the primary or alternate discharge connections. The primary injection path to the RCS will be through the seismically-designed primary BDB RCS pump discharge connection to be installed in the low head safety injection (LHSI) pump discharge piping located in the Seismic Category I, tornado missile protected Safeguards Building (Figure 4). The alternate path of RCS injection will be through an existing seismically-designed 2-inch blind flanged test connection (BDB RCS alternate discharge connection) in the charging pump discharge header located in the Seismic Category I, tornado missile protected Auxiliary Building (Figure 5).

Hydraulic analysis of the flowpath from the BDB RCS injection pump suction connections to the primary and alternate pump discharge connections will be performed to confirm that applicable performance requirements are met. **[Open Item 5]**

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C. Maintain RCS Inventory Control	
C.3 - PWR Portable Equipment Phase 3:	
Details:	
C.3.1 - Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* Site specific procedural guidance governing the RCS inventory and reactivity strategies will be developed using industry guidance, and will address: - the necessary steps to deploy portable pumps and hoses, establish connections, and operate the portable equipment to perform the required function. **[Open Item 7]**
C.3.2 - Identify modifications	*List modifications* (1) Install the BDB RCS injection pump suction connection **[Open Item 11]** (2) Install the primary BDB RCS injection pump discharge connection **[Open Item 11]**
C.3.3 - Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* The Phase 3 strategy utilizes the same Key Reactor Parameters and associated indications as described in Section C.1.3 for Phase 1. In addition, the following instrumentation is used for Phase 3: <u>RCS Wide Range Pressure</u> – RCS wide range pressure indication is available from the MCR. RCS wide range pressure indication is available throughout the event. Portable BDB equipment from the RRC will be supplied with local instrumentation needed to operate the equipment. The use of these instruments will be in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operation experience and expected equipment function in an ELAP.

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C.3.4 - Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. Phase 3 equipment will be provided by the RRC. Equipment transported to the site will be either immediately staged at the point of use location or temporarily stored at the designated lay down area until moved to the point of use area. Pre-determined deployment paths will be used to move equipment as necessary.	*Identify modifications*	*Identify how the connection is protected*
a. <u>Water Sources</u> The primary supply of borated water for injection will be from the RWST. The primary suction supply connection for the BDB RCS injection pump will be located on the suction line to the containment spray pump (modification required), which is located in the CSPH (Figure 4). A flexible suction hose will be routed from the suction connection to the BDB RCS injection pump. This provides borated water to the suction of the BDB RCS injection pump from the RWST. In the event that one unit's RWST is unavailable as a water source for RCS	BDB RCS injection pump suction connection – modification required to permanently install this connection**[Open Item 11]** The BDB RCS injection pump suction connection consists of a piping tee installed in the suction line to the containment spray pump located in the CSPH. The connection will be a hose end fitting and include an isolation valve.	The BDB RCS injection pump suction connection will be seismically designed and located within the Seismic Category I, non-missile protected CSPH. Portable heating will be provided in the event of an ELAP and extended extreme cold hazard to protect the connection from freezing. **[Open Item 14]** The connection is protected from the external hazards described in Section A.1, except for the high winds and associated missiles hazard.

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injection, the opposite unit's RWST has more than adequate capacity to supply both units RCS makeup and boration volume requirements. A flexible hose will be routed to the opposite unit's BDB RCS injection pump suction supply connection, which can supply both BDB RCS injection pumps. In the unlikely event that no RWST source of water is available, a portable boric acid batching tank will be deployed to provide the backup water source to the BDB RCS injection pump. The batching tank and bags of dry boric acid would be transported from the BDB Storage Building(s) and staged near the BDB RCS injection pump. Water and powdered boric acid would be mixed in the tank to the necessary boric acid concentration. Flexible hose will be routed to either an existing on-site water source, if available, or to the discharge of the BDB High Capacity pump to provide a source of water to the tank for boric acid mixing. Flexible hose will be routed to the BDB RCS injection pump to provide the suction flowpath. No permanent plant system connections are required for this backup water supply.		

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b. <u>RCS Injection – Primary Connection</u> The BDB RCS injection pump will be transported from the RRC storage facility and positioned near the RWST (Figure 1). A high pressure hose will be routed from the pump to the primary BDB RCS injection pump discharge connection point in the Safeguards Building (modification required). The second BDB RCS injection pump to arrive from the RRC will be deployed in a similar manner for the other unit.	Primary BDB RCS injection pump discharge connection – modification required to permanently install this connection **[Open Item 11]** The primary RCS injection BDB connection will consist of a piping tee fitting installed in the LHSI pump discharge line to the RCS hot legs. The connection will be seismically-designed and include an isolation valve and a hose end connection.	The primary BDB RCS injection pump discharge connection will be seismically designed and located in the Seismic Category I, high wind and associated missile protected Safeguards Building. The connection is protected from the hazards identified in Section A.1.
c. <u>RCS Injection – Alternate Connection</u> In the event that the primary BDB RCS injection pump discharge connection should become unavailable, an alternate RCS injection point has been identified. The alternate connection utilizes an existing 2-inch blind flanged test connection on the charging pump discharge line located in the Auxiliary Building basement. The BDB RCS injection pump discharge will be connected via a high pressure hose to this test connection. The BDB RCS injection pump can deliver borated water from the RWST or the batching tank as described above to the RCS via the charging header.	No modifications are required for the alternate BDB RCS injection pump discharge connection.	The alternate BDB RCS injection pump discharge connection is located in the Seismic Category I, tornado missile protected Auxiliary Building. The charging pump discharge line is seismically-designed and protected from the hazards identified in Section A.1.

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If necessary, the second BDB RCS injection pump to arrive from the RRC could be deployed in a similar manner for the other unit.		

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

Calculation MISC-11789, "Investigation of Reactivity Control During Extended Station Blackout – Surry Units 1 and 2", Revision 0, February 18, 2013.

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D. Maintain Containment

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

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

D.1 - 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.

The Phase 1 coping strategy for containment involves verifying containment isolation per ECA-0.0, Loss of All AC Power, and continuing to monitor containment pressure using installed instrumentation.

Evaluations have been performed and conclude that containment temperature and pressure will remain below design limits and key parameter instruments subject to containment environment will remain functional for at least 7 days. (Reference Calculations MISC-11793 and MISC-11794) Therefore, actions to reduce containment temperature and pressure and ensure continued functionality of the key parameters will not be required prior to this time and will utilize off-site equipment and resources during Phase 3.

Details:

D.1.1 - Provide a brief description of Procedures / Strategies / Guidelines	Procedural guidance for monitoring containment pressure is provided by ECA-0.0, Loss of All AC power.
D.1.2 - Identify modifications	No plant modifications are required to support implementation of this Phase 1 strategy.
D.1.3 - Key Containment Parameters	*List instrumentation credited for this coping evaluation.* <u>Containment Pressure</u> - Containment pressure indication is available in the MCR throughout the event.

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

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D. Maintain Containment

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

Calculation MISC-11793, "Evaluation of Long Term Containment Pressure and Temperature Profiles Following Loss of Extended AC Power (ELAP)," Revision 0, February 18, 2013.

Calculation MISC-11794, "Evaluation of North Anna, Surry, and Millstone Containment Instrumentation Following Extended Loss of AC (ELAP)," Revision 0, February 18, 2013.

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D. Maintain Containment	
D.2 - PWR Portable Equipment Phase 2:	
Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain containment. Identify methods (containment spray/hydrogen igniters) and strategy(ies) utilized to achieve this coping time. Evaluations have been performed and conclude that containment temperature and pressure will remain below design limits and key parameter instruments subject to containment environment will remain functional for at least 7 days. (Reference Calculations MISC-11793 and MISC-11794) Therefore, actions to reduce containment temperature and pressure and ensure continued functionality of the key parameters will not be required prior to this time and will utilize off-site equipment and resources during Phase 3. There is no separate Phase 2 strategy.	
Details:	
D.2.1 - Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* None required for Phase 2
D.2.2 - Identify modifications	*List modifications* None required for Phase 2
D.2.3 - Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* Although a Phase 2 strategy is not required to maintain containment, the Phase 1 containment monitoring instrumentation will continue to be powered during Phase 2 from portable generators.
D.2.4 - Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* None required for Phase 2
Flooding	*List how equipment is protected or schedule to protect* None required for Phase 2

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D. Maintain Containment	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* None required for Phase 2
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* None required for Phase 2
High Temperatures	*List how equipment is protected or schedule to protect* None required for Phase 2

D.2.5 - Deployment Conceptual Modification (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. None required for Phase 2	*Identify modifications* None required for Phase 2	*Identify how the connection is protected* None required for Phase 2

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

Calculation MISC-11793, "Evaluation of Long Term Containment Pressure and Temperature Profiles Following Loss of Extended AC Power (ELAP)," Revision 0, February 18, 2013.

Calculation MISC-11794, "Evaluation of North Anna, Surry, and Millstone Containment Instrumentation Following Extended Loss of AC (ELAP)," Revision 0, February 18, 2013.

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D. Maintain Containment

D.3 - PWR Portable Equipment Phase 3:

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

Further analysis is required to determine the strategy and time requirements for actions beyond seven days to reduce containment pressure and temperature, if any. As such, the Phase 3 coping strategy to maintain containment integrity is under development. Methods to monitor and evaluate containment conditions and depressurize/cool containment, if necessary, will be provided in a future update. **[Open Item 4]**

Details:

D.3.1 - Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* Phase 3 procedure guidance to evaluate containment conditions and depressurize/cool containment will be developed later.
D.3.2 - Identify modifications	*List modifications* To be determined.
D.3.3 - Key Containment Parameters	*List instrumentation credited for this coping evaluation.* Containment Pressure - Containment pressure indication is available in the MCR throughout the event.

D.3.4 - Deployment Conceptual Modification
(Attachment 3 contains Conceptual Sketches)

Strategy	Modifications	Protection of connections
Identify Strategy including how the equipment will be deployed to the point of use. Phase 3 strategies to assess containment conditions and deploy equipment to depressurize/cool containment will be developed later.	*Identify modifications* Any modifications for future Phase 3 strategies to assess containment conditions and deploy equipment to depressurize/cool containment will be developed later.	*Identify how the connection is protected* Protection of connections for future Phase 3 strategies to assess containment conditions and deploy equipment to depressurize/cool containment will be identified later.

Notes:
The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

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E. Maintain Spent Fuel Pool Cooling

Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications, utilizing methods described in Table 3-2 of NEI 12-06:

- **Makeup with Portable Injection Source**

E.1 - 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.

Following the occurrence of an ELAP/LUHS event, normal SFP cooling capability is lost which, in the long term, can result in SFP boiling and loss of adequate SFP level for adequate spent fuel cooling. Conservative analysis has shown that, based on the limiting fuel storage scenario resulting in maximum design heat load, with no operator action, the SFP will reach 212°F in approximately 12 hours and boil off to a level 10 feet above the top of fuel in approximately 51 hours from initiation of the event. (Reference Calculation MISC-11792)

Based on the extended time available for action to supplement SFP cooling, the Phase 1 coping strategy is to monitor SFP level, using instrumentation to be installed as required by NRC Order EA-12-051.

Details:

E.1.1 - Provide a brief description of Procedures / Strategies / Guidelines	The Phase 1 coping strategy for SFP cooling is to monitor SFP level using instrumentation to be installed as required by NRC Order EA-12-051.
E.1.2 - Identify modifications	No additional modifications are required other than installation of the BDB SFP level monitoring instruments as required by NRC Order EA-12-051.
E.1.3 - Key SFP Parameter	*Per EA-12-051* SFP water level – water level indication will be provided in accordance with the requirements of NRC Order EA-12-051. Water level indication will be available throughout the event.

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

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

Calculation MISC-11792, "Extended Loss of AC Power, Spent Fuel Pool Heatup Times and Water Makeup for Dominion Nuclear," Revision 0, February 8, 2013.

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E. Maintain Spent Fuel Pool Cooling

E.2 - 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.

As described in Section E.1, Phase 1 coping for maintaining the fuel in the SFP adequately cooled following an ELAP/LUHS will be accomplished by monitoring SFP level using the BDB SFP instrumentation installed as required by NRC Order EA-12-051. SFP cooling will be maintained by providing makeup to the pool using on-site portable equipment stored in the BDB Storage Building(s). Makeup to the SFP will be required prior to 51 hours, at which time continued pool boiling is calculated to reduce the pool level to within ten feet of the top of stored fuel.

a. The primary coping strategy for SFP cooling is to utilize the BDB High Capacity pump, deployed as described in Section B.2, to provide makeup water flow to the pool. The BDB High Capacity Pump will draw water from the station discharge canal and discharge to the pool through a flexible hose connected to the pre-installed, seismically-designed, tornado missile protected SFP makeup connection installed outside the Fuel Building (Figure 6). The flowpath for SFP make-up is through the existing FP system emergency SFP fill line inside the Fuel Building, which provides flow directly into the pool. Since the BDB SFP makeup connection is protected, and other necessary equipment is deployed from the BDB Storage Building(s), this SFP makeup capability will be available for the external hazards described in Section A.1.

b. The alternate coping strategy for providing makeup water to the SFP is to use the BDB High Capacity Pump to provide the water source to pressurize the fire main from the station discharge canal through a flexible hose connected to a hydrant in the yard. The flowpath for SFP make-up is through the existing FP system emergency SFP fill line, which provides flow directly into the pool. This method for SFP makeup relies on FP system components located in the yard that are non-Seismic Category I and not tornado missile protected, and may not be available following an seismic event or extreme wind hazard. The method is protected from the other hazards described in Section A.1.

c. Additional capability for SFP makeup utilizes methods developed for compliance with 10 CFR 50.54(hh)(2) (consistent with NEI 12-06 Table D). The BDB High Capacity Pump would provide flow from the discharge canal through portable spray nozzles that will be set-up on the deck near the SFP, or through a flexible hose that will be routed over the edge of the pool. The staging of equipment within the Fuel Building can be accomplished before the SFP area becomes inaccessible since pool boiling is not anticipated until after 12 hours and Fuel Building access is expected to be available for a considerable time after boiling begins.

   Water flow to the spray nozzles or flexible hose discharging to the SFP can be provided directly

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E. Maintain Spent Fuel Pool Cooling

from the BDB High Capacity Pump, or from a FP system hose station after pressurizing the fire main using the BDB High Capacity Pump (Figure 6). Since makeup flow can be established using equipment deployed from the BDB Storage Building(s), this method will be available for the external hazards described in Section A.1.

The BDB High Capacity pump will provide SFP makeup capability of up to 500 gpm, which exceeds the calculated boil-off rate of 78 gpm. (Reference Calculation MISC-11792) Hydraulic analysis of the flowpaths from the station discharge canal to the SFP for each of the makeup methods described above will be performed to confirm that applicable performance requirements are met. **[Open Item 5]**

SFP Area Vent Pathway

Per NEI 12-06, a vent pathway for removal of steam and condensate from the SFP area is required as steam from pool boiling can condense and cause access and equipment problems in other parts of the plant. Following a BDB event, a vent pathway would be required in the event of SFP bulk boiling and can be established by opening the Fuel Building roll-up doors for inlet and outlet air flow.

Details:

E.2.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* Site-specific procedural guidance governing the SFP cooling will be developed using industry guidance, and will address the necessary steps to deploy portable pumps and hoses, establish connections, operate the portable equipment to perform the required function, and establish a SFP area vent pathway. **[Open Item 7]**
E.2.2 – Identify modifications	*List modifications* a. Install the SFP makeup connection located outside the Fuel Building. **[Open Item 11]**
E.2.3 – Key SFP Parameter	*Per EA-12-051* SFP water level – water level indication will be provided in accordance with the requirements of NRC Order EA-12-051. Water level indication will be available throughout the event.

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E. Maintain Spent Fuel Pool Cooling	
E.2.4 – Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from seismic events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Flooding	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from flooding events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from severe storms with high wind events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from snow, ice and extreme cold events while stored in the BDB Storage Building(s) or in protected areas of the plant.
High Temperatures	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings will be protected from high temperature events while stored in the BDB Storage Building(s) or in protected areas of the plant.

E.2.5 – Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. a. Primary FLEX strategy – Within the first 24 hours of the	*Identify modifications* BDB SFP Makeup Connection – modification required to	*Identify how the connection is protected* The BDB SFP Makeup Connection is seismically-

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E. Maintain Spent Fuel Pool Cooling		
BDB event, the BDB high capacity pump will be staged near the station discharge canal and a suction flowpath will be established as described in Section B.2. Figure 1 identifies the deployed location of BDB equipment and routing of hoses, relative to plant structures and features, necessary to implement this strategy. A flexible hose will be routed from the pump discharge to the BDB SFP makeup connection outside the Fuel Building. The SFP makeup connection will be installed and tied into the SFP emergency makeup line that extends above the SFP so that water can be discharged directly into the pool.	permanently install this connection **[Open Item 11]** The BDB SFP Makeup Connection will consist of a piping tee fitting installed in the FP system emergency SFP makeup line located inside the Fuel Building. Piping will be installed terminating in a hose fitting connection external to the Fuel Building.	designed and tornado missile protected. The connection is designed to withstand a design basis earthquake, design basis external flooding; storms with high winds (hurricanes, tornadoes, etc.) and associated missiles; snow, ice, and low temperatures; and extreme high temperatures.
b. The alternate FLEX strategy utilizes the BDB high capacity pump to pressurize the fire main from the station discharge canal and provide makeup to the SFP via the installed emergency makeup line. A flexible hose will be routed from the discharge of the pump to a yard hydrant to supply the fire main. The SFP emergency makeup is initiated by opening a FP system post-indicator valve in the yard, and actuating a deluge valve in the line using	No modifications are required.	The yard hydrant connection is not seismically designed and is not protected from tornado missiles, and this strategy may not be available following a seismic event or high wind hazard. The hydrant connection is protected from the other external hazards described in Section A.1.

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E. Maintain Spent Fuel Pool Cooling		
one of two fire pull stations located inside the Fuel Building.		
c. The SFP makeup capability using methods developed for 10 CFR 50.54(hh)(2) compliance will provide flow through portable spray nozzles, or through a flexible hose, directly to the SFP. A flexible hose will be routed from the discharge of the BDB High Capacity Pump (or from the FP system hose station pressurized by the BDB High Capacity Pump) through a door to the Fuel Building. A hose will be run from the discharge of the BDB high capacity pump, through the door on the North side of the Fuel Building, and up to SFP operating deck. From there, the hose may be run directly over the side of the pool or to portable spray monitors. When deployed, the two spray monitors are connected via a wye that splits the pump discharge into two hoses. The two hoses are routed to the spray monitors (nozzles) set-up near the SFP. The two oscillating spray monitors are set up 30 feet apart and 16 feet back from the SFP. These spray monitors spray water into the SFP to maintain water level.	No modifications are required.	No permanent connections are required to be protected.

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E. Maintain Spent Fuel Pool Cooling
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0 Calculation MISC-11792, "Extended Loss of AC Power, Spent Fuel Pool Heatup Times and Water Makeup for Dominion Nuclear," Revision 0, February 8, 2013.

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E. Maintain Spent Fuel Pool Cooling

E.3 – 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.

A separate Phase 3 strategy is not required to maintain spent fuel pool cooling. However, the Phase 2 spent fuel pool makeup strategies will be maintained using offsite pumps if the onsite portable pumps fail.

Details:

E.3.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* No separate strategies are required for Phase 3
E.3.2 – Identify modifications	*List modifications* No separate modifications are required for Phase 3
E.3.3 – Key SFP Parameter	*Per EA-12-051* SFP water level – water level indication will be provided in accordance with the requirements of NRC Order EA-12-051. Water level indication will be available throughout the event.

E.3.4 – Deployment Conceptual Design
(Attachment 3 contains Conceptual Sketches)

Strategy	Modifications	Protection of connections
Identify Strategy including how the equipment will be deployed to the point of use. Although a separate Phase 3 strategy is not required to maintain SFP cooling, pumps from the RRC may be deployed to the same Phase 2 equipment deployment location if the onsite portable pumps fail.	*Identify modifications* No separate modifications are required for Phase 3	*Identify how the connection is protected* No separate connections are required for Phase 3

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E. Maintain Spent Fuel Pool Cooling

Notes:

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F1. Safety Functions Support (Electrical)

Determine Baseline coping capability with installed coping[5] modifications not including FLEX modifications.

F1.1 – 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.

Successful implementation of FLEX strategies relies on several support functions. An important support function is to maintain electrical power to key parameter monitoring instrumentation that is necessary to successfully implement planned FLEX strategies. The Phase 1 strategy to provide this support function involves extending the available electrical power from the installed Class 1E 125 VDC batteries through reduction of DC bus loading soon after the occurrence of an ELAP/LUHS by stripping non-essential loads from the 125 VDC and the battery-backed 120 VAC vital buses. Essential instrumentation necessary for key parameter monitoring is powered by the 120 VAC vital bus circuits, which will be maintained energized by 125 VDC battery bus through the Class 1E inverters following an ELAP.

A detailed review has been performed to determine essential and non-essential loads on the safety-related 125 VDC and 120 VAC buses. Based on a review of instrumentation necessary to provide key parameter monitoring for FLEX strategies, a load list was developed to identify essential circuits. Based on this list, a battery load analysis was performed to determine the extended battery life. The analysis included assumptions that the two trains of Class 1E DC buses on each unit would be tied together using the installed cross-tie circuit and that load stripping would begin within 45 minutes after the occurrence of an ELAP/LUHS and completed within the next 30 minutes. With load stripping and cross-tie of the battery buses, the useable battery life was calculated to be 14 hours for the Unit 1 batteries and 14 hours for the Unit 2 batteries. **[Open Item 2]**

The vital AC and DC distribution system and associated equipment is seismically-designed and installed in protected areas of the plant and is expected to remain available following an ELAP/LUHS. However, in the unlikely event of vital AC and DC infrastructure damage due a seismic event or other hazard, key parameter monitoring capability can be provided using methods, such as repowering instruments locally, that are currently addressed by existing site procedures previously developed to respond to extreme events.

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

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Details:	
F1.1.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Analysis shows that the Class 1E 125 VDC batteries will provide sufficient voltage for the required Phase 1 strategy loads for a minimum 14 hours of operation for Unit 1 and Unit 2. **[Open Item 2]** This assumes that load stripping starts within 45 minutes after the ELAP and is completed within the next 30 minutes. Procedures currently direct the operators to strip selected non-essential loads after the unit is stabilized. However, to achieve the extended 14 hours battery life, additional load stripping will be necessary. Site specific procedural guidance governing load stripping will be developed. **[Open Item 7]**
F1.1.2 – Identify modifications	*List modifications and describe how they support coping time.* A wiring modification will be implemented to ensure that the SG A Wide Range Level (key parameter monitoring instrument) indication is available in the MCR for both Units 1 and 2 following load stripping. **[Open Item 11]**
F1.1.3 – Key Parameters	*List instrumentation credited for this coping evaluation phase.* MCR instrumentation is available to monitor the Class 1E vital battery bus voltage during Phase 1 of an ELAP/LUHS event. Instrumentation will be available to monitor key parameters during Phase 1 activities for up to 14 hours as a result of the successful implementation of the load stripping activities. These key parameters are listed in Sections B.1.3, C.1.3, and D.1.3.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0	

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F1. Safety Functions Support (Electrical)

F1.2 – 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.

Prior to depletion of the Class 1E 125 VDC batteries, vital 120 VAC circuits will be re-powered to continue to provide key parameter monitoring instrumentation using portable DGs stored on-site. Additional key parameter monitoring instrumentation, down-powered for load stripping in Phase 1, will be restored when 120 VAC re-powering is implemented. In addition, selected plant lighting will be re-energized.

The primary strategy for re-powering 120 VAC vital bus circuits is the deployment of two 120/240V DGs per unit connected to 120 VAC vital buses through pre-installed BDB cabling, connections, and distribution panels. The portable 120/240V DGs (and connecting power cables) will be deployed from their protected storage location to the alleyways west of the Auxiliary Building for Unit 1 and east of the Auxiliary Building for Unit 2 (Figure 8). Cables will be run from the portable DGs to seismically-designed, tornado missile protected BDB connection receptacles accessible from the alleyways. The BDB receptacles will be connected to two BDB distribution panels via pre-installed cable and conduit. Each 120/240V DG will power one BDB distribution panel which provides power to the vital 120 VAC buses and selected lighting circuits (See Figure 9).

The alternate strategy for re-powering 120 VAC vital bus circuits is the deployment of one 480V DG per unit connected to the Class 1E 480 VAC bus through pre-installed BDB cabling and connections. The 480V DG would allow for recharging the Class 1E 125 VDC batteries and restoration of other AC loads in addition to the key parameter monitoring instrumentation. The portable 480V DGs (and necessary connecting power cables) will be transported from the BDB Storage Building(s) to the deployed positions in the alleyways on the west and east sides of the Auxiliary Building (Figure 8). The power cables will be connected to seismically-designed, tornado missile protected 480 VAC BDB connection receptacles accessible from the alleyways. The BDB connection receptacles will be connected to the Class 1E 480 VAC bus via pre-installed cable and conduit to Class 1E 480 VAC MCC breakers (See Figure 10).

Figure 7 provides an electrical one line overview of the re-powering strategy.

The final performance criteria for the DGs will be determined by an electrical loading analysis. Cabling and connector sizing will be matched to the performance criteria. **[Open Item 15]**

Details:

F1.2.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Site specific procedural guidance governing re-powering strategies

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F1. Safety Functions Support (Electrical)	
F1.2 – PWR Portable Equipment Phase 2	
	will be developed using industry guidance. Procedures will include the necessary steps to deploy and connect the 120/240V DGs and the 480V DGs to the BDB connection receptacles, to start the generators, and to connect selected loads to the re-powered panels and buses. **[Open Item 7]**
F1.2.2 – Identify modifications	*List modifications necessary for phase 2.* A modification on each unit will install the BDB connection receptacles for the cables from the portable 120/240V DGs. **[Open Item 11]** A modification on each unit will install the BDB connection receptacles for the cables from the portable 480V DGs. **[Open Item 11]**
F1.2.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* No instrumentation is credited to monitor the re-powered AC distribution system during Phase 2 of an ELAP event. Local instrumentation on the portable DG units will monitor the generator performance. Instrumentation will be available to monitor key parameters during Phase 2 activities as a result of the successful re-powering of the vital 120 VAC buses. These key parameters are listed in Sections B.2.3, C.2.3, and D.2.3.
F1.2.4 – Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* The BDB portable DGs, necessary cables and connectors will be protected from seismic events while stored in either the BDB Storage Building(s) or in seismic protected areas of the plant.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* The BDB portable DGs, necessary cables and connectors will be protected from flooding events while stored in either the BDB Storage Building(s) or in flood protected areas of the plant.

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F1. Safety Functions Support (Electrical)	
F1.2 – PWR Portable Equipment Phase 2	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* The BDB portable DGs, necessary cables and connectors will be protected from severe storms with high wind events while stored in either the BDB Storage Building(s) or in wind/missile protected areas of the plant.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* The BDB portable DGs, necessary cables and connectors will be protected from snow, ice and extreme cold events while stored in either the BDB Storage Building(s) or in weather protected areas of the plant.
High Temperatures	*List how equipment is protected or schedule to protect* The BDB portable DGs, necessary cables and connectors will be protected from high temperature events while stored in either the BDB Storage Building(s) or in weather protected areas of the plant.

F1.2.5 – Deployment Conceptual Design (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. a. The 120/240V DG and connection cables will be transported from their storage location(s) to the alleyways west of the Auxiliary Building for Unit 1 and east of the Auxiliary Building for Unit 2. Cables will be run from the portable DGs to BDB connection receptacles. Each DG will power one distribution panel which provides power to the vital 120 VAC buses and	*Identify modifications* A modification will install the 120/240 VAC BDB connection receptacles at locations accessible from the Unit 1 and 2 alleyways east and west of the Auxiliary Building. The receptacles will be seismically mounted, protected from high wind/tornado missile, floods and extreme temperatures. From the receptacles, Class 1E cables and conduit will be installed to new BDB	*Identify how the connection is protected* The seismically mounted 120/240 VAC BDB connection receptacles will be protected from high wind/tornado missiles, flooding, and extreme temperatures. Therefore, the connection will be protected from the extreme external hazards identified in Section A.1.

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F1. Safety Functions Support (Electrical)		
F1.2 – PWR Portable Equipment Phase 2		
selected lighting circuits.	distribution panels (two for each unit). The Class 1E cables from each of the new BDB distribution panels to the vital buses will be permanently connected to the load side of a circuit breaker in a vital bus distribution panel.	
b. The portable 480V DGs and connection cables will be transported from their storage location(s) to the alleyway on the west side (Unit 1) and east side (Unit 2) of the Auxiliary Building. The power cables will be used to connect the DGs to the 480 VAC BDB connection receptacles. One DG per unit powers two 480 VAC emergency buses.	A modification will install the 480 VAC BDB connection receptacles at locations accessible from the Unit 1 and 2 alleyways east and west of the Auxiliary Building. The receptacles will be seismically mounted, protected from high wind/tornado missile, floods and extreme temperatures. For each unit, the 480 VAC power will be supplied from a single portable DG to two BDB connection receptacles. From the receptacles, Class 1E cables and conduit will be installed to a 480 VAC emergency MCC breaker.	The seismically mounted 480 VAC BDB connection receptacles will be protected from high wind/tornado missiles, flooding, and extreme temperatures. Therefore, the connection will be protected from the extreme external hazards identified in Section A.1.

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

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F1. Safety Functions Support (Electrical)

F1.3 – 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 coping strategy is to obtain additional electrical capability and redundancy for on-site equipment until such time that normal power to the site can be restored. This will be provided by two 4160V portable DGs, as described below. Figure 7 provides a one line description of the re-powering strategy which includes the connection of the 4160V DGs.

> 4160V Diesel Generator – One 4160V mobile DG for each unit will be brought in from the RRC in order to supply power to either of the two Class 1E 4160 VAC buses on each unit. Due to the size of the equipment, the DGs will be deployed to areas near large openings in the Unit 1 and 2 Turbine Buildings (See Figure 8).
>
> The 4160V mobile DG can provide power to either Emergency 4160 VAC Bus H or J (Figure 7). The installed bus tie breaker can be closed to re-power selected loads on the opposite train electrical bus. Additionally, by restoring the 4160VAC bus, power can be restored to the Class 1E 480 VAC via the 4160/480 VAC transformers to power selected 480 VAC loads.
>
> Temporary power cables will be deployed from the BDB Storage Building(s) to the staged location of the 4160V DGs for direct connection to the Emergency 4160 VAC Bus through switchgear located in the ESGR of each unit.

The final performance criteria for the DG will be determined by an electrical loading analysis performed in accordance with the design process. **[Open Item 15]** Cabling and connector sizing will be matched to the performance criteria.

Details:

F1.3.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Site specific procedural guidance governing re-powering strategies will be developed using industry guidance. Procedures will include the necessary steps to connect the 4160V DG to the Emergency 4160 VAC Bus, to start the generators, and to re-power the emergency buses. **[Open Item 7]**
F1.3.2 – Identify modifications	*List modifications necessary for phase 3.* No modification is necessary for the connection of the mobile 4160V DG.

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F1. Safety Functions Support (Electrical)

F1.3 – PWR Portable Equipment Phase 3

F1.3.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* No instrumentation is credited to monitor the re-powered AC distribution system during Phase 3 of an ELAP event. Local instrumentation on the portable DG units will monitor the generator performance. Instrumentation will be available to monitor key parameters during Phase 3 activities and is the same instrumentation as for Phase 2. These key parameters are listed in Sections B.2.3, C.2.3, and D.2.3.

F1.3.4 – Deployment Conceptual Design
(Attachment 3 contains Conceptual Sketches)

Strategy	Modifications	Protection of connections
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications.*	*Identify how the connection is protected.*
For Unit 1, the mobile DG will be transported from the RRC and staged in an open area by the Unit 1 Turbine Building rollup door. From there, a temporary power cable will be routed to the ESGR and connected from the 4160V DG to the Emergency 4160 VAC Bus through switchgear. For Unit 2, the mobile DG can be transported from the RRC and staged in an open area by the Unit 2 Turbine Building rollup door. From there, a temporary power cable will be routed to the ESGR and connected from the 4160V DG to the Emergency 4160 VAC Bus through switchgear. Temporary power cables to	No modifications are necessary.	The connections for the mobile 4160V DGs are located in the ESGRs at both units. The connections are to equipment that is already protected from the extreme external hazards identified in Section A.1.

Italicized text is part of the NEI standard template and is retained for information purposes.

F1. Safety Functions Support (Electrical)		
F1.3 – PWR Portable Equipment Phase 3		
facilitate the connections of the DGs to the switchgear bus bars will be stored in the BDB Storage Building(s).		
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0		

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F2. Safety Functions Support (Fuel)

Determine Baseline coping capability with installed coping[6] modifications not including FLEX modifications.

F2.1 – 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.

The FLEX strategies for maintenance and/or support of safety functions involve several elements. One element is maintaining fuel to necessary diesel powered generators, pumps, hauling vehicles, compressors, etc. The general coping strategy for supplying fuel oil to diesel driven portable equipment, i.e., pumps and generators, being utilized to cope with an ELAP/LUHS, is to draw fuel oil out of any available existing diesel fuel oil tanks on the Surry site.

Details:

F2.1.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* No procedures or guidelines related to fueling of BDB equipment are required during Phase 1.
F2.1.2 – Identify modifications	*List modifications and describe how they support coping time.* No modifications related to fueling of BDB equipment are required during Phase 1.
F2.1.3 – Key Parameters	*List instrumentation credited for this coping evaluation phase.* There are no key parameters related to fueling of BDB equipment applicable to Phase 1

Notes:
The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

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

Italicized text is part of the NEI standard template and is retained for information purposes.

F2. Safety Functions Support (Fuel)

F2.2 – 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.

Fuel is required for BDB equipment during Phase 2 and Phase 3 of the FLEX coping strategies. The primary source of fuel oil for portable equipment will be the emergency diesel generator (EDG) fuel oil wall tanks and base tanks. The three diesel fuel oil wall tanks contain 550 gallons of fuel each (a total of 1650 gallons) and are seismically designed and housed in the tornado protected EDG rooms. Fuel can be obtained using the tank drain valve by gravity feed to suitable fuel containers for transport to BDB equipment. Each of the three EDGs also includes a 550 gallon base tank (a total of an additional 1650 gallons). These base tanks are also seismically designed and missile protected. Fuel can be obtained using a cart mounted, 12 VDC fuel pump to draw fuel from the base tank. Therefore, with two 550 gallon fuel oil tanks in each of three EDG rooms, a combined total of 3300 gallons of fuel oil is available.

A secondary source for fuel oil will be the two EDG Underground Diesel Fuel Oil Storage Tanks. Each tank has a 17,500 gallon capacity. These tanks are protected from high wind/tornado missiles by virtue of the underground location and are also protected from seismic and flooding events. Fuel can be obtained using a cart mounted, 12 VDC fuel pump and attaching the pump suction to any of the six (6) EDG fuel transfer pump suction strainer drain valves and pumping the fuel oil to suitable fuel containers for transport. Fuel transfer carts and pumps are stored in the BDB Storage Building(s).

An evaluation of BDB equipment fuel consumption and required re-fill strategies will be developed including any gasoline required for small miscellaneous equipment. **[Open Item 16]**

Details:

F2.2.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Site specific procedural guidance governing re-fueling strategies will be developed using industry guidance, and will address the monitoring of fuel supplies and consumption in order to initiate refueling activities prior to equipment shutdown. **[Open Item 7]**
F2.2.2 – Identify modifications	*List modifications necessary for phase 2* No modifications are required to provide fueling capabilities during Phase 2.

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F2.2.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* The specifications for local instrumentation for portable diesel powered BDB equipment will include fuel gauges. Monitoring of fuel supplies and consumption in order to initiate refueling activities prior to equipment shutdown will be performed (See Section F2.2.1).

F2.2.4 – Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* The BDB fuel carts, pumps, necessary hoses, fittings, and containers will be protected from seismic events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* The BDB fuel carts, pumps, necessary hoses, fittings, and containers will be protected from flooding events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* The BDB fuel carts, pumps, necessary hoses, fittings, and containers will be protected from severe storms with high wind events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* The BDB fuel carts, pumps, necessary hoses, fittings, and containers will be protected from snow, ice and extreme cold events while stored in the BDB Storage Building(s) or in protected areas of the plant.
High Temperatures	*List how equipment is protected or schedule to protect* The BDB fuel carts, pumps, necessary hoses, fittings, and containers will be protected from high temperature events while stored in the BDB Storage Building(s) or in protected areas of the plant.

Italicized text is part of the NEI standard template and is retained for information purposes.

F2.2.5 – Deployment Conceptual Design (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. The BDB Storage Building(s) will have fuel carts to provide the necessary equipment to transfer fuel from storage tanks to the deployed portable equipment. Equipment for clearing potential obstructions which could inhibit mobility of the fuel carts and fuel transfers is also stored within the protected storage facility. The primary source of fuel oil for portable equipment will be the 550 gallon EDG fuel oil wall tank and the 550 gallon base tank in each of three EDG rooms. Therefore, with two 550 gallon fuel oil tanks in each of three EDG rooms, a combined total of 3300 gallons of fuel oil is available. Fuel can be obtained from the wall tank using each tank's drain valve and gravity fed to suitable fuel containers for transport to BDB equipment. Fuel can be obtained from the base tanks using a portable, 12 VDC fuel pump. Fuel oil can also be removed from the two EDG Underground Diesel Fuel Oil Storage Tanks using a portable, 12 VDC fuel pump assembly. The pump will be used to fill suitable fuel containers.	*Identify modifications* No modifications are required to provide fueling capabilities during Phase 2.	*Identify how the connection is protected* The connection to access the primary fuel supply in the re-fueling strategy are the connections from the drain valves of EDG fuel oil tanks located in the site EDG rooms. These are seismically designed Class I tanks in Class I structures that are protected from the extreme external hazards identified in Section A.1.

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Notes:

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Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0.

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F2. Safety Functions Support (Fuel)	
F2.3 – 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 coping strategy for supplying fuel oil to diesel driven portable equipment, i.e., pumps and generators, is described in Section F2.2 for Phase 2 and is the same for Phase 3. An evaluation of BDB equipment fuel consumption and required re-fill strategies will be developed and will include Phase 3 equipment including any gasoline required for small miscellaneous equipment. The fuel strategy will evaluate the need for additional fuel required from the Regional Response Center or other offsite sources. **[Open Item 16]**	
Details:	
F2.3.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Site specific procedural guidance governing re-fueling strategies will be developed using industry guidance as stated in Section F2.2.1.
F2.3.2 – Identify modifications	*List modifications necessary for phase 2* No modifications are required to provide fueling capabilities during Phase 3.
F2.3.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* There are no key parameters related to fueling of BDB equipment applicable to Phase 3.

F2.3.4 – Deployment Conceptual Design
(Attachment 3 contains Conceptual Sketches)

Strategy	**Modifications**	**Protection of connections**
a. *Identify Strategy including how the equipment will be deployed to the point of use.* Same as Phase 2 as stated in Section F2.2.4.	*Identify modifications* Same as Phase 2 as stated in Section F2.2.4.	*Identify how the connection is protected* Same as Phase 2 as stated in Section F2.2.4.

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F2. Safety Functions Support (Fuel)
F2.3 – PWR Portable Equipment Phase 3
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

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F3. Safety Functions Support (Lighting)

Determine Baseline coping capability with installed coping[7] modifications not including FLEX modifications.

F3.1 – 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.

The FLEX strategies for maintenance and/or support of safety functions involve several elements. One necessary element is maintaining sufficient lighting in areas needed to successfully implement the planned FLEX strategies. Surry Power Station initially relies on emergency lighting installed for FP/Appendix R to perform Phase 1 coping strategy activities. However, Appendix R lighting is powered by battery packs at each light and is rated for only 8 hours. This lighting also does not provide 100% coverage of areas involving FLEX strategy activities including ingress and egress from task areas. In these areas and areas poorly lit, portable lighting and head lamps are available for use. Portable lighting is currently staged throughout the site, mainly for use by the Fire Brigade.

A lighting study will be performed to validate the adequacy of existing lighting and the adequacy and practicality of using portable lighting to perform FLEX strategy actions. **[Open Item 17]**

Details:

F3.1.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* There are no procedures, strategies, or guidelines needed with regard to use or restoration of lighting in Phase 1 of an ELAP/LUHS event. Portable lighting is currently staged throughout the site, mainly for use by the Fire Brigade. The location of these lights will be identified in the FLEX Guidelines. **[Open Item 7]**
F3.1.2 – Identify modifications	*List modifications and describe how they support coping time.* No modifications are planned to provide lighting to support the implementation of Phase 1 FLEX strategies. Additional portable lighting or necessary modifications may be identified in the lighting study to be performed.

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

Italicized text is part of the NEI standard template and is retained for information purposes.

F3.1.3 – Key Parameters	*List instrumentation credited for this coping evaluation phase.* There are no key parameters associated with the lighting systems in any phase of the ELAP/LUHS response.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0	

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F3. Safety Functions Support (Lighting)

F3.2 – 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.

There are three methods of providing light in areas needed to successfully implement Phase 2 FLEX strategies. First, is the continued use of the Appendix R lighting discussed in Section F3.1, however, as previously stated, this lighting is limited to approximately 8 hours. Additionally, the use of portable hand held lighting or head lamps will continue to be available for use in dark or poorly lit areas.

Second, is the use of supplemental lights that will be available as stored BDB equipment. This includes additional small portable sources (such as flashlights and head lamps) for personal uses, as well as larger portable equipment (such as self-powered light plants). The larger lighting equipment would be typically deployed in outside areas to support deployment of BDB pumps and generators. In some cases, BDB equipment will be equipped with their independent lighting sources.

Third, is the restoration of power to various lighting panels in the electrical distribution system. Connections for selected lighting are discussed in Section F1.2.

A lighting study will be performed to validate the adequacy of supplemental lighting and the adequacy and practicality of using portable lighting to perform FLEX strategy actions. **[Open Item 17]**

Details:

F3.2.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Site specific procedural guidance governing lighting strategies will be developed using industry guidance, and will address the operation and placement of supplemental lighting stored in the BDB Storage Building(s). **[Open Item 7]** Procedures for the restoration of power to lighting panels are addressed in Section F1.2.
F3.2.2 – Identify modifications	*List modifications necessary for phase 2.* No modifications to the lighting system are planned. Modifications to facilitate restoration of power to lighting systems are addressed in Section F1.2.

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F3. Safety Functions Support (Lighting)	
F3.2 – PWR Portable Equipment Phase 2	
F3.2.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* There are no key parameters associated with the lighting systems in any phase of the ELAP/LUHS response.
F3.2.4 – Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Supplemental BDB lighting equipment will be protected from seismic events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* Supplemental BDB lighting equipment will be protected from flooding events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Supplemental BDB lighting equipment will be protected from severe storms with high wind events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Supplemental BDB lighting equipment will be protected from snow, ice and extreme cold events while stored in the BDB Storage Building(s) or in protected areas of the plant.
High Temperatures	*List how equipment is protected or schedule to protect* Supplemental BDB lighting equipment will be protected from high temperature events while stored in the BDB Storage Building(s) or in protected areas of the plant.

Italicized text is part of the NEI standard template and is retained for information purposes.

F3.2.5 – Deployment Conceptual Design
(Attachment 3 contains Conceptual Sketches)

Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
Small portable lighting equipment will be distributed as needed from the BDB Storage Building(s). Large portable lighting equipment from a BDB Storage Building(s) would be deployed directly to its point of use by tow vehicles. Some BDB equipment, such as pumps or generators, may have the necessary lighting to operate that equipment incorporated as part of the equipment skid and is, therefore, deployed with the equipment.	No modifications are needed to the site or lighting systems to support FLEX strategy implementation.	The protection of connections does not apply to existing light systems or to the supplemental lighting that may be deployed from storage.

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

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F3. Safety Functions Support (Lighting)

F3.3 – 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.

Lighting to support Phase 3 FLEX strategies is available onsite as discussed in Section F3.2 for Phase 2 activities. No supplemental lighting is required from off-site sources such as the RRC.

Details:

F3.3.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* There are no additional procedures, strategies, or guidance for lighting systems other than those needed for Phase 2. (Refer to Section F3.2.1)
F3.3.2 – Identify modifications	*List modifications necessary for phase 3* No modifications to the lighting system are planned. Modifications to facilitate restoration of power to lighting systems are addressed in the strategies to restore 120 VAC power. (Refer to Section F1.2.2)
F3.3.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* There are no key parameters associated with the lighting systems in any phase of the ELAP/LUHS response.

F3.3.4 – Deployment Conceptual Design
(Attachment 3 contains Conceptual Sketches)

Strategy	Modifications	Protection of connections
Identify Strategy including how the equipment will be deployed to the point of use. Refer to Section F3.2.5.	*Identify modifications* Refer to Section F3.2.5.	*Identify how the connection is protected* Refer to Section F3.2.5.

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F3. Safety Functions Support (Lighting)
F3.3 – PWR Portable Equipment Phase 3
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

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F4. Safety Functions Support (Communications)

Determine Baseline coping capability with installed coping[8] modifications not including FLEX modifications.

F4.1 – 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.

The FLEX strategies for maintenance and/or support of safety functions involve several elements. One element is maintaining necessary communication to support interaction between personnel in the plant and those providing overall command and control in order to successfully implement the planned FLEX strategy. Normal communications may be lost or severely hampered during an ELAP. Hand-held portable radios would be limited to line-of-sight operation due to the loss of repeater stations. Sound-powered phones, which do not require power to operate, would be available in many areas of the plant.

As described in a letter dated October 29, 2012 (Reference Letter S/N 12-208F), a communications study will be performed in accordance with the commitments made in response to Recommendation 9.3 of the 10 CFR 50.54(f) letter dated March 12, 2012. This study evaluated the adequacy of the communications equipment available after the ELAP/LUHS event and determined any additional equipment or modifications needed to implement the Phase 1 FLEX strategies. The results of this study will be used to develop the communication requirements necessary to support implementation of FLEX strategies. A description of these requirements will be provided in a supplement to this submittal provided at a later date. **[Open Item 18]**

Details:

F4.1.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Any communications related procedures, strategies, and/or guidelines needed to support implementation of the Phase 1 coping strategies will be identified and developed at a later date.
F4.1.2 – Identify modifications	*List modifications and describe how they support coping time.* Any communications related modifications needed to support the implementation of the Phase 1 coping strategy will be identified at a later date.

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

Italicized text is part of the NEI standard template and is retained for information purposes.

F4.1.3 – Key Parameters	*List instrumentation credited for this coping evaluation phase.* No key parameters are credited for communications during Phase 1.

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

Virginia Electric and Power Company Letter S/N 12-208F, David A. Heacock to NRC Document Control Desk, "Response to Communications Aspects of Recommendation 9.3 for Emergency Preparedness Programs," dated October 29, 2012

Italicized text is part of the NEI standard template and is retained for information purposes.

F4. Safety Functions Support (Communications)

F4.2 – 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.

Communications equipment available in Phase 1 of an ELAP event will continue to be available for Phase 2 activities. Hand-held radio battery life is approximately 14-18 hours.

Phase 2 BDB equipment is used to re-power the various vital buses using portable DGs (120/240V and 480V) as discussed in Section F1.2. Once AC power is supplied to the 120 VAC vital buses, partial plant communications would be restored. Additional (supplemental) radios and satellite phones will be stored in BDB Storage Building(s) and will be fully charged and available for use.

A communications study will be performed as stated in Section F4.1. This study will determine the adequacy of the communications equipment available after the ELAP event (radios and sound-powered phones) and will include the equipment available as a result of the re-powering of the 120 VAC vital buses. The study will determine any additional equipment or modifications needed to support the implementation of Phase 2 FLEX strategies. The result of this study will be provided at a later date. **[Open Item 18]**

Details:

F4.2.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Any communications related procedures, strategies, and/or guidelines needed to support implementation of the Phase 2 coping strategies will be identified and developed at a later date.
F4.2.2 – Identify modifications	*List modifications and describe how they support coping time.* Any communications related modifications needed to support the implementation of the Phase 2 coping strategy will be identified at a later date.
F4.2.3 – Key Parameters	*List instrumentation credited for this coping evaluation phase.* No key parameters are credited for communications during Phase 2.

Italicized text is part of the NEI standard template and is retained for information purposes.

F4.2.4 – Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Supplemental BDB communications equipment will be protected from seismic events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* Supplemental BDB communications equipment will be protected from flooding events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Supplemental BDB communications equipment will be protected from severe storms with high wind events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Supplemental BDB communications equipment will be protected from snow, ice and extreme cold events while stored in the BDB Storage Building(s) or in protected areas of the plant.
High Temperatures	*List how equipment is protected or schedule to protect* Supplemental BDB communications equipment will be protected from high temperature events while stored in the BDB Storage Building(s) or in protected areas of the plant.

F4.2.5 – Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. Supplemental communications equipment will be deployed/distributed from the BDB Storage Building(s) directly to its point of use.	*Identify modifications* Any communications related modifications needed to support the implementation of the Phase 2 coping strategy will be identified at a later date.	*Identify how the connection is protected* The protection of connections does not apply to existing or to supplemental communication equipment.

Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

Italicized text is part of the NEI standard template and is retained for information purposes.

F4. Safety Functions Support (Communications)

F4.3 – 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.

Onsite communications equipment available in Phase 1 and 2 of an ELAP event will continue to be available for Phase 3 activities. No additional communications equipment from offsite sources is anticipated.

As stated in Section F3.1, a communications study will be performed in conjunction with the commitments made in response to Recommendation 9.3 of the 10 CFR 50.54(f) letter dated March 12, 2012. This study will determine the adequacy of the communications equipment available after the ELAP event and determine any additional equipment or modifications needed to implement the Phase 1and Phase 2 FLEX strategies. The study also addresses communication capability to offsite persons and emergency response organizations. The study will address the ability to communicate with the RRC, offsite suppliers (such as fuel), and with transportation vehicles used to bring equipment and supplies to the site. This capability is required to successfully coordinate the receipt of Phase 3 equipment as required. (Refer to Section A.9) The result of this study will be provided at a later date. **[Open Item 18]**

Details:

F4.3.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Any communications related procedures, strategies, and/or guidelines needed to support receipt of equipment and/or supplies from offsite locations (Phase 3) will be identified by the communications study and developed at a later date.
F4.3.2 – Identify modifications	*List modifications and describe how they support coping time.* Any communications related modifications needed to support receipt of equipment and/or supplies from offsite locations (Phase 3) will be identified by the communications study.
F4.3.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* No key parameters are credited for communications during Phase 3.

Italicized text is part of the NEI standard template and is retained for information purposes.

F4.3.4 – Deployment Conceptual Design (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. Any communications related equipment identified by the communications study as needed to support receipt of equipment and/or supplies from offsite locations (Phase 3) will be deployed/ distributed from the BDB Storage Building(s) directly to its point of use.	*Identify modifications* Any communications related modifications needed to support receipt of equipment and/or supplies from offsite locations (Phase 3) will be identified by the communications study.	*Identify how the connection is protected* The protection of connections does not apply to existing or to supplemental communication equipment.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0		

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F5. Safety Functions Support (Ventilation)

Determine Baseline coping capability with installed coping[9] modifications not including FLEX modifications.

F5.1 – 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.

The FLEX strategies for maintenance and/or support of safety functions involve several elements. One element is to ensure that ventilation, heating, and cooling is adequate to maintain acceptable environmental conditions for equipment operation and personnel habitability. Details of the ventilation strategy are under development and will conform to the guidance given in NEI 12-06. The details of this strategy will be provided at a later date. **[Open Item 14]**

Details:

F5.1.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* Any ventilation related procedures, strategies, and/or guidelines needed to support implementation of the Phase 1 coping strategies will be identified and developed at a later date.
F5.1.2 – Identify modifications	*List modifications and describe how they support coping time.* Any ventilation related modifications needed to support the implementation of the Phase 1 coping strategy will be identified at a later date.
F5.1.3 – Key Parameters	*List instrumentation credited for this coping evaluation phase.* Key ventilation parameters will be identified at a later date.

Notes:
The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

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

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F5. Safety Functions Support (Ventilation)	
F5.2 – 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. Details of the ventilation strategy are under development and will conform to the guidance given in NEI 12-06. The details of this strategy will be provided at a later date. **[Open Item 14]**	
Details:	
F5.2.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Any ventilation related procedures, strategies, and/or guidelines needed to support implementation of the Phase 2 coping strategies will be identified and developed at a later date.
F5.2.2 – Identify modifications	*List modifications necessary for phase 2* Any ventilation related modifications needed to support the implementation of the Phase 2 coping strategies will be identified at a later date.
F5.2.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* Key ventilation parameters will be identified at a later date.
F5.2.4 – Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Supplemental BDB ventilation equipment will be protected from seismic events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* Supplemental BDB ventilation equipment will be protected from flooding events while stored in the BDB Storage Building(s) or in protected areas of the plant.

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F5. Safety Functions Support (Ventilation)	
F5.2 – PWR Portable Equipment Phase 2	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Supplemental BDB ventilation equipment will be protected from severe storms with high wind events while stored in the BDB Storage Building(s) or in protected areas of the plant.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Supplemental BDB ventilation equipment will be protected from snow, ice and extreme cold events while stored in the BDB Storage Building(s) or in protected areas of the plant.
High Temperatures	*List how equipment is protected or schedule to protect* Supplemental BDB ventilation equipment will be protected from high temperature events while stored in the BDB Storage Building(s) or in protected areas of the plant.

F5.2.5 – Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. The deployment strategy for equipment needed to maintain acceptable environmental conditions for equipment operation and personnel habitability will be developed in accordance with the guidance of NEI 12-06 and will be provided at a later date after the ventilation needs are identified. **[Open Item 14]**	*Identify modifications* Any ventilation related modifications needed to support the implementation of the Phase 2 coping strategies will be identified at a later date.	*Identify how the connection is protected* Any ventilation related connections (and their protections requirements) needed to support the implementation of the Phase 2 coping strategies will be identified at a later date.

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F5. Safety Functions Support (Ventilation)
F5.2 – PWR Portable Equipment Phase 2
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

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F5. Safety Functions Support (Ventilation)

F5.3 – 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.

Details of the ventilation strategy are under development and will conform to the guidance given in NEI 12-06. The details of this strategy will be provided at a later date. **[Open Item 14]**

Details:

F5.3.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Any ventilation related procedures, strategies, and/or guidelines needed to support implementation of the Phase 3 coping strategies will be identified and developed at a later date.
F5.3.2 – Identify modifications	*List modifications necessary for phase 3* Any ventilation related modifications needed to support the implementation of the Phase 3 coping strategies will be identified at a later date.
F5.3.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* Key ventilation parameters will be identified at a later date.

F5.3.4 – Deployment Conceptual Design
(Attachment 3 contains Conceptual Sketches)

Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. The deployment strategy for equipment needed to maintain acceptable environmental conditions for equipment operation and personnel habitability will be developed in accordance with the guidance of NEI 12-06 and will	*Identify modifications* Any ventilation related modifications needed to support the implementation of the Phase 3 coping strategies will be identified at a later date.	*Identify how the connection is protected* Any ventilation related connections (and their protections requirements) needed to support the implementation of the Phase 3 coping strategies will be identified at a later date.

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F5. Safety Functions Support (Ventilation)		
F5.3 – PWR Portable Equipment Phase 3		
be provided at a later date after the ventilation needs are identified. **[Open Item 14]**		
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0		

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F6. Safety Functions Support (Accessibility)

Determine Baseline coping capability with installed coping[10] modifications not including FLEX modifications.

F6.1 – 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.

The FLEX strategies for maintenance and/or support of safety functions involve several elements. One element is the ability to access site areas required for successful implementation of the planned FLEX strategy.

The potential impairments to required access are: 1) doors and gates, and 2) site debris blocking personnel or equipment access. The coping strategy to maintain site accessibility through doors and gates is applicable to all phases of the FLEX coping strategies, but is immediately required as part of Phase 1.

Doors and gates serve a variety of barrier functions on the site. One primary function is security and is discussed below. However, other barrier functions include fire, flood, radiation, ventilation, tornado, and high-energy line break. As barriers, these doors and gates are typically administratively controlled to maintain their function as barriers during normal operations. Following an ELAP event, FLEX coping strategies require the routing of hoses and cables to be run through various barriers in order to connect BDB equipment to station fluid and electric systems. For this reason, certain barriers (gates and doors) will be opened and remain open. This violation of normal administrative controls is acknowledged and is acceptable during the implementation of FLEX coping strategies.

The security doors and gates of concern are those barriers that rely on electric power to operate opening and/or locking mechanisms. The ability to open doors for ingress and egress, ventilation, or temporary cables/hoses routing is necessary to implement the FLEX coping strategies. The Security force will initiate an access contingency upon loss of the Security Diesel and all AC/DC power as part of the Security Plan. Access to the Owner Controlled Area, site Protected Area, and vital areas within the plant will be controlled under this access contingency.

Vehicle access to the Protected Area is via the double gated sally-port at the Security Building. As part of the security access contingency, the sally-port gates will be manually controlled to allow delivery of BDB equipment (e.g., generators, pumps) and other vehicles such as debris removal

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

equipment into the Protected Area.

A significant impairment to access may be debris on site resulting from seismic, high wind (tornado), or flooding events. This is addressed in Section F6.2 as part of the Phase 2 coping strategy.

Details:	
F6.1.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* An access contingency plan within the Surry Security Plan for loss of power situations ensures the ability of plant personnel and BDB equipment to access areas inside the plant structures as well as access from areas outside the site Protected Area to implement the planned FLEX strategies.
F6.1.2 – Identify modifications	*List modifications and describe how they support coping time.* No modifications to ensure site accessibility are planned.
F6.1.3 – Key Parameters	*List instrumentation credited for this coping evaluation phase.* There are no key parameters associated with the site accessibility in any phase of the ELAP/LUHS response.

Notes:

The information provided in this section is based on the following reference(s):

Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0

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F6. Safety Functions Support (Accessibility)

F6.2 – 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.

The potential impairments to required access are: 1) doors and gates, and 2) site debris blocking personnel or equipment access. The coping strategy to maintain site accessibility through doors and gates is applicable to all phases of the FLEX coping strategies. The deployment of onsite BDB equipment to implement coping strategies beyond the initial plant capabilities (Phase 1) requires that pathways between the BDB Storage Building(s) and various deployment locations be clear of debris resulting from seismic, high wind (tornado), or flooding events.

Preferred travel pathways will be determined using the guidance contained in NEI 12-06. The pathways will attempt to avoid areas with trees, power lines, and other potential obstructions and will consider the potential for soil liquefaction. **[Open Item 19]** However, debris can still interfere with these preferred travel paths. Debris removal equipment will be kept in the BDB Storage Building(s) so that it is protected from the severe storm, earthquake and flood hazards. Therefore, the debris removal equipment remains functional and deployable to clear obstructions from the travel pathways to the BDB equipment's deployed location(s).

The stored BDB equipment includes tow vehicles (small tractors) equipped with front end buckets and rear tow connections in order to move or remove debris from the needed travel paths. A front end loader will also be available to deal with more significant debris conditions.

Details:	
F6.2.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* Site specific procedural guidance governing debris removal strategies will be developed to direct activities to ensure that travel pathways are cleared as necessary for deployment of BDB equipment. **[Open Item 7]**
F6.2.2 – Identify modifications	*List modifications necessary for phase 2.* No modifications to ensure site accessibility are planned.

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F6.2.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* There are no key parameters associated with the site accessibility in any phase of the ELAP/LUHS response.

F6.2.4 – Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* The BDB equipment for removing debris (tractors and front-end loader) will be protected from seismic events while stored in the BDB Storage Building(s).
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* The BDB equipment for removing debris (tractors and front-end loader) will be protected from flooding events while stored in the BDB Storage Building(s).
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* The BDB equipment for removing debris (tractors and front-end loader) will be protected from severe storms with high wind events while stored in the BDB Storage Building(s).
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* The BDB equipment for removing debris (tractors and front-end loader) will be protected from snow, ice and extreme cold events while stored in BDB Storage Building(s).
High Temperatures	*List how equipment is protected or schedule to protect* The BDB equipment for removing debris (tractors and front-end loader) will be protected from high temperature events while stored in the BDB Storage Building(s).

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F6.2.5 – Deployment Conceptual Design (Attachment 3 contains Conceptual Sketches)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
Site accessibility is necessary for the successful deployment of BDB equipment to respond to an ELAP/LUHS event. Security procedures contain contingencies to provide access through site security barriers and debris removal equipment is available to clear travel pathways as needed.	No modifications are needed to support site accessibility for the implementation of the planned FLEX strategy.	The protection of connections is not applicable to the site accessibility strategy.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0		

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F6. Safety Functions Support (Accessibility)
F6.3 – 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 potential impairments to required access are: 1) door and gate barriers, and 2) site debris blocking personnel or equipment access. The coping strategy to maintain site accessibility through gates and doors is applicable to all phases of the FLEX strategy and is discussed in Section F6.1. Debris removal is addressed in the deployment of the on-site Phase 2 BDB equipment and is discussed in Section F6.2. Phase 3 involves the receipt of equipment from offsite sources including the RRC and various commodities such as fuel and supplies. Transportation of these deliveries can be through airlift or via ground transportation. Debris removal for the pathway between the site and the RRC receiving location and from the various plant access routes may be required. The same debris removal equipment used for on-site pathways would be used. Evaluation and development of coordination with the RRC will be performed and document as described in Section A.9.

Details:	
F6.3.1 – Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* The procedural guidance developed for Phase 2 will be applicable to debris removal activities in Phase 3.
F6.3.2 – Identify modifications	*List modifications necessary for phase 3.* No modifications to ensure site accessibility are planned.
F6.3.3 – Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* There are no key parameters associated with the site accessibility in any phase of the ELAP/LUHS response.

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F6.3.4 – Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use. Site accessibility is necessary for the successful deployment of BDB equipment to respond to an ELAP/LUHS event. Security procedures contain contingencies to provide access through site security barriers and debris removal equipment is available to clear travel pathways as needed.	*Identify modifications.* No modifications are needed to support site accessibility for the implementation of the planned FLEX strategy.	*Identify how the connection is protected.* The protection of connections is not applicable to the site accessibility strategy.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0011, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0		

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Table 1 – PWR Portable Equipment Phase 2[1] [Open Item 20]

Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment **[Open Item 4]**	SFP	Instrumentation	Accessibility		Maintenance / Preventive Maintenance requirements
BDB High Capacity diesel-driven pump (2) and assoc. hoses and fittings	**X**		**X**			1200 gpm[4]	Will follow EPRI template requirements
BDB AFW pump (4) and assoc. hoses and fittings	**X**					300 gpm[4]	Will follow EPRI template requirements
120/240V AC generators (4)[3] and associated cables, connectors and switchgear				**X**		10 kW[5]	Will follow EPRI template requirements
120/240V AC generators (4)[2] and associated cables, connectors and switchgear (to power support equipment)					**X**	10 kW[5]	Will follow EPRI template requirements
480V AC generators (2)[3] and associated cables, connectors and switchgear (to re-power battery chargers, inverters, and Vital Buses)				**X**		300-350 kW[5]	Will follow EPRI template requirements
Portable boric acid batching tank (4)	**X**						Will follow EPRI template requirements

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Table 1 – PWR Portable Equipment Phase 2[1] [Open Item 20]

Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment **[Open Item 4]**	SFP	Instrumentation	Accessibility		Maintenance / Preventive Maintenance requirements
Light plants (4)[2]					**X**		Will follow EPRI template requirements
Front end loader (2)[2]					**X**		Will follow EPRI template requirements
Tow vehicles (2)[2]					**X**		Will follow EPRI template requirements
Hose trailer or utility vehicle (2)[2]					**X**		Will follow EPRI template requirements
Fans / blowers / heaters (2 sets)[2]					**X**		Will follow EPRI template requirements
Air compressors (4)[2]					**X**		Will follow EPRI template requirements
Fuel carts with transfer pumps (2)[2]					**X**		Will follow EPRI template requirements
Communications equipment (2 sets)[6]					**X**		Will follow EPRI template requirements

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Table 1 – PWR Portable Equipment Phase 2[1] [Open Item 20]							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment **[Open Item 4]**	SFP	Instrumentation	Accessibility		Maintenance / Preventive Maintenance requirements
Misc. debris removal equipment (2 sets)[2]					**X**		Will follow EPRI template requirements
Misc. Support Equipment (2 sets)[2]					**X**		Will follow EPRI template requirements
Cables for 4160 VAC generator connections (4 sets)				**X**	**X**		

Table 1 Notes:

1. The number of storage buildings and associated design requirements has not been determined **[Open Item 6]**. For the purposes of this table, two storage buildings have been assumed.
2. Support equipment. Not required to meet N+1.
3. 480V AC generators are an alternate strategy to the 120/240V AC generators. Therefore, only N is required.
4. Preliminary performance criteria. Final performance criteria will be determined by the hydraulic analyses performed in accordance with the design process **[Open Item 5]**.
5. Preliminary performance criteria. Final performance criteria will be determined by the electrical loading analyses performed in accordance with the design process **[Open Item 15]**.
6. Equipment purchased in response to the results of the study performed for Recommendation 9.3 of the 10 CFR 50.54(f) letter dated March 12, 2012.

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Table 2 - PWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment **[Open Item 4]**	SFP	Instrumentation	Accessibility		
BDB RCS Injection pump (2) and assoc. hoses and fittings	**X**					40 gpm	1, 2
4 kV generators (2) and associated cables, connectors and switchgear	**X**			**X**		1.6-2 MW	3

Table 2 Notes:

1. Pumps will be brought from the RRC beginning at 26 hours. RCS injection is not required until 33 hours into the event.
2. Preliminary performance criteria. Final performance criteria will be determined by the hydraulic analyses performed in accordance with the design process **[Open Item 5]**. RRC equipment will meet the required performance criteria.
3. Preliminary performance criteria. Final performance criteria will be determined by the electrical loading analyses performed in accordance with the design process **[Open Item 15]**. RRC equipment will meet the required performance criteria.

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Table 3 - Phase 3 Response Equipment/Commodities	
Item	**Notes**
Radiation Protection Equipment • Survey instruments • Dosimetry • Off-site monitoring/sampling	No radiation protection equipment from offsite (Phase 3) is anticipated.
Commodities • Food • Potable water	No food/water from offsite (Phase 3) is anticipated.
Fuel Requirements	An evaluation of all BDB equipment fuel consumption and required re-fill strategies will be developed and will include Phase 3 equipment. The fuel strategy will evaluate the need for additional fuel required from the RRC or other offsite sources. **[Open item 16]**
Heavy Equipment • Transportation equipment • Debris clearing equipment	From Table 1, transportation and debris clearing equipment is available onsite (Phase 2).

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Attachment 1A
Sequence of Events Timeline

Action Item	Elapsed Time	Action	Time Constraint Y/N	Remarks/Applicability
	0	Event Starts	NA	Plant @ 100% power [a]
1	15 sec	TDAFW pump starts. Verify AFW flow.	N	Original design basis for SBO event. 50 min to SG dryout. [a]
2	15 sec	Loss of all AC power procedure is entered	N	Standard event required response. [a]
3	15 min	Verify RCS Isolation	N	Establishes long term inventory in the RCS. [a]
4	45 min	ELAP Declared	N/A	
5	50 min	Control SG PORVs and AFW flow	N	On-going action for cooldown and decay heat removal – operations personnel remain stationed. [a]
6	**75 min**	**DC load stripping completed**	**Y**	**Starts at 45 min and completed in 30 min to provide a battery life of 14 hours.**
7	**2.3 hrs**	**Control AFW flowrate to prevent SG overfill**	**Y**	**2.3 hrs to SG overfill.**
8	**4.4 hrs**	**Align ECMT to TDAFW pump suction**	**Y**	**Minimum ECST level is reached at 4.4 hours.**
9	6 hrs	Augmented Staff begin to Arrive on Site	N/A	Reference NEI 12-01
10	**13.1 hrs**	**Initiate BDB High Capacity pump flow to refill the ECST**	**Y**	**Depletion of ECST volume plus ECMT volume (13.1 hours).**

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Action Item	Elapsed Time	Action	Time Constraint Y/N	Remarks/Applicability
11	**14 hrs**	**Repower 120 VAC vital buses[b]**	**Y**	**Batteries depleted in 14 hours**
12	12 to 24 hrs	Deploy BDB AFW pumps	N	BDB AFW pumps are deployed in standby as a backup to the TDAFW pump. This is not a time critical action since the TDAFW pump will continue to function.
13	~26 hrs	Additional BDB RCS Injection pump arrives from RRC[c]	N	24 hours after request.
14	**33 hrs**	**Initiate RCS injection for RCS inventory make-up /reactivity control using the BDB RCS Injection pump**	**Y**	**33 hours (RCS Inventory Make-up: to prevent loss of natural circulation) / Reactivity control: Not required for the first 72 hours if SG pressure >300 psig.**
15	**51 hrs**	**Initiate makeup flow to the SFP**	**Y**	**12 hours to boiling / 51 hours to water level at 10 ft. above fuel.**
16	**> 7 days**	**Reduce pressure and temperature in Containment**	**Y**	**Prior to affecting the function of key parameter monitoring instrumentation.**

Notes:

[a] Previously evaluated in response to 10 CFR 50.63 and in accordance with existing procedures.

[b] The primary strategy is to use the 120V generators. The 480V generator for each unit is an alternate to the 120V generators.

Attachment 1B
NSSS Significant Reference Analysis Deviation Table

Item	Parameter of interest	WCAP value (WCAP-17601-P August 2012 Revision 0)	WCAP page	Plant applied value	Gap and discussion
1	Applicable computer code for NSSS analysis	NOTRUMP	Section 4.1.1.1	NOTRUMP Hand Calculation	Section 5.3 of WCAP-17601 provided results to demonstrate that the Reference Case results are bounding for all Westinghouse plant types.
2	RCS leakage	1 gpm	Section 4.2.1	1 gpm	No deviation.
3	RCP leakage	21 gpm/RCP	Section 4.2.2 Section 4.4.1 Section 5.2.1 Table 5.2.2-1	<21 gpm/RCP	A leakrate of 21 gpm from Westinghouse RCP seals is used in deterministic analysis to show compliance with 10 CFR 50.63 (SBO) as stated in Section 4.4.1 of WCAP-17601. Surry RCP seals have been upgraded to Flowserve N-9000 seals, including the abeyance seal feature, which reduces seal leakage compared to Westinghouse RCP seals, extending the time to loss of natural circulation and core uncovery from the Reference Plant Case.

Attachment 1B
NSSS Significant Reference Analysis Deviation Table

Item	Parameter of interest	WCAP value (WCAP-17601-P August 2012 Revision 0)	WCAP page	Plant applied value	Gap and discussion
4	Number of SGs used to establish natural circulation	Four - Symmetric	Section 4.1.1.1 Section 4.2.1	Three - Symmetric	Section 5.3 of WCAP-17601 provided results to demonstrate that the Reference Case results are bounding for all Westinghouse plant types.
5	Total Turbine Driven AFW pump flow	Adequate to establish and maintain NR level	Section 4.2.1 Section 5.2.1 Table 5.2.2-1	Minimum flow is > 636 gpm to three SGs at 1100 psia	Adequate to establish and maintain SG NR water level. Minimum delivered AFW capability exceeds AFW requirements for decay heat removal and RCS cooldown.
6	Start cooldown and cooldown rate	2 hours @ 70°F/hr	Section 5.2.1 Table 5.2.2-1	2 hours @ < 100°F/hr to a SG pressure of 300 psig	Section 5.3 of WCAP-17601 provided results to demonstrate that the Reference Case results are bounding for all Westinghouse plant types. The minimum SG pressure is consistent with the existing EOP setpoint to prevent safety injection accumulator nitrogen gas from entering the RCS.

Attachment 2A
Milestone Schedule
Surry Power Station - Full Compliance Date: May 2015

TASK	Feb-13	Mar-13	Apr-13	May-13	June 13	July-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	June-14	July-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	June-15	July-15	Aug-15	Sep-15	Oct-15	Nov-15
6-month Status Update							■						■						■						■									
Submit Integrated Plan	■																																	
Develop Strategies	■	■	■	■	■	■																												
Develop Mods.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																			
Implement Mods.					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■														
Develop Training Plan			■	■	■	■	■	■	■	■	■	■	■	■	■																			
Implement Training												■	■	■	■	■	■	■	■															
Issue FSGs																				■														
Develop Strategies/ Contract with RRC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																			
Purchase Equipment												■	■																					
Procure Equipment																■	■	■	■															
Create Maint. Procs.												■	■	■	■	■	■	■	■															
Unit 1 Outage Imp.									■																		■							
Unit 2 Outage Imp.															■																		■	

Attachment 2B
Open Items

Open Item #	Description	Completion Schedule[1]
1	Verify response times listed in timeline and perform staffing assessment.	December, 2014
2	Preliminary analyses have been performed to determine the Class 1E battery life based on implementation of load stripping actions. The final battery life duration will be provided when the analyses are completed.	June, 2013
3	Preliminary analyses have been performed to determine the time to steam generator overfill without operator action to reduce AFW flow, time to steam generator dryout without AFW flow, and time to depletion of the useable volume of the ECST and ECMT. The final durations will be provided when the analyses are completed.	June, 2013
4	The Phase 3 coping strategy to maintain containment integrity is under development. Methods to monitor and evaluate containment conditions and depressurize/cool containment, if necessary, will be provided in a future update.	December, 2013
5	Analyses will be performed to develop fluid components performance requirements and confirm fluid hydraulic-related strategy objectives can be met.	September, 2013
6	A study is in progress to determine the design features, site location(s), and number of equipment storage facilities. The final design for BDB equipment storage will be based on the guidance contained in NEI 12-06, Section 11.3, Equipment Storage. A supplement to this submittal will be provided with the results of the equipment storage study.	June, 2013

Attachment 2B
Open Items

Open Item #	Description	Completion Schedule[1]
7	FSGs will be developed in accordance with PWROG guidance. Existing procedures will be revised as necessary to implement FSGs.	See Milestone Schedule
8	EPRI guidance documents will be used to develop periodic testing and preventative maintenance procedures for BDB equipment. Procedures will be developed to manage unavailability of equipment such that risk to mitigating strategy capability is minimized.	December, 2014
9	An overall program document will be developed to maintain the FLEX strategies and their bases, and provide configuration control and change management for the FLEX Program.	December, 2014
10	The Dominion Nuclear Training Program will be revised to assure personnel proficiency in the mitigation of BDB events is developed and maintained. These programs and controls will be developed and implemented in accordance with the SAT.	December, 2014
11	Plant modifications will be completed for permanent plant changes required for implementation of FLEX strategies.	See Milestone Schedule

Attachment 2B
Open Items

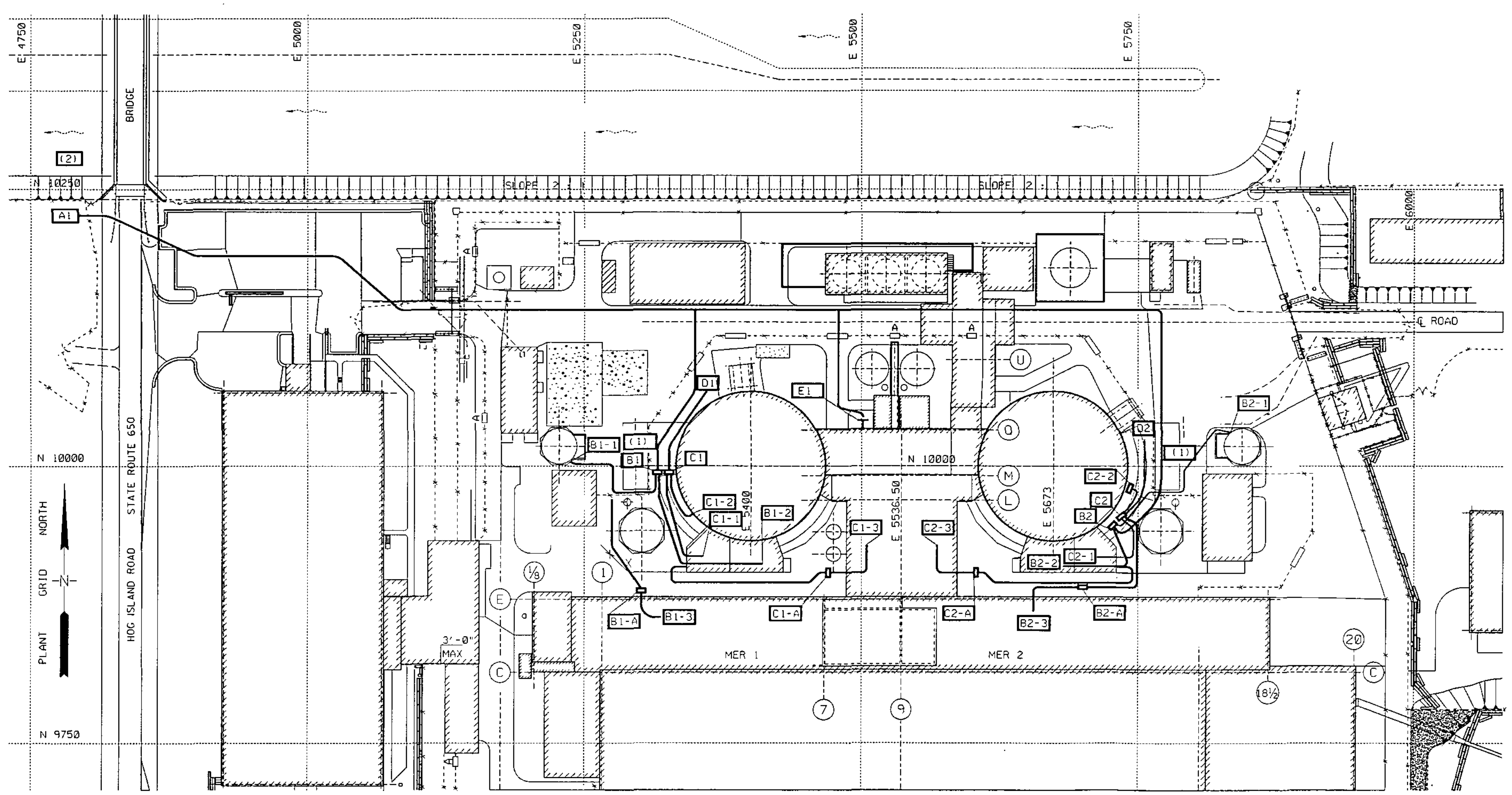
Open Item #	Description	Completion Schedule[1]
12	The following actions will be completed to qualify the ECMT as a source of water to the TDAFW pump in response to an ELAP/LUHS event: (1) Upgrade the piping system from the ECMT to the TDAFW pump suction to Seismic Category I (2) Modify the TDAFW pump discharge piping to install local AFW flowrate indication (3) Confirm adequate TDAFW pump NPSH with flow from the ECMT through the idle AFW booster pumps	December, 2013
13	Complete the evaluation of TDAFW pump long term operation with </= 290 psig inlet steam pressure.	December, 2013
14	Details of the ventilation strategy are under development and will conform to the guidance given in NEI 12-06. The details of this strategy will be provided at a later date.	September, 2013
15	Analyses will be performed to develop electrical components performance requirements and confirm electrical loading-related strategy objectives can be met.	September, 2013
16	An evaluation of all BDB equipment fuel consumption and required re-fill strategies will be developed including any gasoline required for small miscellaneous equipment.	June, 2014
17	A lighting study will be performed to validate the adequacy of supplemental lighting and the adequacy and practicality of using portable lighting to perform FLEX strategy actions.	June, 2014

Attachment 2B
Open Items

Open Item #	Description	Completion Schedule[1]
18	A communications study will be performed in accordance with the commitments made in response to Recommendation 9.3 of the 10 CFR 50.54(f) letter dated March 12, 2012 in Dominion letter S/N 12-208F dated October 29, 2012.	Consistent with Rec 9.3 commitment dates
19	Preferred travel pathways will be determined using the guidance contained in NEI 12-06. The pathways will attempt to avoid areas with trees, power lines, and other potential obstructions and will consider the potential for soil liquefaction.	June, 2014
20	The equipment listed in Table 1 will be procured.	June, 2014

[1]The completion status of open items, or any necessary changes to the completion schedule dates, will be provided in the planned 6-month status reports submitted in accordance with Order EA-12-049, Condition C.2.

Attachment 3
Conceptual Sketches



LEDGEND

A1 U1 BDB HIGH CAPACITY PUMP

B1 U1 BDB AFW PUMP
B1-A U1 BDB AFW PUMP (ALTERNATE LOCATION)

B2 U2 BDB AFW PUMP
B2-A U2 BDB AFW PUMP (ALTERNATE LOCATION)

C1 U1 BDB RCS INJECTION PUMP
C1-A U1 BDB RCS INJECTION PUMP (ALTERNATE LOCATION)

C2 U2 BDB RCS INJECTION PUMP
C2-A U2 BDB RCS INJECTION PUMP (ALTERNATE LOCATION)

B1-1 U1 BDB AFW PUMP SUCTION (ECST)
B1-2 U1 PRIMARY BDB AFW PUMP DISCHARGE (AFW HEADER)
B1-3 U1 ALTERNATE BDB AFW PUMP DISCHARGE (MAIN FEEDWATER LINES MER 1)

B2-1 U2 BDB AFW PUMP SUCTION (ECST)
B2-2 U2 PRIMARY BDB AFW PUMP DISCHARGE (AFW HEADER)
B2-3 U2 ALTERNATE BDB AFW PUMP DISCHARGE (MAIN FEEDWATER LINES MER 2)

C1-1 U1 BDB RCS INJECTION PUMP SUCTION (RWST)
C1-2 U1 PRIMARY BDB RCS INJECTION PUMP DISCHARGE (LHSI TO HOT LEG)
C1-3 U1 ALTERNATE RCS INJECTION PUMP DISCHARGE (CH PUMP DISCHARGE-AB 2)

C2-1 U2 BDB RCS INJECTION PUMP SUCTION (RWST)
C2-2 U2 PRIMARY BDB RCS INJECTION PUMP DISCHARGE (LHSI TO HOT LEG)
C2-3 U2 ALTERNATE RCS INJECTION PUMP DISCHARGE (CH PUMP DISCHARGE-AB 2)

D1 U1 BDB PORTABLE BATCH TANK
D2 U2 BDB PORTABLE BATCH TANK

E1 PRIMARY BDB SFP FILL

ADDITIONAL WATER SOURCES

(1) U1/U2 EMERGENCY CONDENSATE MAKEUP TANK (ECMT)
(2) DISCHARGE CANAL (JAMES RIVER)

SCALE
50 25 0 50 100

FIGURE 1
BDB MECHANICAL EQUIPMENT AND HOSE LAYOUT
SURRY POWER STATION

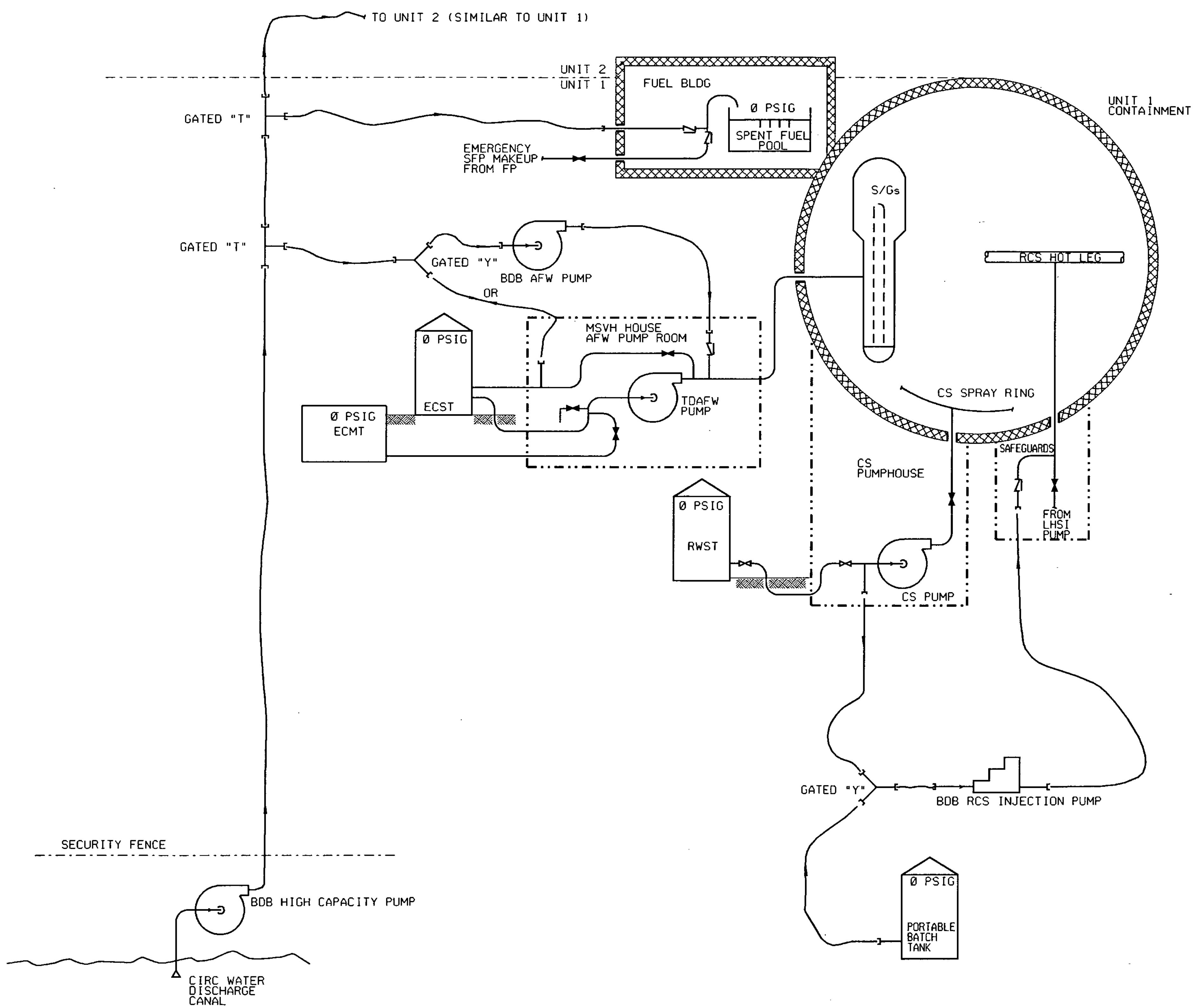


FIGURE 2
BDB FLEX STRATEGY PRIMARY MECHANICAL CONNECTONS
FLOW DIAGRAM
SURRY POWER STATION

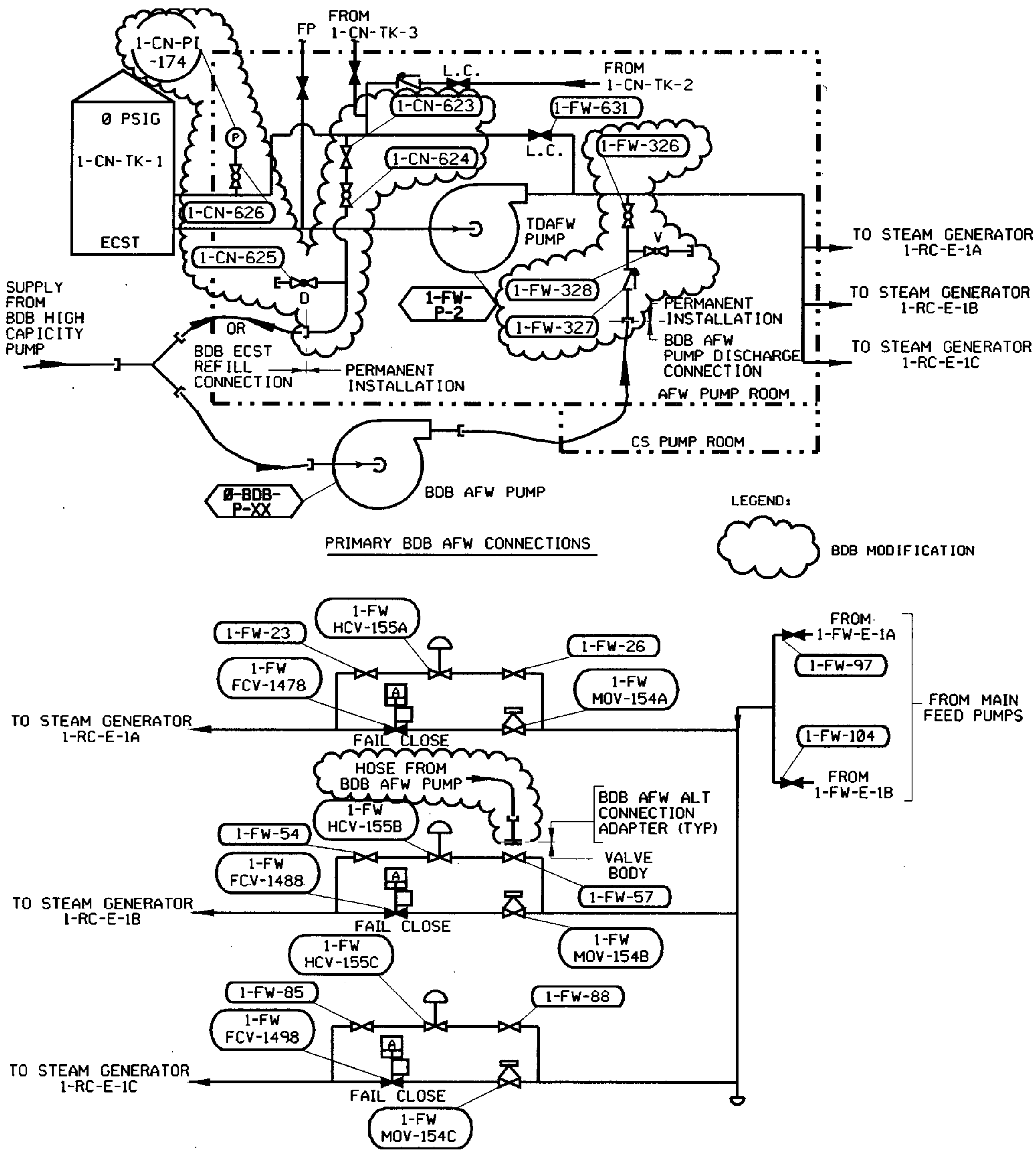


FIGURE 3
CORE COOLING AND DECAY HEAT REMOVAL
-PRIMARY AND ALTERNATE MECHANICAL CONNECTIONS-
SURRY POWER STATION

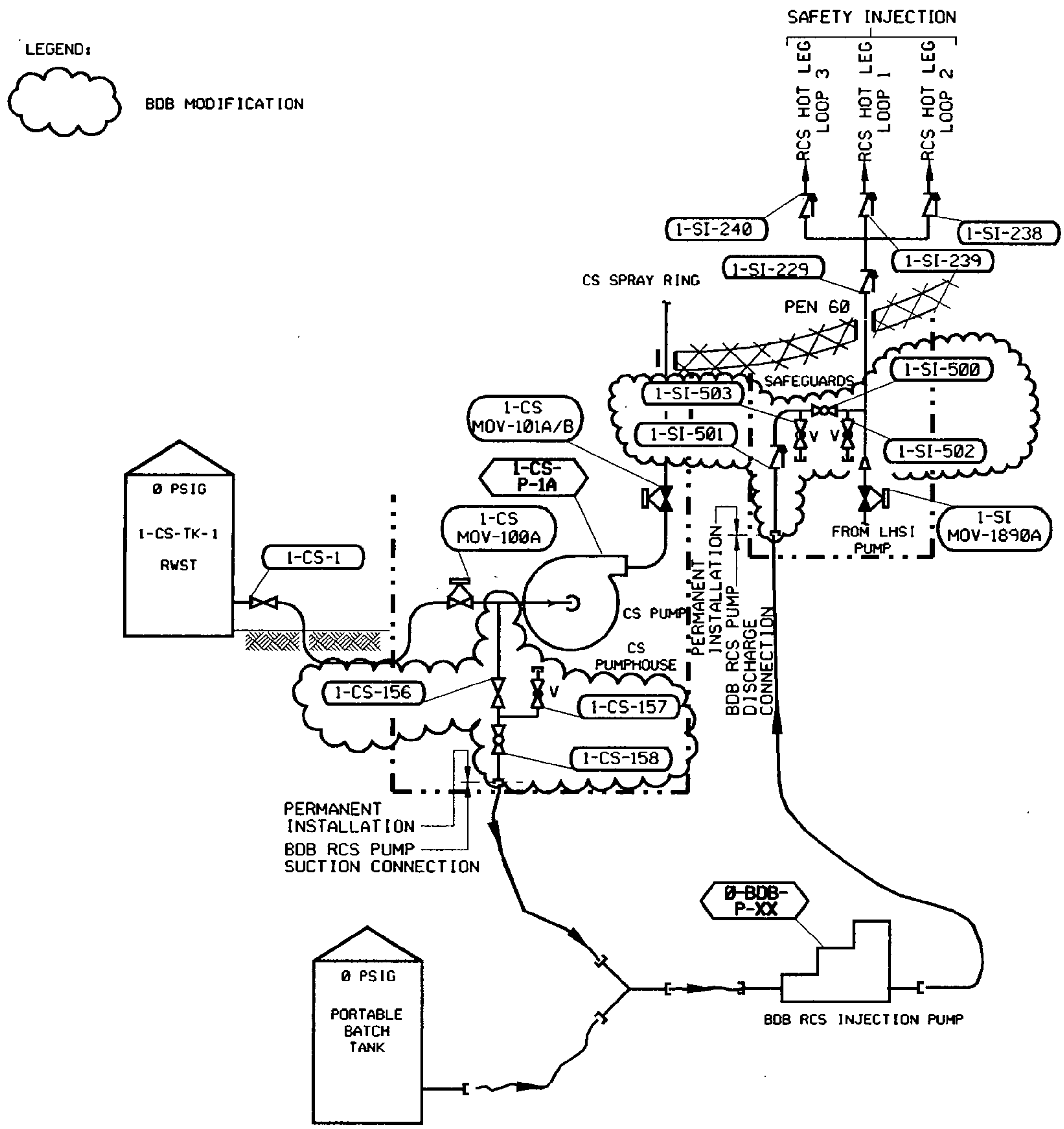


FIGURE 4
RCS INVENTORY AND REACTIVITY CONTROL MAKEUP
-PRIMARY MECHANICAL CONNECTIONS-
SURRY POWER STATION

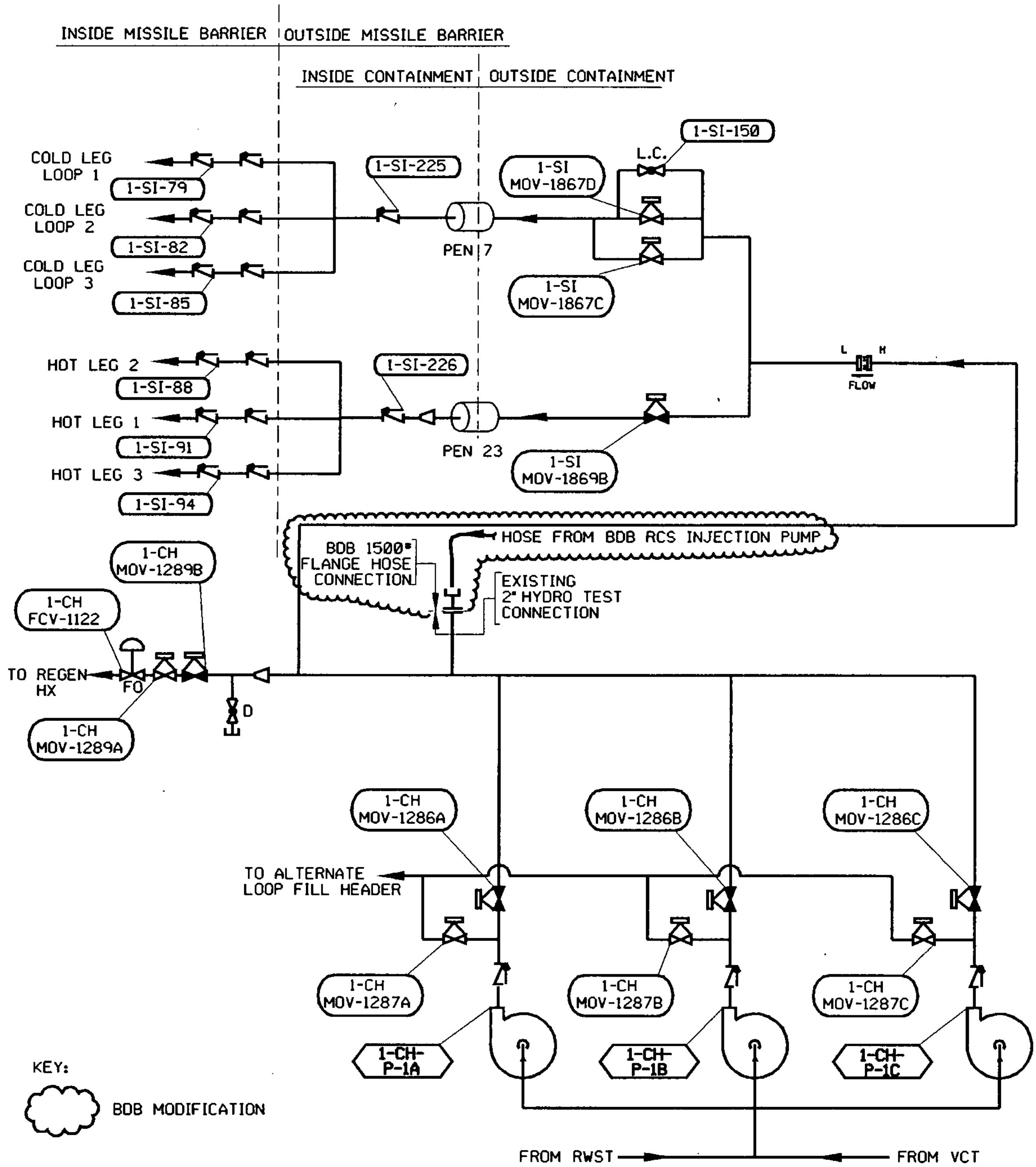


FIGURE 5
RCS INVENTORY AND REACTIVITY CONTROL MAKEUP
-ALTERNATE MECHANICAL CONNECTIONS-
SURRY POWER STATION

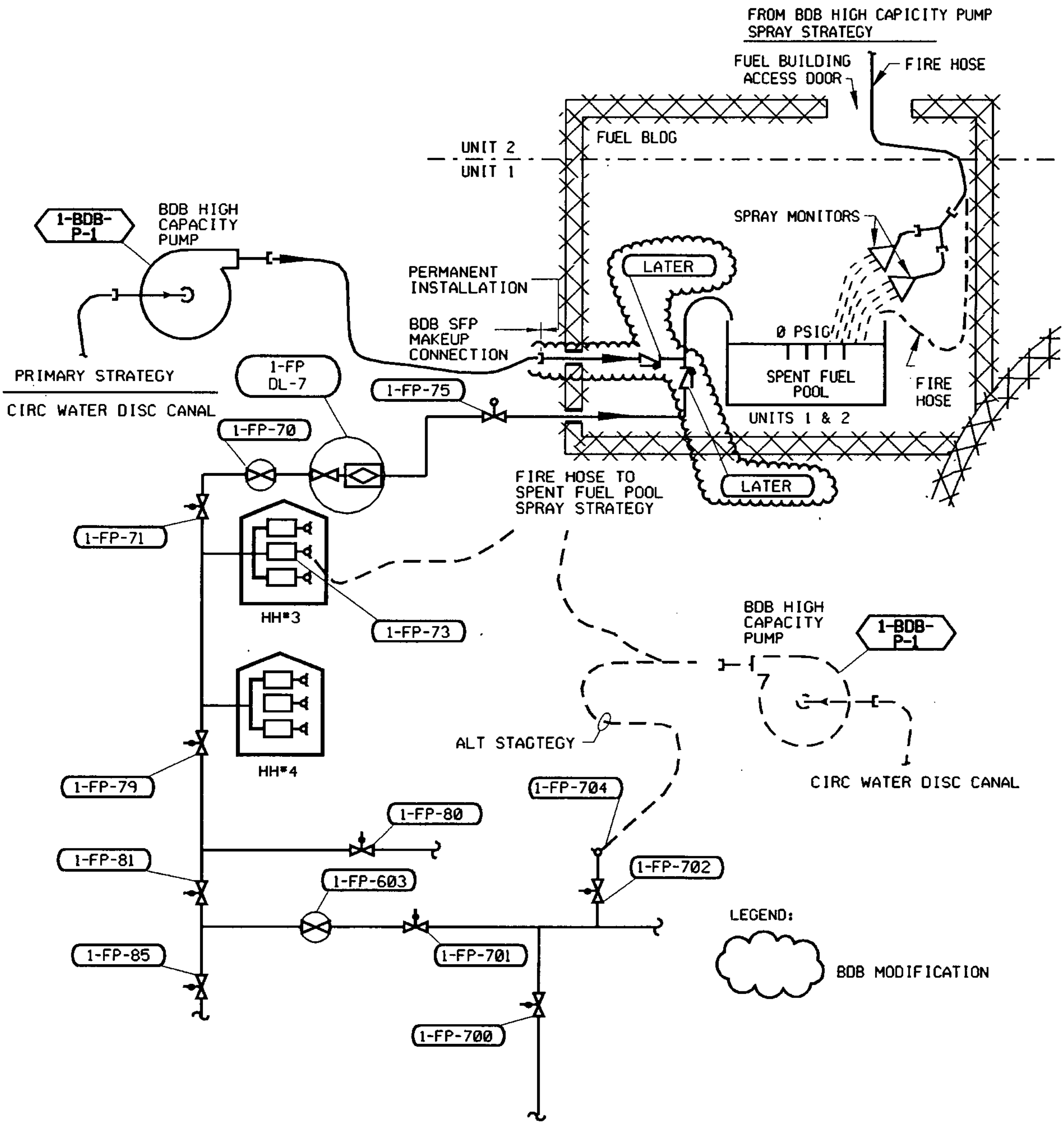


FIGURE 6
SPENT FUEL POOL COOLING
-PRIMARY AND ALTERNATE MECHANICAL CONNECTIONS-
SURRY POWER STATION

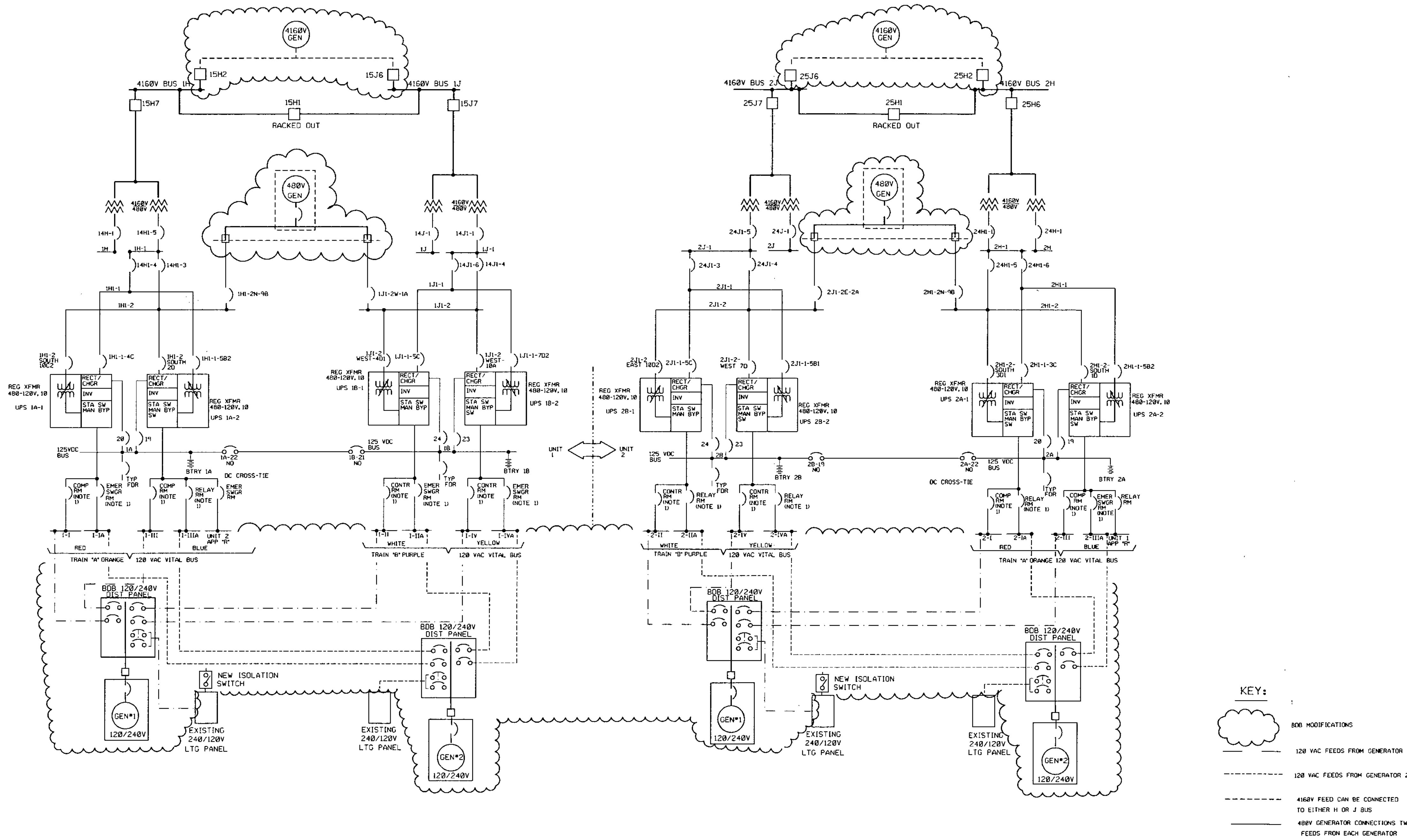


FIGURE 7
BDB FLEX STRAGETY ELECTRICAL CONNECTIONS
ONE-LINE DIAGRAM
SURRY POWER STATION

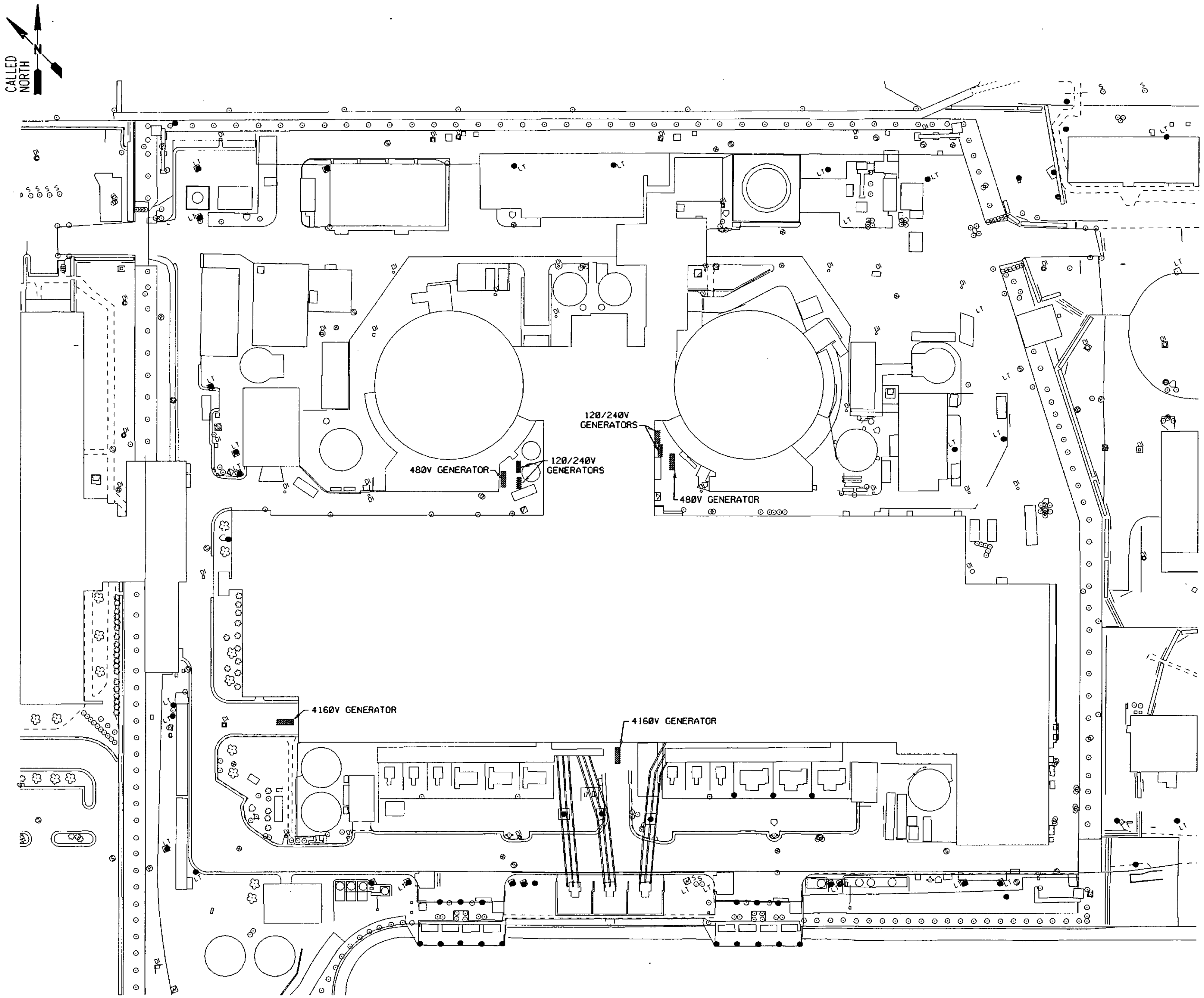


FIGURE 8
BDB ELECTRICAL EQUIPMENT LAYOUT
SURRY POWER STATION

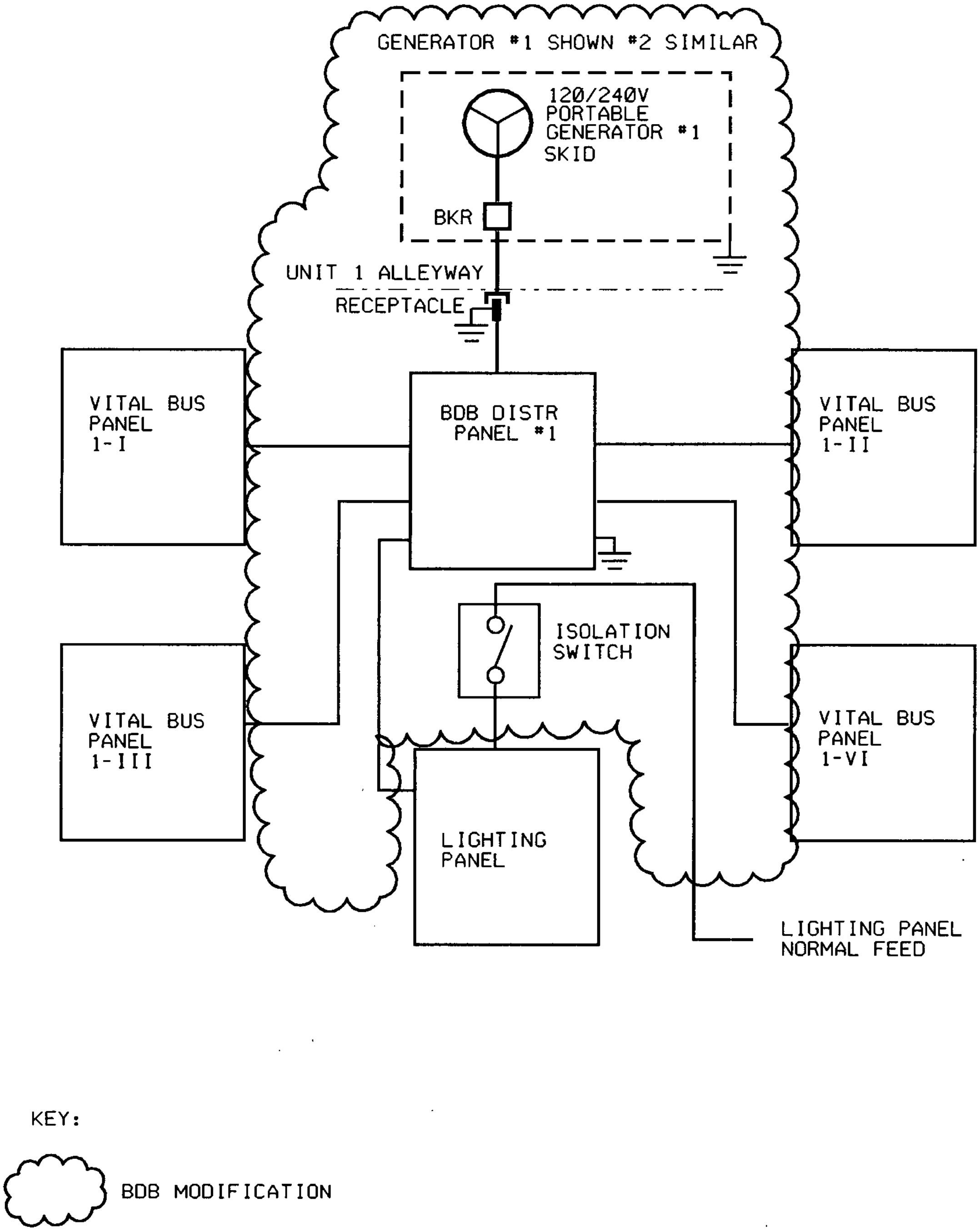


FIGURE 9
120/240 VAC GENERATOR ELECTRICAL CONNECTIONS
SURRY POWER STATION

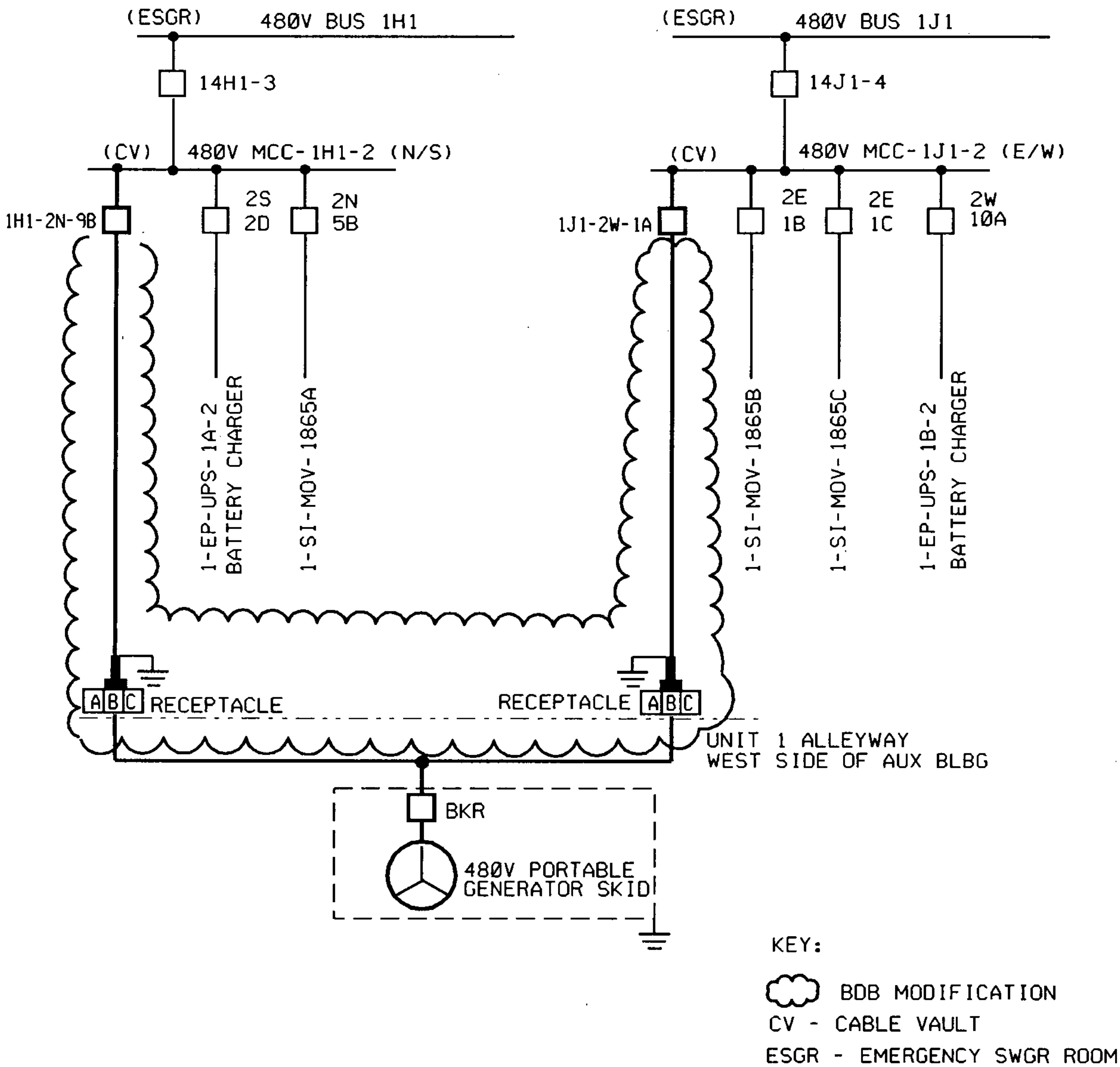


FIGURE 10
480VAC GENERATOR ELECTRICAL CONNECTIONS
SURRY POWER STATION