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.: 12-162B
NL&OS/MAE: R2
Docket Nos.: 50-338/339
License Nos.: NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA 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. 12-162A)

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.

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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 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)

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Enclosure

North Anna Units 1 & 2 Overall Integrated Plan

Mitigation Strategies For Beyond-Design-Basis External Events

North Anna Power Station

Virginia Electric and Power Company (Dominion)

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LIST OF ACRONYMS

AC	Alternating Current
AFW	Auxiliary Feedwater
AP	Abnormal Procedure
AOT	Allowed Outage Times
ASD	Auxiliary Shutdown
ATWS	Anticipated Transient Without Scram
BAST	Boric Acid Storage Tank
BDB	beyond-design-basis
CFR	Code of Federal Regulations
DC	Direct Current
DDFP	Diesel Driven Fire Pump
DG	Diesel Generator
ECA	Emergency Contingency Action
ECST	Emergency Condensate Storage Tank
EDG	Emergency Diesel Generator
ELAP	Extended Loss of AC Power
EOC	End of Cycle
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
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
MSL	Mean Sea Level
MSVH	Main Steam Valve House
NEI	Nuclear Energy Institute
NR	Narrow Range
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
OBE	Operating Basis Earthquake
PA	Protected Area
PEICo	Pooled Equipment Inventory Company

LIST OF ACRONYMS

PGA	Peak Ground Acceleration
PORV	Power-Operated Relief Valve
PWROG	Pressurized Water Reactor Owners Group
QS	Quench Spray
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
SDM	Shutdown Margin
SFP	Spent Fuel Pool
SG	Steam Generator
SG PORV	Steam Generator Power-Operated Relief Valve
SW	Service Water
TDAFW	Turbine Driven Auxiliary Feedwater
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
VAC	Volt AC
VDC	Volt 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 North Anna Power Station provides protection against a broad range of external hazards. A site-specific assessment for North Anna 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 Seismic Events The North Anna seismic hazard is considered to be the earthquake magnitude associated with the design basis seismic event. Per UFSAR Section 2.5.2.6, the design-basis earthquake for structures founded on rock is taken at 0.12g for horizontal ground motion and two-thirds of that value for vertical ground motion. For structures founded on soil, the design-basis earthquake is taken at 0.18g for horizontal motion and 0.12g for vertical motion. For the operating basis earthquake (OBE), horizontal ground accelerations are 0.06g for structures founded on rock and 0.09g for structures founded on soil. As described in UFSAR Section 2.5.2.5.1, a magnitude 5.8 earthquake occurred on August 23, 2011, with an epicenter approximately 11 miles from the site. The peak ground acceleration (PGA) values developed from recorded motions as a result of this earthquake exceeded the horizontal and vertical design basis PGA values. However, evaluations performed following the earthquake have concluded that there was no significant physical or functional damage to seismically designed SSCs and only

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	limited effects on non-seismic plant structures and equipment. Therefore, the seismic hazard remains the design basis earthquake. 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> North Anna Power Station is located on Lake Anna, which has a nominal water level at the 250 foot MSL elevation. The watershed for Lake Anna is 343 square miles. The release of any upstream body of impounded water, due to a seismic event or dam failure, would not have a significant impact on lake level and thus would not cause flooding at the site (UFSAR Section 2.4.4). A potential cause of flooding at the site would be from high lake level due to runoff from an extreme precipitation event in the watershed. An evaluation was performed to determine the highest potential lake level due to runoff of precipitation in the watershed. The probable maximum flood was generated using the unit hydrograph of April 1973 and the 48-hour probable maximum precipitation of 27.04 inches. The standard project storm of 13.54 inches in 48 hours (approximately one-half of the probable maximum precipitation), is used for antecedent precipitation. The antecedent precipitation is assumed to occur 5 days before the main storm, with 3 rainless days between the storms. The resultant probable maximum flood still-water level is Elevation 264.2 feet. When wind surge and wave run-up, due to a 40 mph wind blowing in the most critical direction, are added to this height, there is an increase of 2.9 feet, plus a backwater allowance of 0.2 foot. The resultant upper-bound flood stage is at Elevation 267.3, which is 3.7 feet below typical plant grade (UFSAR Section 2A.2.1). A potential source of flooding is the local accumulation of water due to precipitation. UFSAR Section 2.4.2.2 states:

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	"The site is relatively flat, and no concentration of runoff is expected on the flat areas. The drainage area that will contribute to runoff on the site is not much larger than the site. The area west of the site will receive runoff from approximately 35 acres; however, the drainage facilities in this area have been designed for a 50-year storm." In this discussion, the site refers to the area around the turbine buildings and reactor containments. Since the site is not located on an estuary or open coast, surge flooding is not a concern. Tsunami flooding is not a concern for the site because of its inland location. Seiche-related flooding is not addressed in the UFSAR and is not a design consideration. However, the North Anna Unit 3, Early Site Permit, Section 2.4.5 does address a seiche event and concludes that since the power station site is not located on an estuary or open coast, surge or seiche flooding would not produce maximum water levels on the site. The North Anna Unit 3 COL is a more recent evaluation of flooding on the North Anna site and is applicable per NEI 12-06, Section 6.2.3.1. Storms Such As Hurricanes, High Winds, and Tornadoes Plant design bases address the storm hazards of hurricanes, high winds and tornadoes. For hurricanes, a total of 51 tropical storms or hurricane centers were recorded between 1871 and 1987 as passing within 100 nautical miles of the North Anna site. North Anna UFSAR Section 2.3.1 states that an average of approximately two tropical storms or hurricanes pass within 100 nautical miles of the North Anna plant site every 5 years. With the site being approximately 100 miles from the Atlantic Ocean, hurricanes and tropical storms tend to weaken before reaching the site. For extreme straight winds – the extreme 1-mile wind speed is defined as the 1-mile passage of wind with the highest speed for the day. The extreme 1-mile wind speed at 30 feet above the ground, which is predicted to occur once in 100 years, is 80 mph. The fastest wind speed recorded at Richmond, based on the 1951-1987 period, was 68 mph from the southeast in October 1954.

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	For tornadoes and tornado missiles, the North Anna UFSAR indicates that between January 1916 and December 1987, there was a total of 65 tornadoes reported within a 50-mile radius of the site (UFSAR Section 2.3.1). The tornado model used for design purposes has a 300 mph rotational velocity and a 60 mph translational velocity (UFSAR Section 3.3.2). <u>Snow and Ice Storms and Cold</u> Snowfalls of 4 inches or more occur, on average, once a year, and snow usually only remains on the ground from 1 to 4 days at a time. Richmond averages about 14.6 inches of snow a year. The UFSAR states that an examination of the period between 1977 and 1987, indicates that there were only six documented cases of ice storms in Louisa and the immediately surrounding counties. Of these, two were reported to have caused serious damage (including damage to power lines and trees). Temperatures in the site region rarely fall below 10 deg F (UFSAR Section 2.3.1). The lowest temperature recorded in Richmond was minus 12 deg F in January 1940 and the lowest recorded in Charlottesville was minus 9 deg F in January 1985 (UFSAR Table 2.3-2). Such low temperatures could adversely affect access to and the flow path from Lake Anna or the Service Water Reservoir. Ice could form on the surface of Lake Anna or the Service Water Reservoir and impact the FLEX strategy. However, capabilities are available to break through the ice, if needed, to provide access and a flow path. <u>Extreme Heat</u> Temperatures in the site region rarely exceed 95 deg F (UFSAR Section 2.3.1). The peak temperature recorded in Richmond was 105 deg F in July 1977 and the peak temperature recorded in Charlottesville was 107 deg F in September 1954 (UFSAR Table 2.3-2).
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*

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	will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes. • *Exceptions for the site security plan or other (license/site specific) requirements of 10CFR may be required.* • *Deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours.* • *Certain Technical Specifications cannot be complied with during FLEX implementation.* Key assumptions associated with implementation of FLEX Strategies: • Flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes. • Exceptions for the site security plan or other (license/site specific) requirements of 10CFR may be required. • Deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours. • This plan defines strategies capable of mitigating a simultaneous loss of all alternating current (AC) power and loss of normal access to the ultimate heat sink resulting from a 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 in accordance with established emergency operating procedure (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

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	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). This position is consistent with the previously documented 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). 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 ATWS). Steam release to maintain decay heat removal upon shutdown functions normally, and reactor coolant system (RCS) overpressure protection valves respond normally, if required by plant conditions, and reseat. • On-site staff are 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:

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	• 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 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 is lost, but the water inventory in the ultimate heat sink (UHS) remains available and robust piping connecting the UHS to plant systems remains intact. The motive force for UHS flow, i.e., pumps, is assumed to be lost with no prospect for recovery. • 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 upper limit of Technical Specifications, reactor coolant letdown flow (until isolated), and reactor coolant pump seal leak-off at normal maximum rate. • For the spent fuel pool, 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 North Anna Power Station FLEX Program will fully implement the guidance of NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" and 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 walk through of deployment).* *Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment 1A* *See attached sequence of events timeline (Attachment 1A).* *Technical Basis Support information, see attached NSSS Significant Reference Analysis Deviation Table (Attachment 1B)* 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 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 Service Water Reservoir (staging location) and routing hoses to provide flow to the spent fuel pool. 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 assumed response times included in Attachment 1A will be completed once FLEX Support Guidelines (FSG) have been developed and will include a staffing analysis. **[Open Item 1]** The following items correspond to Action Items listed in Attachment 1A: <u>Action Item 4:</u> Re-align AFW to all SGs – 50 minutes On loss of AC power, initially all auxiliary feedwater (AFW) flow is to the "A" steam generator (SG) and there is no AFW flow to the "B" and "C" SGs. Flow must be provided to these SGs within 50 minutes to prevent SG dryout. **[Open Item 2]** The procedure for loss of all AC power provides instruction to verify that the turbine driven auxiliary feedwater (TDAFW) pump automatically starts. The TDAFW pump is normally aligned to supply water from the emergency condensate storage tank (ECST) to the "A" steam generator (SG) only. The motor driven AFW pumps are normally aligned to the "B" and "C" SGs. Since the motor driven AFW pumps would not be operating during an extended loss of AC power (ELAP) event, the loss of all AC power procedure directs Operations personnel to realign AFW flow from the TDAFW pump to supply all three SGs. Realignment and throttling of the AFW valves is needed to prevent overfilling of the "A" SG which would occur in 1 hour without throttling and to prevent dryout of the "B" and "C" SGs. Dryout of the SGs would occur in approximately 50 minutes without makeup flow. Operators would be assigned within the first 15 minutes of the event to perform the realignment. This realignment and throttling would be performed locally in the AFW Pump House. Operators could reach the room in less than 5 minutes and manual realignment of the valves in the room is estimated to take 15 minutes. Thus realignment would be accomplished in less than 50 minutes. See Section B for a discussion of AFW operation.

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	Action Item 7: DC load stripping completed – 90 minutes Plant specific analysis for extension of Class 1E DC battery life included an initial condition that load stripping would be completed in 90 minutes from a loss of all AC power event. With completion of load stripping in 90 minutes, the battery life was calculated as 8 hours for Unit 1 and 8 hours for Unit 2. **[Open Item 3]** Within 60 minutes of the initiating event, an ELAP condition would be diagnosed and load stripping of the vital buses would be initiated. Load stripping starts at 60 minutes from the initiating event and is completed within 30 minutes. The vital 120 VAC panels and 125 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 due to their 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 90 minute time constraint can be met. Load stripping is discussed in Section F1.1. Action Item 8: Provide backup AFW supply – 3.8 hours The emergency condensate storage tank (ECST) has a usable volume of more than 96,000 gallons to provide AFW for 3.8 hours **[Open Item 2]**, at which time a supplemental supply of AFW is required. The credited supplemental source of AFW is from the seismic and missile protected fire protection system. The diesel driven fire pump (DDFP) in the Service Water (SW) Pump House would be used to provide water to the fire main. The DDFP should automatically start following a loss of AC power. When a supplemental supply of AFW is needed, AFW supply to the TDAFW pump would be realigned to the fire main using valves at the AFW Pump House. Thus water from the fire main could be provided to the AFW system within the 3.8 hour time

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	constraint. See Section B for a discussion of AFW operation. Action Item 10: Repower 120 VAC vital buses – 8 hours The DC load stripping discussed in Action Item 4 above will extend the emergency battery life to 8 hours. To continue to power the vital instrumentation and controls, backup power must be provided within 8 hours. **[Open Item 3]** Portable diesel generators (DGs) will be deployed to repower several 120 VAC vital buses. The portable 120/240V DGs will be deployed from their protected storage locations and connected to BDB electrical connections to provide required power. Alternatively, and as a backup to the 120/240V DGs, 480V DGs can be deployed from the BDB Storage Building(s). Separate BDB electrical connections are provided that allow the 480V DG(s) to provide required power. Allowing 2 hours for debris removal and an additional 2 hours for transport of the generators to the staging location, there is sufficient time to accomplish this objective. See Section F1.2 for additional discussion. Action Item 14: Initiate RCS injection for RCS inventory make-up /reactivity control using the BDB RCS Injection pump – 33 hours Reactivity Requirement: An analysis of boration requirements following shutdown determined that for cooldown and depressurization to the ECA-0.0, "Loss of All AC Power," target steam generator pressure of 290 psig (corresponds to core inlet temperature of ~ 419 deg F), no boration is required for the first 37 hours to maintain Keff< 0.99. This is the most limiting boration requirement and occurs at the highest core burnup condition, end of cycle (EOC) life. RCS Inventory Requirement: A conservative site-specific assessment of the generic WCAP-17601 evaluation showed that for a Westinghouse NSSS with Westinghouse reactor coolant pump (RCP) seals, natural circulation flow could be sustained for 33

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	hours without RCS inventory makeup considering the approximately 21 gpm/seal initial leakage rate. (Engineering Technical Evaluation, ETE-NAF-2012-0150) North Anna will complete the installation of the Flowserve N-9000 low leakage RCP seals with the abeyance feature on two of three RCPs on each unit by the FLEX implementation date. With essentially zero leakage from the two Flowserve N-9000 seals with the abeyance seal feature at North Anna, the natural circulation time during Phase 1 and Phase 2 significantly extends the time for deployment of the BDB RCS injection pump. However, to be conservative, a time constraint of 33 hours is being used for RCS inventory makeup. A BDB RCS injection pump will arrive on site in approximately 26 hours from the Regional Response Center (RRC) for one unit. A second BDB RCS injection pump from the RRC will arrive on site in approximately 30 hours. The BDB RCS injection pump will be deployed taking suction from the refueling water storage tank (RWST) and discharging into the RCS. Setup of the BDB RCS injection pump will take approximately 2 hours after arrival on site. Initiation of water into the RCS will begin within 28 hours for RCS inventory control on the first unit. Initiation of water into the RCS of the second unit will begin within 32 hours. This will ensure that sufficient RCS inventory is maintained and there is no loss of natural circulation in the RCS. Thus the conservatively established time constraint for RCS injection of 33 hours will be met. Injection of borated water within 33 hours also ensures that reactivity requirements are met. See Section C for additional discussion. The RWSTs are the preferred source of RCS makeup supply, but are not missile protected. In the unlikely event that both units RWSTs are damaged by multiple tornado missiles, a contingency plan has been developed. To provide a source of borated water, a portable tank that provides the ability to mix boric acid with water will be purchased as BDB equipment and stored onsite. This tank can be deployed in a timeframe to support RCS injection if the RWST is not available. The use of the tank is discussed in Section C.

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	Action Item 15: Add inventory to SFP – 43 hours An evaluation indicated that without cooling or makeup, boiling could occur in the spent fuel pool (SFP) in 9 hours and the water level in the pool could decrease to 10 feet above the pool in 43 hours. (Reference Calculation, MISC-11792) These times are based on the maximum design heat load. Neither the primary nor alternate makeup strategies require entry into the Fuel Building. Makeup to the SFP, if needed, can occur within 43 hours, which is considered a time constraint. Refer to Section E for additional discussion. 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. Therefore, action to reduce containment pressure and temperature will not be required for a minimum of seven days following the ELAP event initiation. (Reference Calculation MISC-11793) 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 (loss of normal access to the ultimate heat sink) 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 that the 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

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	alternate connection points for each strategy. **[Open Item 5]** Mode-specific impacts on FLEX strategies are described below. Mode 1 Power Operations - 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). Mode 2 Startup - operation in this mode occurs the least amount of time, with lower levels of decay heat than Mode 1. Mode 1 equipment design assumptions bound Mode 2 impacts on FLEX strategies. No additional or modified strategies are necessary for this mode. Mode 3 Hot Standby - operation in this mode occurs for relatively short periods with lower levels of decay heat than Mode 1. Mode 1 equipment design assumptions bound Mode 3 impacts on FLEX strategies. No additional or modified strategies are necessary for this mode. Mode 4 Hot Shutdown - operation in this mode occurs for relatively short periods with lower levels of decay heat than Mode 1. Mode 1 equipment design assumptions bound Mode 4 impacts on FLEX strategies. No additional or modified strategies are necessary for this mode. Mode 5 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 (195 gpm) **[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.

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	Mode 6 Refueling - operation in this mode occurs for relatively short periods of time. As described in Cold Shutdown mode, the BDB AFW Pumps will be available to add water from the RWST to the RCS primary or alternate connections as described. See Section E for Spent Fuel Pool Cooling.

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**
• **BDB 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: No modifications are anticipated for Phase 1.
	  o Phase 2: Modifications will occur per the schedule shown on Attachment 2A.
	  o Phase 3: Modifications will occur per the schedule shown on Attachment 2A.
	• Procedure guidance development for Strategies and Maintenance.
	  o Strategies: Shown on Attachment 2A as "Issue FSGs and associated procedure revisions."
	  o Maintenance: Shown on Attachment 2A as "Create Maintenance Procedures."
	• Storage plan: Storage planning is included with the time segment identified as "Develop Modifications" on Attachment 2A. Implementation is included with the time segment identified as "Implement Modifications" on Attachment 2A.
	• Staffing analysis: **[Open Item 1]**
	• FLEX equipment acquisitions schedule: 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.

A.7 - Identify how the programmatic controls will be met. **Ref: NEI 12-06 section 11**	*Provide a description of the programmatic controls equipment protection, storage and deployment and equipment quality. See section 11 in NEI 12-06. Storage of equipment, 11.3, will be documented in later sections of this*

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JLD-ISG-2012-01 section 6.0	*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., fire protection), 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 that 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, steam generators). e) Capacity, temperature, boron concentration, water quality (suspended solids content, etc.) and availability of the suction sources given the specific external initiating events (emergency condensate storage tank (ECST)/refueling water storage tank (RWST)/fire main/lake, etc.) to provide an adequate supply for the BDB pumps (portable pumps, fire protection system pumps, etc.).

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	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 Lake Anna, the service water reservoir, or 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 future submittal will be provided with the results of the equipment storage study. **[Open Item 6]** 4) Procedure Guidance **[Open Item 7]** a) FLEX strategy support guidelines will be developed in accordance with PWROG guidelines. b) Interface with EOPs ECA-0.0, "Loss of All AC Power" will be revised to the extent necessary to include appropriate reference to FSGs. c) Interface with Abnormal Procedures (APs) The APs listed below will be revised to the extent necessary to include appropriate reference to FSGs. i) 0-AP-27, "Malfunction of Spent Fuel Pit System" ii) 0-AP-36, "Seismic Event" iii) 0-AP-41, "Severe Weather Conditions" d) FSG Maintenance Process FSG maintenance will be performed using the 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

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	need for prior NRC approval. Changes to procedures (EOPs, APs, EDMGs, SAMGs, or FSGs) that perform actions in response 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 which recognize the BDB ELAP/LUHS has occurred and which 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 INPO AP-913. The testing and maintenance recommendations will be developed by 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 performs a FLEX mitigation strategy for 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 AOT (Allowed Outage Times) 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]**

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	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 spent fuel pool cooling, v) Provide indication of key parameters, and vi) Provide reactor core cooling (Modes 5 and 6). 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 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.

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A.8 - Describe training plan	*List training plans for affected organizations or describe the plan for training development.* Dominion's 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 Regional Response Center. "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 permanently installed equipment during these drills.

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A.9 - Describe Regional Response Center plan	The industry will establish two (2) Regional Response Centers (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):

- North Anna Updated Final Safety Analysis Report, Revision 48.
- North Anna Unit 3, Early Site Permit, Revision 9, Section 2.4.5
- Engineering Technical Evaluation, ETE-CPR-2012-0012, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0.
- 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-11792, "Extended Loss of AC Power, Spent fuel Pool Heatup times and Water Makeup for Dominion Nuclear", Revision 0.
- Calculation MISC-11793, "Evaluation of Long Term Containment Pressure and Temperature Profiles Following Loss of Extended AC Power (ELAP)", Revision 0.

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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 reactor coolant system (RCS) temperature and pressure conditions, with reactor decay heat removal via steam release to the atmosphere through the steam generator safety valves and/or power-operated relief valves (SG PORVs). Natural circulation of the reactor coolant system will develop to provide core cooling and the steam turbine driven auxiliary feedwater pump will provide flow from the emergency condensate storage tank to the steam generators to make-up for steam release.

Operators will respond to the event in accordance with emergency operating procedures (EOPs) to confirm reactor coolant system, secondary system, and containment conditions. A transition to ECA-0.0, "Loss of All AC Power," will be made upon the diagnosis of the total loss of AC power. This procedure directs isolation of reactor coolant system letdown pathways, confirmation of natural circulation cooling, verification of containment isolation, reducing DC loads on the station Class 1E batteries, and establishment of electrical equipment alignment in preparation for eventual power restoration. The operators re-align auxiliary feedwater flow to all steam generators, 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 auxiliary feedwater flow to the steam generators and 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 auxiliary feedwater (AFW) supply to the steam generators and steam release to the atmosphere.

[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.

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The turbine driven auxiliary feedwater (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 steam generators (SGs). In the event that the TDAFW pump does not start on demand, or trips after start, the operator will locally reset the turbine and the pump will be restarted. Sufficient time (approximately 50 minutes) will be available to restart the TDAFW pump to prevent SG dry-out **[Open Item 2]**. The AFW system is pre-aligned for flow to one SG from the TDAFW pump, and operator action will be required to manually align flow to all three SGs locally in the AFW Pump House. Manual control of TDAFW pump flowrate to the SGs to establish and maintain proper water levels will be performed locally in the AFW Pump House.

Steam release from the SGs will be controlled remotely from the main control room using air-operated SG PORVs equipped with local back-up compressed air bottles. Local manual operation of the SG PORVs, using the installed manual control handwheel, can be performed in the event that back-up compressed air is expended. 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 290 psig minimum, which corresponds to an RCS core inlet temperature of approximately 419 deg F. 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 that the TDAFW pump becomes unavailable. 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 emergency condensate storage tank (ECST). The tank has a minimum usable capacity of 96,649 gallons and will provide a suction source to the TDAFW pump for a minimum of 3.8 hours of RCS decay heat removal assuming a concurrent RCS cooldown at 100°F/hr to a minimum SG pressure of 290 psig. **[Open Item 2]**After depletion of the inventory in the ECST, the TDAFW pump suction will be aligned to the seismic category I, tornado missile protected portion of the fire protection (FP) system. The FP system will be pressurized by the diesel driven fire pump (DDFP), which provides water from the Service Water Reservoir at sufficient flowrate and pressure to support TDAFW pump operation. The Service Water Reservoir provides an approximately 22.5 million gallon useable water volume to the FP system since the service water system would not be functional due to the ELAP/LUHS. The water volume from the Service Water Reservoir extends the time to depletion of AFW water supply indefinitely. Potential debris at the suction screening of the DDFP would not prevent an adequate flow to the DDFP. The trash screens on the SW reservoir intake bay are designed to pass the full design flow of a SW pump and the FP pump. The SW pumps will not be operating due to the ELAP/LUHS. Since the 600 gpm required by the DDFP to provide a suction source for the TDAFW pump is a small fraction of the design flow rate of the trash screen, the calculated unblocked trash screen area required for passing the required flow rate is justifiable. Continuous operation of the diesel engine driven fire pump will require replenishment of fuel at approximately 7.8 hour intervals as described in Section F2.

Vital AC and DC bus load stripping will be implemented to preserve battery life as described in

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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. The equipment relied upon to provide reactor core cooling and heat removal for the Phase 1 strategy are 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.* Procedural guidance supporting Phase 1 coping exists in EOPs governing plant response to loss of all AC power.
B.1.2 - Identify modifications	*List modifications and describe how they support coping time.* None required.
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: AFW Flowrate - AFW flowrate indication is available in the MCR. AFW flowrate indication is available for SG A, B, and C throughout the event. SG Water Level- SG wide range (WR) water level indication is available from the MCR, Auxiliary Shutdown (ASD) Panel, and locally within the AFW Pump House. SG narrow-range (NR) level indication is available from the MCR and ASD Panel. SG WR and NR level indication is available for SG A, B, and C throughout the event. SG Pressure - SG pressure indication is available from the MCR, the ASD Panel, and locally in the Main Steam Valve House (MSVH). SG pressure indication is available for SG A, B, and C throughout the event. RCS Temperature - RCS hot-leg and cold-leg temperature indication is available from the MCR (recorder only), the ASD panel, and the Fuel Building. RCS hot-leg and cold-leg temperature indication is available throughout the event but only “A” and “B” loop temperatures are indicated in the Fuel Building.

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	Core Exit Thermocouple Temperature – Core exit thermocouple temperature indication is available in the MCR. This temperature indication is available throughout the event. ECST Level - ECST water level indication is available from the MCR, the ASD Panel, and locally using pump suction gauges.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0012, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," 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 FP system 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 indefinitely and is sufficient to stabilize the plant at 290 psig SG pressure, which will result in RCS cold leg temperature of approximately 419 deg F with pressure remaining greater than SI accumulator nitrogen injection pressure.

Core Cooling and Heat Removal Phase 2 Strategy

The Phase 2 strategy for reactor core cooling and heat removal provides indefinite supply of water for feeding SGs and a portable, diesel driven backup AFW pump for use in the event that the FP system water make-up source and/or the TDAFW pump becomes 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 11]** The strategy includes repowering of vital 120 VAC buses to maintain availability of key parameters monitoring instrumentation. Phase 2 electrical bus repowering strategies are described in Section F1.2.

a. Indefinite Supply of Water for SG Injection
A back-up 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 Lake Anna or the Service Water Reservoir. Lake Anna will remain available for any of the external hazards listed in Section A.1. The Service Water Reservoir is a safety-related, seismic category I earthen structure and will also 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 selected water source. A flexible hose will be routed from the pump suction to the water source 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 selected water source can also be pumped to the Spent Fuel Pool 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 Spent Fuel Pool make-up simultaneously. Hydraulic analysis of the flowpath from each water source to the ECST and to the

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B. Maintain Core Cooling & Heat Removal
B.2 - PWR Portable Equipment Phase 2

BDB AFW Pump suction will be performed to confirm that applicable performance requirements are met. **[Open Item 5]**

b. <u>Back-up SG Water Injection</u>
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 a back-up SG injection method in the event that the TDAFW pump can no longer perform its function due to low turbine inlet steam flow from the SGs. 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 flexible hose will be routed from either the BDB ECST Refill connection or directly to the discharge of the BDB High Capacity Pump to the pump suction (Figure 2). The BDB AFW Pump discharge can be aligned to either the primary or the alternate pump discharge connection for SG injection.

b.i <u>Primary AFW Pump Discharge Connection</u>
The primary AFW Pump discharge connection for SG injection will be located on the TDAFW pump discharge line in the AFW Pump House (Figure 3). A flexible hose will be routed from the BDB AFW Pump discharge to the primary connection through the AFW Pump House. The AFW Pump House is a seismic category I, tornado missile protected structure and the primary AFW Pump discharge connection will be available for all 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 <u>Alternate AFW Pump Discharge Connection</u>
In the event that the primary AFW Pump discharge connection is not available, an alternate connection location 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 in the Service Building, which is separate from the AFW Pump House. The connection consists of a hose adapter that replaces the valve bonnet on one of three main feedwater regulator bypass 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 bypass valve. This alternate connection approach relies upon the non-seismic category I, non-tornado missile protected area of the Service Building and Turbine Building. Therefore, the availability of

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B. Maintain Core Cooling & Heat Removal	
B.2 - PWR Portable Equipment Phase 2	
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 BDB 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 12]** (2) Install BDB AFW Pump discharge primary connection located on the TDAFW pump discharge line in the AFW Pump House. **[Open Item 12]** (3)
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. Maintain Core Cooling & Heat Removal	
B.2 - PWR Portable Equipment Phase 2	
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 are 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 are 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 are 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 are protected from snow, ice and extreme cold events while stored in the BDB Storage Building(s) or in protected areas of the plant to ensure equipment readiness at extreme temperatures when called upon.
High Temperatures	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings are protected from high temperature events while stored in the BDB Storage Building(s) or in protected areas of the plant to ensure equipment readiness at extreme temperatures when called upon.

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B. Maintain Core Cooling & Heat Removal		
B.2 - PWR Portable Equipment Phase 2		
B.2.5 - 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.* Indefinite Supply of Water for SG Injection The BDB High Capacity Pump will be deployed to transfer water from Lake Anna or the Service Water Reservoir 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 is stored in the BDB Storage Building(s). The pump is deployed by towing the trailer to a designated location near the selected water source. One end of the flexible suction hose, equipped with a strainer, will be lowered to below the water surface, and the other end will be attached to the pump suction via quick-connect hose connection. A discharge hose	*Identify modifications* BDB ECST Refill connection - modification required to permanently install this connection. **[Open Item 12]** The BDB ECST Refill connection consists of a piping tee fitting installed in the ECST make-up line. The connection will be located in the AFW Pump House. The connection will include a hose quick-connect fitting and isolation valve.	*Identify how the connection is protected* The BDB ECST Refill connection is located inside the seismic category I, tornado missile protected AFW Pump House above the Elev. 272' floor. Portable heating will be provided in the event of an ELAP and extended extreme cold hazard to protect the connection from freezing. **[Open Item 13]** The connection will be protected from the external hazards described in Section A.1.

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B. Maintain Core Cooling & Heat Removal		
B.2 - PWR Portable Equipment Phase 2		
will be routed from the pump discharge quick-connect hose 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 will be through the AFW Pump House.		
b. <u>Back-up SG Water Injection</u> 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 steam generator 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 engine 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 AFW Pump House.	b.i Primary BDB AFW Pump discharge connection - modification required to permanently install this connection. **[Open Item 12]** The primary BDB AFW Pump discharge connection consists of a piping tee fitting installed in the TDAFW pump discharge line located inside the AFW Pump House. The connection will include a quick-connect hose fitting and an isolation valve.	b.i The primary BDB AFW Pump discharge connection will be located within the seismic category I, tornado missile protected AFW Pump House. Portable heating will be provided in the event of an ELAP and extended extreme cold hazard to protect the connection from freezing. **[Open Item 13]** The connection will be protected from the external hazards described in Section A.1. b.ii The alternate BDB AFW Pump discharge 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

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B. Maintain Core Cooling & Heat Removal		
B.2 - PWR Portable Equipment Phase 2		
An appropriate length of hose equipped with quick-connect hose fittings will be routed between the BDB ECST Refill connection (described in Section B.2.5.a) and the pump suction connection. Alternatively, the 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 BDB AFW Pump discharge 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 primary connection within the AFW Pump House. The hose will be attached to the BDB AFW Pump discharge nozzle via quick-connect hose fitting. The other end of the hose will be attached to the hose quick-connect fitting at the primary BDB AFW Pump discharge connection (modification required to permanently install this connection). Water from the ECST, or from the discharge of the BDB High Capacity Pump, can be pumped to the SGs via the BDB AFW		event or extreme high wind condition. The connection will be protected from the other external hazards described in Section A.1.

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B. Maintain Core Cooling & Heat Removal		
B.2 - PWR Portable Equipment Phase 2		
Pump discharge connection through the AFW system piping. For discharge to the alternate BDB AFW Pump discharge connection described in Section B.2.b.ii, a suitable length of high pressure flexible hose will be routed from the BDB AFW Pump, up the exterior Service Building wall, and into the mechanical equipment room. The hose will be connected to the main feedwater line by disassembling a main feedwater regulator 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 of 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-2012-0012, "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 Regional Response Center (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. Maintain Core Cooling & Heat Removal		
B.3 - PWR Portable Equipment Phase 3		
B.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.* Phase 3 equipment will be provided by the Regional Response Center (RRC) which is to be located in Memphis, TN. Equipment transported to the site will be either immediately staged at the point of use location (pumps and generators) or temporarily stored at the 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-2012-0012, "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.

In general, the FLEX strategy for RCS inventory control / reactivity management relies on reactor coolant pump (RCP) seal leakage being sufficiently low for initial control of RCS inventory, isolation of the RCS as directed by the emergency procedure, and cooldown limitations to limit reactivity addition. With these controls in place, no RCS makeup or boration is required for the first 33 hours of an ELAP / LUHS event. (Reference 1)

Reactivity:
The emergency procedure for the loss of all AC power, ECA-0.0, provides direction for the Operator to initiate an RCS cooldown using the SG PORVs to a steam generator pressure of approx 290 psig which equates to an RCS core inlet temperature of approximately 419 deg F. At this RCS temperature, analysis indicates that at the most limiting core condition, additional RCS boration is not needed to ensure adequate Shutdown Margin (SDM), e.g., reactivity <0.99, is maintained for the first 37 hours without boration. (Reference 1) The most limiting core condition is the highest core burnup, which occurs at end of EOC.

Inventory:
The emergency procedure also directs the operators to minimize RCS inventory loss through potential RCS letdown paths by closing or verifying closed RCS letdown isolation valves, pressurizer PORVs, excess letdown valves, RCS sample valves, loop drain valves, reactor vent valves, pressurizer vent valves, and RCP seal injection/return valves.

A conservative site-specific assessment of the generic WCAP-17601 evaluation showed that for a Westinghouse NSSS with Westinghouse reactor coolant pump (RCP) seals, natural circulation flow could be sustained for 33 hours without RCS inventory makeup considering the approximately 21 gpm/seal initial leakage rate. (References 1 and 2)

[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	
North Anna will complete the installation of the Flowserve N-9000 low leakage RCP seals with the abeyance feature on two of three RCPs on each unit by the FLEX implementation date. **[Open Item 14]** With essentially zero leakage from the two Flowserve N-9000 seals with the abeyance seal feature at North Anna, the natural circulation time during Phase 1 and Phase 2 significantly extends the time for deployment of the BDB RCS injection pump. However, to be conservative, a time constraint of 33 hours is being used. Based on the above, the Phase 1 strategy for ensuring adequate RCS inventory and reactivity control consists of performing the RCS letdown path isolations directed by the emergency response procedures and limiting cooldown to a SG pressure of 290 psig for the first 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* RCS inventory is preserved by isolating or verifying isolated potential RCS letdown paths. (RCS letdown isolation valves, pressurizer PORVs, excess letdown valves, RCS sample valves, loop drain valves, reactor vent valves, pressurizer vent valves, and RCP seal injection/return valves) The loss of all AC procedure, ECA-0.0, requires verification of isolation of potential letdown paths and no revisions to this procedure is anticipated to accomplish Phase 1 for RCS Inventory 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.* SG Pressure SG pressure indication is available from the MCR, the Auxiliary Shutdown (ASD) panel, and locally in the MSVH. SG pressure indication is available for SG A, B, and C throughout the event. RCS Temperature RCS hot-leg and cold-leg temperature indication is available from the MCR (recorder only), the ASD

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C. Maintain RCS Inventory Control	
	panel, and the Fuel Building. RCS hot-leg and cold-leg temperature indication is available throughout the event but only "A" and "B" loop temperatures are indicated in the Fuel Building. Pressurizer Level Pressurizer level indication is available from the MCR, ASD panel, and Fuel Building. Pressurizer level indication is available throughout the event. Reactor Vessel Level Indication System (RVLIS) RVLIS indication is available from the MCR. Train "A" of RVLIS is also available on a recorder in the post accident monitoring (PAM) panel. RVLIS is available throughout the event. Excore Nuclear Instruments Indication of nuclear activity is available from the MCR and in the Fuel Building. Indication is available throughout the event.

Notes:

Reference 1 – Engineering Technical Evaluation, ETE-CPR-2012-0012, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Design."

Reference 2 – 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.

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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. Based on the time required for inventory makeup / boration, no Phase 2 equipment is needed. This is considered a Phase 3 response.	
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 C.1.1.
C.2.2 - Identify modifications	*List modifications* None for Phase 2.
C.2.3 - Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* See C.1.3.
C.2.4 - Storage / Protection of Equipment: **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List Protection or schedule to protect* N/A
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* N/A
Severe Storms with High Winds	*List Protection or schedule to protect* N/A
Snow, Ice, and Extreme Cold	*List Protection or schedule to protect* N/A
High Temperatures	*List Protection or schedule to protect* N/A

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Maintain RCS Inventory Control		
C.2 - PWR Portable Equipment Phase 2:		
C.2.5 - Deployment Conceptual Modification (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.* N/A	*Identify modifications* None for Phase 2.	*Identify how the connection is protected* No connections for Phase 2.

Notes:

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

Engineering Technical Evaluation, ETE-CPR-2012-0012, "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..

The strategy for Phase 3 is to maintain the secondary system at 290 psig until the BDB RCS Injection pump is deployed and begins injecting borated water into the RCS. Adequate RCS inventory and shutdown margins exist for 33 hours without any RCS make-up or boration. Once RCS makeup from the RWST begins, RCS cooldown can continue.

In order to ensure RCS inventory and reactivity controls are maintained, a portable, diesel powered, BDB RCS Injection pump will be available to add borated water to the RCS beginning prior to 33 hours into the event. Two portable BDB RCS injection pumps will be transported from the RRC facility and positioned in the Protected Area next to each Unit's Safeguards Building. (See Figure 1) A portable hose will be used to supply water from the RWST to the pump and another portable hose will supply pump discharge to the RCS. (See Figure 2) These connections are described below. The pump will be capable of injecting greater than 40 gpm. **[Open Item 5]**

The first BDB RCS Injection pump from the RRC can be expected 24 hours after notification which will be controlled by procedure to be 2 hours after the event (26 hours total). Since the BDB RCS injection pump is obtained from the RRC, the RCS injection is considered a Phase 3 event. 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.

RWST Supply – The primary supply of borated water for injection will be from the refueling water storage tank (RWST) via quench spray supply piping. The BDB RCS pump suction connection will be permanently installed on the suction line to the quench spray pump, which is located in the Quench Spray (QS) Pump House. (See Figure 4) Each unit has one RWST. Each tank is located at grade level just outside of its respective Safeguards Building. The RWSTs are stainless steel, safety related, seismically qualified storage tanks, but are not missile protected. During normal power operation each has a minimum Technical Specification volume of 466,200 gal of borated water at a concentration between 2600 and 2800 ppm. The RWST is the preferred borated water source.

Backup sources of borated water – The opposite unit's RWST can be used as a supply of borated water make-up to the RCS. However, the RWSTs are not missile protected. In the unlikely event that both units RWSTs are damaged by multiple tornado missiles, a FLEX strategy to support using a portable boric acid mixing tank has been developed. The mixing tank would be transported from an on-site BDB Storage Building and positioned near the BDB RCS injection pump. The tank is used to mix dilution water from a hose connected to the

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C. Maintain RCS Inventory Control
C.3 - PWR Portable Equipment Phase 3:

BDB AFW pump or from the BDB High Capacity pump providing water from the lake with bags of powdered boric acid or concentrated boric acid solution from a boric acid storage tank (BAST) to achieve the proper concentration to maintain adequate shutdown margin while making up RCS inventory. Boric acid solution concentrations as high as 6,000 ppm may be mixed without creating precipitation concerns. The BDB RCS injection pump would then use the portable mixing tank as a suction source. There are three BASTs in the Auxiliary Building, each with a capacity of 8000 gal of concentrated boric acid (12,900 to 15,750 ppm). The tanks are maintained at a minimum temperature of 115 deg F to prevent boric acid precipitation.

Discharge to the RCS – The primary path of injection into the RCS will be through a temporary high pressure discharge hose to a hose connection (BDB RCS pump discharge connection as shown on Figure 4) in the Safeguards Building. In the Safeguards Building, seismically supported piping will be permanently installed from the hose connection and will tee into the discharge piping of the low head safety injection (LHSI) pump. The alternate path of RCS injection will be through a temporary high pressure discharge hose to a 2-inch blind flanged test connection in the charging pump discharge header in the Auxiliary Building. The test connection (BDB RCS alternate discharge connection) is shown on Figure 5.

For cooldown and depressurization to the current target SG pressure of 290 psig (specified in the procedure for loss of all AC power), no boration is required for the first 37 hours to maintain Keff < 0.99. A SG pressure of 290 psig corresponds to an RCS core inlet temperature of approximately 419 deg F. After the BDB RCS Injection pump is placed in service, if further cooldown and depressurization is desired, some boration will be needed.

Longer term reactivity control for cooldown to a core inlet temperature of 350 deg F requires approximately 5200 gallons of injected water from the RWST. This reactivity addition is needed for the most limiting core condition which is at the end of cycle (EOC) burnup.

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.

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C. Maintain RCS Inventory Control	
C.3 - PWR Portable Equipment Phase 3:	
The discussion in this section is based on reactivity control for the most limiting reactor condition, which occurs at the highest core burnup, e.g., EOC. In this condition, RCS cooldown may be limited to ensure adequate Shutdown Margin (SDM) is maintained. At lower core burnup conditions, RCS cooldown may be performed sooner than described in this section, since this section addresses EOC conditions. Controls will be established to ensure that during cooldowns performed at non-EOC conditions, an adequate SDM will be maintained.	
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* Installation of permanent hose connections at 1-QS-P-1B and 2-QS-P-1B pump suction elbows along with associated isolation valves are required as a suction source for the BDB RCS injection pump. These hose connections are located in each unit's Quench Spray Pump House. See Figure 4. **[Open Item 12]** Installation of permanent connections downstream of the low head safety injection pump discharge motor operated valves (1-SI-MOV-1890A and 2-SI-MOV-2890A) along with associated piping and valves are required to provide a discharge path for the BDB RCS injection pump. These connections are located in each unit's Safeguards Building. Each connection includes isolation valves and a hose connection. See Figure 4. **[Open Item 12]**
C.3.3 - Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* <u>SG Pressure</u> SG pressure indication is available from the MCR, the Auxiliary Shutdown (ASD) panel, and locally in the MSVH. SG pressure indication is available for SG A, B, and C throughout the event.

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C. Maintain RCS Inventory Control	
C.3 - PWR Portable Equipment Phase 3:	
	RCS Wide Range Pressure RCS wide range pressure indication is available from the MCR, ASD panel, and Fuel Building. RCS wide range pressure indication is available throughout the event. RCS Temperature RCS hot-leg and cold-leg temperature indication is available from the MCR (recorder only), the ASD panel, and the Fuel Building. RCS hot-leg and cold-leg temperature indication is available throughout the event but only "A" and "B" loop temperatures are indicated in the Fuel Building. Pressurizer Level Pressurizer level indication is available from the MCR, ASD panel, and Fuel Building. Pressurizer level indication is available throughout the event. Reactor Vessel Level Indication System (RVLIS) RVLIS indication is available from the MCR. RVLIS is available throughout the event. Excore Nuclear Instruments Indication of nuclear activity is available from the MCR and in the Fuel Building. Indication is available throughout the event. Portable BDB equipment will include 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.

C.3.4 - Deployment Conceptual Modification **(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.* The portable BDB RCS injection pumps will be transported from the RRC	*Identify modifications* Installation of permanent hose connections at 1-QS-P-1B and 2-QS-P-1B pump suction	*Identify how the connection is protected* The primary suction supply connection for the pump is located on the suction line to

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C. Maintain RCS Inventory Control		
C.3 - PWR Portable Equipment Phase 3:		
facility and deployed in the Protected Area next to the Unit 1 or Unit 2 Safeguards Buildings. The primary supply of borated water for injection will be from the refueling water storage tank (RWST) via Quench Spray supply piping. Suction hose will be routed from 1-QS-P-1A and 2-QS-P-1B suction elbow connection to the BDB RCS injection pump. This provides RWST borated water to the suction of the BDB RCS Injection pump.	elbows along with associated isolation valves are required as a suction source for the BDB RCS injection pump. These hose connections are located in each unit's Quench Spray Pump House. (See Figure 4) **[Open Item 12]**	the quench spray pump, which is located in the Quench Spray Pump House. This connection will be seismically mounted in a location above the design flood elevation in the non-missile protected QS Pump House. Portable heating can be deployed if required to protect against extreme cold temperatures. The connection is protected from other external hazards as described in A.1.
b. A high pressure hose will be routed from the discharge of the BDB RCS injection pump to the primary connection point in the Unit 1 / 2 Safeguards Building and connected to the primary RCS injection BDB connection. The primary RCS injection BDB connection will consists of permanent piping from the entrance to the Safeguards Building to a piping connection downstream of the low head safety injection (LHSI) pump discharge motor operated valves (1-SI-MOV-1890A and 2-SI-MOV-2890A) to the RCS hot legs.	Installation of permanent connections downstream of the low head safety injection pump discharge motor operated valves (1-SI-MOV-1890A and 2-SI-MOV-2890A) along with associated piping and isolation valves are required to provide a discharge path for the BDB RCS injection pump. These hose connections are located in each unit's Safeguard Building. (See Figure 4) **[Open Item 12]**	The primary discharge connection will be seismically mounted above the design flood elevation in the missile protected Safeguards Building. Portable heating will be provided in the event of an ELAP and extended extreme cold hazard to protect the connection from freezing. **[Open Item 13]** The connection is protected from other external hazards as described in A.1.

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C. Maintain RCS Inventory Control		
C.3 - PWR Portable Equipment Phase 3:		
c. Alternate RCS injection point: In the event the new permanent plant system connection installed to support the FLEX strategy should become unavailable, an alternate RCS injection point has been identified. The alternate connection utilizes a hydro test connection on the "normal charging header" 4"-CH-80-1502-Q2 (Unit 1) and 4"-CH-480-1502-Q2 (Unit 2) located in the overhead in the Auxiliary Building basement. The BDB RCS injection pump discharge will be connected via a high pressure hose to this hydro 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 normal charging header. (See Figure 5)		This connection's location in the Auxiliary Building is on a missile-protected, seismically designed line. However the path of the high pressure hose from the BDB RCS injection pump to this connection point will require routing through non-missile protected areas of the Auxiliary Building. Although this connection will be below the design flood elevation, the Auxiliary Building is not subject to flooding. The connection is protected from other external hazards as described in A.1.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0012, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0.		

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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 monitoring 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. 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	*Confirm that procedure/guidance exists or will be developed to support implementation.* Procedural guidance for monitoring containment pressure is provided by ECA-0.0, Loss of All AC power. This procedure needs to be revised to ensure containment isolation prior to load stripping. **[Open Item 7]**
D.1.2 - Identify modifications	*List modifications and describe how they support coping.* 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 main control room (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	
	Containment Wide Range Temperature Containment wide range temperature indication is available in the MCR throughout the event.

Notes:

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

Engineering Technical Evaluation, ETE-CPR-2012-0012, “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)"

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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. 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.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect.* None required for Phase 2.

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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**
a. *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-2012-0012, “Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document,” Revision 0.

Dominion Nuclear Engineering Calculation MISC-11793, "Evaluation of Long Term Containment Pressure and Temperature Profiles Following Loss of Extended AC Power (ELAP)"

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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 or recovered for this coping evaluation.* <u>Containment Pressure</u> Containment pressure indication is available in the main control room (MCR) throughout the event. <u>Containment Wide Range Temperature</u> Containment wide range temperature indication is available in the MCR, but is not available immediately following DC bus load stripping (Section F1.1). As containment pressure slowly increases, containment wide range temperature indication will be repowered after several days.

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D. Maintain Containment		
D.3.4 - Deployment Conceptual Modification **(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.* 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 developed later.
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0012, "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. Evaluations estimate that with no operator action following a loss of SFP cooling at the maximum design heat load, the SFP will reach 212 deg F in approximately 9 hours and boil off to a level 10 feet above the top of fuel in 43 hours from initiation of the event. Therefore, the Phase 1 coping strategy for spent fuel pool cooling is to monitor spent fuel pool 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	*Confirm that procedure/guidance exists or will be developed to support implementation* The Phase 1 coping strategy for spent fuel pool cooling is to monitor spent fuel pool level using instrumentation to be installed as required by NRC Order EA-12-051.
E.1.2 - Identify modifications	*List modifications* No additional modifications are required other than installation of the BDB Spent Fuel Pool level monitoring instruments as required by NRC Order EA-12-051.
E.1.3 - Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation. Per EA-12-051* Spent Fuel Pool water level

[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.

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Notes:

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Engineering Technical Evaluation, ETE-CPR-2012-0012, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0.

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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.

a. The primary FLEX strategy for SFP cooling is to utilize the BDB SFP instrumentation (installed as required by NRC Order EA-12-051) to continuously monitor SFP level. Within the first 24 hours of the BDB event, stage the BDB high capacity pump and connect this pump to the permanent, seismically designed external SFP makeup connection installed outside the Fuel Building. The FLEX strategy will support connection to the new permanent plant fitting using hoses and fittings to provide SFP makeup capabilities up to 500 gpm which exceeds the boiloff rate of 101 gpm. This connection and makeup strategy does not require entry into the Fuel Building.

b. The alternate FLEX strategy utilizes the diesel driven fire pump to pressurize the fire main which provides makeup to the SFP via the 6" emergency makeup line. This makeup strategy does not require entry into the Fuel Building.

c. An existing spray strategy provides a means to spray water to the SFP per NEI 12-06 Table D at a rate of 500 gpm. The strategy provides makeup flow through either fire hose run over the side of the SFP or spray monitors set up on the SFP deck fed by the fire main or the BDB High Capacity pump. When deployed, two spray monitors are connected via a wye that splits the pump supply into two (2) 3-inch hoses. The two 3-inch spray monitor hoses will be routed from the New Fuel storage area to the spent fuel pool. The two oscillating spray monitors will be set up 30 feet apart and 16 feet back from the SFP to spray water into the SFP to maintain water level.

Suction sources for the BDB High Capacity pump are the SW Reservoir or Lake Anna.

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.

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E. Maintain Spent Fuel Pool Cooling	
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 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, and establish a SFP area vent pathway. **[Open Item 7]**
E.2.2 - Identify modifications	*List modifications* a. The primary FLEX strategy utilizes a seismically designed external SFP makeup connection will be installed outside the Fuel Building. **[Open Item 12]** b. No modifications are required for the alternate FLEX strategy. c. No modifications are required for the 10CFR 50.54(hh)(2) spray strategy
E.2.3 - Key SFP Parameter	*List instrumentation credited or recovered for this coping evaluation. Per EA-12-051* Spent Fuel Pool water level
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 are protected from seismic events while stored in the BDB Storage Building(s) or pre-staged in protected areas of the plant.
Flooding	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings are protected from flooding events while stored in the BDB Storage Building(s) or pre-staged in protected areas of the plant.

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E. Maintain Spent Fuel Pool Cooling	
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings are protected from severe storms with high wind events while stored in the BDB Storage Building(s) or pre-staged 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 are protected from snow, ice and extreme cold events while stored in the BDB Storage Building(s) or pre-staged in protected areas of the plant to ensure equipment readiness at extreme temperatures when called upon.
High Temperatures	*List how equipment is protected or schedule to protect* The BDB pumps, necessary hoses and fittings are protected from high temperature events while stored in the Storage Building(s) or pre-staged in protected areas of the plant to ensure equipment readiness at extreme temperatures when called upon.

E.2.5 - 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.* Primary FLEX strategy - Within the first 24 hours of the BDB event, stage the BDB high capacity pump and connect this pump to the permanent, seismically designed external SFP makeup connection installed outside the Fuel Building. The FLEX strategy will support connection to the external fitting using hoses and fittings.	*Identify modifications* Primary FLEX strategy – hookup to the permanent, seismically designed external SFP makeup connection will be installed outside the Fuel Building. **[Open Item 12]**	*Identify how the connection is protected* The connection for the primary FLEX strategy 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. The exterior connection is suitable for a 5-inch fire hose connection and is accessible from outside the Fuel Building. The connection

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E. Maintain Spent Fuel Pool Cooling		
		is located outside the Fuel Building at approximately the 274 ft elevation, which is above the current design flood plain for the North Anna site.
b. The alternate FLEX strategy utilizes the installed diesel driven fire pump at the Service Water Pump House to pressurize the fire main which provides makeup to the SFP via the installed 6" emergency makeup line. No deployment of equipment is necessary to implement this internal alternate strategy.	No modifications are required to deploy the alternate FLEX strategy.	The alternate FLEX strategy utilizes the installed diesel driven fire pump to pressurize the fire main which provides makeup to the SFP via the installed 6" emergency makeup line. No connections are necessary to implement this internal alternate strategy.
c. The existing spray strategy uses fire hose run over the side of the SFP or spray monitors set up on the SFP deck fed by the fire main or the BDB high capacity pump. Two spray monitors are connected via a wye that splits the pump supply into two (2) 3-inch hoses.	No modifications are required.	No permanent connections are required.

Notes:

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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. Although a separate Phase 3 strategy is not required to maintain spent fuel pool cooling, the Phase 2 spent fuel pool makeup strategies may be maintained using pumps from the regional response center if the onsite portable pumps fail during Phase 2.	
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	*List instrumentation credited or recovered for this coping evaluation. Per EA-12-051* Spent Fuel Pool water level.

E.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.* Although a separate Phase 3 strategy is not required to maintain spent fuel pool cooling; pumps from the regional response center 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
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<table>
<tr><td colspan="2" align="center">F1. Safety Functions Support (Electrical)</td></tr>
<tr><td colspan="2">Determine Baseline coping capability with installed coping[5] modifications not including FLEX modifications.</td></tr>
<tr><td colspan="2" align="center">F1.1 - PWR Installed Equipment Phase 1</td></tr>
<tr><td colspan="2">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.

Based on a review of instrumentation 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 the assumption that load stripping would begin within 1 hour after the occurrence of an ELAP/LUHS and completed within the next 30 minutes. With load stripping, the useable battery life is calculated to be 8 hours for Unit 1 and Unit 2 batteries. [Open Item 3]

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.</td></tr>
<tr><td colspan="2" align="center">Details:</td></tr>
<tr><td>F1.1.1 - Provide a brief description of Procedures / Strategies / Guidelines</td><td>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</td></tr>
</table>

[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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	minimum 8 hours of operation for Unit 1 and Unit 2. This assumes that load stripping starts within 1 hour 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 8 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.* No modifications are required to implement Phase 1.
F1.1.3 - Key Parameters	*List instrumentation credited for this coping evaluation phase.* Main Control Room (MCR) instrumentation is credited 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 8 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:
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Engineering Technical Evaluation, ETE-CPR-2012-0012, "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 diesel generators (DGs) stored on-site. 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 120/240 VAC DGs per unit connected to 120 VAC vital buses through pre-installed BDB cabling, connections, and distribution panels. The portable 120/240 VAC DGs (and connecting power cables) will be deployed from their protected storage location to the alleyways east of the Auxiliary Building for Unit 1 and west 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 120/240 VAC DG will power one BDB distribution panel which provides power to the vital 120 VAC buses and selected lighting circuits (See Figure 10). The alternate strategy for re-powering 120 VAC vital bus circuits is the deployment of one 480 VAC DG per unit connected to the Class 1E 480 VAC bus through pre-installed BDB cabling and connections. The 480 VAC 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 480 VAC DGs (and necessary connecting power cables) will be transported from the BDB Storage Building(s) to their 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 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 Figures 11 and 12 for Units 1 and 2, respectively). 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 will be developed using industry guidance.

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F1. Safety Functions Support (Electrical)	
F1.2 - PWR Portable Equipment Phase 2	
	Procedures will include the necessary steps to deploy and connect the 120/240 VAC DGs and the 480 VAC 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 120/240 VAC DGs. **[Open Item 12]** A modification on each unit will install the BDB connection receptacles for the cables from the portable 480 VAC DGs. **[Open Item 12]**
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 diesel generators, 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 diesel generators, 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 diesel generators, 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 diesel generators, 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 to ensure equipment readiness at extreme temperatures when called upon.	
High Temperatures	*List how equipment is protected or schedule to protect* The BDB portable diesel generators, 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 to ensure equipment readiness at extreme temperatures when called upon.	
F1.2.5 - 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.* The 120/240 VAC DGs and connection cables will be transported from their storage location(s) to the alleyways east of the Auxiliary Building for Unit 1 and west of the Auxiliary Building for Unit 2. Cables will be run from the portable DGs to BDB connection receptacles. Each DG will power one	*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	*List how equipment is protected or schedule to protect* The BDB portable diesel generators, 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.

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F1. Safety Functions Support (Electrical)		
F1.2 - PWR Portable Equipment Phase 2		
distribution panel which provides power to the vital 120 VAC buses and selected lighting circuits.	installed to new BDB 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 480 VAC DGs and connection cables will be transported from their storage location(s) to the alleyway on the east side (Unit 1) and west 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-2012-0012, "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 a 4160 VAC portable diesel generator (DG) as described below. Figure 7 provides a one line description of the re-powering strategy which includes the connection of the 4160 VAC DG.

4160 VAC Diesel Generator - One 4160 VAC mobile diesel generator (DG) for each unit will be brought in from the Regional Response Center (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 4160 VAC mobile DG can provide power to either Emergency 4160 VAC Bus H or J. Additionally, by restoring the 4160 VAC 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 4160 VAC DGs for direct connection to the Emergency 4160 VAC Bus through switchgear located in the Emergency Switchgear Room 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. Cabling and connector sizing will be matched to the performance criteria. **[Open Item 15]**

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 4160 VAC 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 4160 VAC 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**
a. *Identify Strategy including how the equipment will be deployed to the point of use.* For Unit 1, the mobile DG will be transported from the RRC to the Unit 1 Turbine Building track bay on the east side if the Turbine Building. From there, a temporary power cable will be routed to the ESGR and connected from the 4160 VAC DG to the Emergency 4160 VAC Bus through switchgear. For Unit 2, the mobile DG can be transported from the RRC to the Unit 2 Turbine Building truck bay on the north side of the Turbine Building. From there, a temporary power cable will be routed to the ESGR and connected from the 4160 VAC DG to the Emergency 4160 VAC Bus through switchgear.	*Identify modifications.* No modifications are necessary.	*Identify how the connection is protected.* The connections for the mobile 4160 DGs are located in the Emergency Switchgear Rooms at both units. The connections are to equipment that is already protected from the extreme external hazards identified in Section A.1.

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F1. Safety Functions Support (Electrical)
F1.3 - PWR Portable Equipment Phase 3
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0012, "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 North Anna site.

During Phase 1, the only fuel requirements would be to re-fuel the diesel driven fire pumps which has an 8 hour fuel oil supply at the beginning of the ELAP event. However, no fuel is required for stored or staged BDB equipment for any of the Phase 1 coping strategies.

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. Refer to Section F2.2.1 regarding the diesel-driven fire pump.
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

[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.

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Notes:

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

Engineering Technical Evaluation, ETE-CPR-2012-0012, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0.

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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 coping strategies. The primary source of fuel oil for portable equipment will be the emergency diesel generator (EDG) Fuel Oil Day Tanks. These four diesel tanks contain 800 gallons of diesel fuel each (a total of 3200 gallons) and are seismically mounted and housed in the tornado protected EDG rooms. Fuel can be obtained using the tank drain valve and a flexible hose. Fuel can be gravity fed to suitable fuel containers for transport to BDB equipment. No pumps are necessary. A secondary source for fuel oil will be the two EDG Underground Diesel Fuel Oil Storage Tanks. Each tank has a 45,000 gallon capacity. These tanks are protected from high wind tornado missile 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 eight (8) 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 all 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. This includes the diesel driven fire pump at the SW reservoir. **[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. Safety Functions Support (Fuel)	
F2.2 - PWR Portable Equipment Phase 2	
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) **[Open Item 7]**
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 to ensure equipment readiness at extreme temperatures when called upon.

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F2. Safety Functions Support (Fuel)		
F2.2 - PWR Portable Equipment Phase 2		
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 to ensure equipment readiness at extreme temperatures when called upon.	
F2.2.5 - 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.* 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 800 gallon EDG Fuel Oil Day Tank in each of four EDG rooms. Therefore, a combined total of 3200 gallons of fuel oil is available. Fuel can be obtained using each tank's drain valve. Fuel can be gravity fed to suitable fuel containers for transport to BDB equipment. No pumps are	*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 the EDG fuel oil tanks located in the site EDG rooms. These are seismically designed Class I tanks located in structures that are protected from the extreme external hazards identified in Section A.1.

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F2. Safety Functions Support (Fuel)		
F2.2 - PWR Portable Equipment Phase 2		
necessary. 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 that can be distributed as above.		
Notes: The information provided in this section is based on the following reference(s): Engineering Technical Evaluation, ETE-CPR-2012-0012, "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 all 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 F2.2.5.	*Identify modifications* Same as Phase 2 as stated in Section F2.2.5.	*Identify how the connection is protected* Same as Phase 2 as stated in Section F2.2.5.

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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-2012-0012, "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. North Anna Power Station initially relies on emergency lighting installed for Fire Protection/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 a 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 or Appendix R fire response. 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.

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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-2012-0012, "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 to ensure equipment readiness at extreme temperatures when called upon.
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

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F3. Safety Functions Support (Lighting)		
F3.2 - PWR Portable Equipment Phase 2		
	Building(s) or in protected areas of the plant to ensure equipment readiness at extreme temperatures when called upon.	
F3.2.5 - 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.* 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.	*Identify modifications* No modifications are needed to the site or lighting systems to support FLEX strategy implementation.	*Identify how the connection is protected* 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-2012-0012, "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 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**
a. *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-2012-0012, "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.

Per the Virginia Electric and Power Company letter dated October 29, 2012 (Reference Letter S/N 12-207F), 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 will determine the adequacy of the communications equipment available after the ELAP/LUHS event (radios and sound-powered phones) and determine any additional equipment or modifications needed to implement the Phase 1 FLEX strategies. The result of this study will be 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.

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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-2012-0012, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0. Virginia Electric and Power Company Letter S/N 12-207F, David A. Heacock to NRC Document Control Desk, "Response to Communications Aspects of Recommendation 9.3 for Emergency Preparedness Programs," dated October 29, 2012	

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<table>
<tr><th colspan="2">F4. Safety Functions Support (Communications)</th></tr>
<tr><th colspan="2">F4.2 - PWR Portable Equipment Phase 2</th></tr>
<tr><td colspan="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 diesel generators (120 VAC and 480 VAC) 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 comprehensive 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]</td></tr>
<tr><th colspan="2">Details:</th></tr>
<tr><td>F4.2.1 - Provide a brief description of Procedures / Strategies / Guidelines</td><td>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.</td></tr>
<tr><td>F4.2.2 - Identify modifications</td><td>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.</td></tr>
<tr><td>F4.2.3 - Key Parameters</td><td>List instrumentation credited for this coping evaluation phase.
No key parameters are credited for communications during Phase 2.</td></tr>
</table>

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F4. Safety Functions Support (Communications)	
F4.2 - PWR Portable Equipment Phase 2	
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 to ensure equipment readiness at extreme temperatures when called upon.
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 to ensure equipment readiness at extreme temperatures when called upon.

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F4. Safety Functions Support (Communications)		
F4.2 - PWR Portable Equipment Phase 2		
F4.2.5 - 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.* 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-2012-0012, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0.		

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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 comprehensive communications study will be performed in conjunction with the commitments made in response to Recommendation 9.3 of the 10CFR50.54(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 Regional Response Center (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.

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F4. Safety Functions Support (Communications)		
F4.3 - PWR Portable Equipment Phase 3		
F4.3.4 - 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.* 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-2012-0012, "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 13]**	
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:	

[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 13]**	
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 to ensure equipment readiness at extreme temperatures when called upon.	
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 to ensure equipment readiness at extreme temperatures when called upon.	
F5.2.5 - 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.* 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 13]**	*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:

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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 13]**
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**
a. *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	*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		
guidance of NEI 12-06 and will be provided at a later date after the ventilation needs are identified. **[Open Item 13]**		
Notes:		

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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 involves 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 HELB. 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 areas within the plant structures 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 equipment into the Protected Area.

[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.

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A significant impairment may be debris on site resulting from BDB 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 in the North Anna 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 (PA) 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-2012-0012, "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 BDB 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. Safety Functions Support (Accessibility)	
F6.2 - PWR Portable Equipment Phase 2	
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) to ensure equipment readiness at extreme temperatures when called upon.
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

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F6. Safety Functions Support (Accessibility)		
F6.2 - PWR Portable Equipment Phase 2		
	stored in the BDB Storage Building(s) to ensure equipment readiness at extreme temperatures when called upon.	
F6.2.5 - 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.* 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-2012-0012, "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) gate and door 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. Safety Functions Support (Accessibility)		
F6.3 - PWR Portable Equipment Phase 3		
F6.3.4 - 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.* 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-2012-0012, "Beyond Design Basis – FLEX Strategy Overall Integrated Plan Basis Document," Revision 0.		

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 / PM requirements
BDB High Capacity pump[4] (2) and assoc. hoses and fittings	**X**		**X**			1200 gpm	Will follow EPRI template requirements
BDB AFW pump[4] (4) and assoc. hoses and fittings	**X**					300 gpm	Will follow EPRI template requirements
120/240 VAC generators[3,5] (4) and associated cables, connectors and switchgear (DGs to re-power Instrumentation)				**X**		10 kW	Will follow EPRI template requirements
120/240 VAC generators[2,5] (4) and associated cables, connectors and switchgear (DGs to provide power to support equipment)					**X**	10 kW	Will follow EPRI template requirements

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 / PM requirements
480 VAC generators[3,5] (2) and associated cables, connectors and switchgear (re-power battery chargers, inverters, and vital buses)				**X**		300-350 kW	Will follow EPRI template requirements
Sufficient size and length of pre-terminated cable for connection of 4kV generator to station bus (4 sets)				**X**	**X**		
Portable boric acid batching tanks (4)	**X**						Will follow EPRI template requirements
Light plants[2] (4)					**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

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 / PM requirements
Fans / blowers/ heaters[2] (2 sets)					**X**		Will follow EPRI template requirements
Air compressors[2] (4)					**X**		Will follow EPRI template requirements
Fuel carts[2] with transfer pumps (2)					**X**		Will follow EPRI template requirements
Communication equipment[6] (2 sets)					**X**		Will follow EPRI template requirements
Misc. debris removal equip. [2] (2 sets)					**X**		Will follow EPRI template requirements
Misc. support equipment[2] (2 sets)					**X**		Will follow EPRI template requirements

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. 480 VAC generators are an alternate strategy to the 120/240 VAC generators. Therefore, only N are 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 10CFR50.54(f) letter dated March 12, 2012

Table 2 - PWR Portable Equipment Phase 3

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

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.

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 Regional Response Center 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.

Attachment 1A
Sequence of Events Timeline

Action Item	Elapsed Time	Action	Time constraint Y/N	Remarks/Applicability
	0	Event Starts	NA	Plant @ 100% power
1	15 sec	TDAFW pump starts. Verify AFW flow to "A" SG.	N	Original design basis for SBO event. 50 min to "A" SG dryout.[a]
2	15 sec	Loss of All Power Procedure is entered	N	SBO event required response [a]
3	15 min	Verify RCS Isolation	N	Establishes long term inventory in the RCS. [a]
4	**50 min**	**Re-Align AFW to all SGs**	**Y**	**50 min to "B" and "C" SGs dryout. 1 hr. to "A" SG overfill. [Open Item 2]**
5	50 min	Control SG PORVs and AFW flow	N	On-going action for cooldown and decay heat removal – operations personnel remain stationed locally. [a]
6	60 min	ELAP Declared	N/A	
7	**90 min**	**DC load stripping completed**	**Y**	**Starts at 60 min and completed in 30 min. to provide an 8 hr. battery life for each unit. [Open Item 3]**
8	**3.8 hrs**	**Provide backup AFW supply**	**Y**	**Minimum ECST level is reached (3.8 hrs).**
9	6 hrs	Augmented Staff Arrive on Site	N/A	Reference NEI 12-01
10	**8 hrs**	**Repower 120 VAC vital buses[b]**	**Y**	**Batteries depleted in 8 hours. [Open Item 3]**
11	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.

Action Item	Elapsed Time	Action	Time constraint Y/N	Remarks/Applicability
12	12 to 24 hrs	Deploy BDB High Capacity pump	N	This pump may be used to replenish the ECST, for mixing with boric acid, or to refill the SFP. It is not required at this time but will be deployed for future use if needed.
13	~26 hrs	Additional BDB RCS Injection pump arrives from RRC[c]	N	24 hrs after request.
14	**33 hrs**	**Initiate RCS injection for RCS inventory make-up /reactivity control using the BDB RCS Injection pump**	**Y**	**33 hrs (RCS Inventory Make-up: to prevent loss of natural circulation) / Reactivity control: 37 hrs**
15	**43 hrs**	**Add inventory to SFP**	**Y**	**9 hours to boiling / 43 hours to water level at 10 ft. above fuel. This is an ongoing activity.**
16	**> 7 days**	**Reduce pressure and temperature in Containment**	**Y**	**Prior to affecting the function of key parameter monitoring instrumentation.**

[a] Previously evaluated in response to 10CFR50.63 and in accordance with existing procedures.

[b] The primary strategy is to use the 120/240V generators. The 480V generator for each unit is an alternate to the 120/240V generators.

Attachment 1B
NSSS Significant Reference Analysis Deviation Table

Item	Parameter of Interest	WCAP-17601 Value	WCAP-17601 Section	Plant Applied Value	Gap and Discussion
1	Applicable computer code for NSSS analysis	NOTRUMP	Section 4.1.1.1	NOTRUMP Hand Calculations	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	This value is used in deterministic analysis to show compliance with 10 CFR 50.63 (SBO) as stated in Section 4.4.1 of WCAP-17601. Dominion has committed to replacement of the original RCP seals with low-leakage seals at NAPS. Implementation of the Flowserve N-9000 seals at NAPS will considerably lengthen the time to loss of natural circulation and core uncovery from the Reference Plant Case.
4	Number of Steam Generators used to establish natural circulation	Four - Symmetric	Section 4.1.1.1 Section 4.2.1	One SG Initially (Early Operator Action aligns AFW to all three SGs)	Spreadsheet calculations confirmed that realignment of the AFW from one to three SGs will occur before the time of SG dryout for SG with no AFW and overfill for the SG with AFW. Restoration of AFW is via the TDAFW pump. Once AFW is restored the coping time is based on the Reference Case results.

Item	Parameter of Interest	WCAP-17601 Value	WCAP-17601 Section	Plant Applied Value	Gap and Discussion
5	Total Turbine Driven AFW flow	Adequate to establish and maintain narrow range (NR) level	Section 4.2.1 Section 5.2.1 Table 5.2.2-1	Adequate to establish and maintain NR level	Minimum available of ≥ 426 gpm to one SGs at 1085 psia
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 290 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
North Anna Power Station - Full Compliance Date: October 2014

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
6-month Status Update							■						■						■												
Submit Integrated Plan	■																														
Develop Strategies	■	■	■	■	■	■																									
Develop Modifications	■	■	■	■	■	■	■	■	■	■	■	■	■																		
Implement Modifications		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■											
Develop Training Plan			■	■	■	■	■	■	■	■	■	■	■	■	■																
Implement Training												■	■	■	■	■	■	■	■	■											
Issue FSGs and associated procedure revisions																				■											
Develop Strategies/ Contract with RRC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																
Purchase Equipment												■	■																		
Procure Equipment																■	■	■	■												
Create Maintenance Procedures												■	■	■	■	■	■	■	■												
Unit 1 Outage Implementation								■																		■					
Unit 2 Outage Implementation			■																	■											

Attachment 2B
Open Items

Open Item #	Description	Completion Schedule[1]
1	Verify response times listed in timeline and perform staffing assessment.	April, 2014
2	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. The final durations will be provided when the analyses are completed.	June, 2013
3	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
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

Attachment 2B
Open Items

Open Item #	Description	Completion Schedule[1]
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
7	FLEX Support Guidelines (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.	September, 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.	September, 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 Systematic Approach to Training (SAT).	September, 2014

Attachment 2B
Open Items

Open Item #	Description	Completion Schedule[1]
11	Complete the evaluation of TDAFW pump long term operation with </= 290 psig inlet steam pressure.	December, 2013
12	Plant modifications will be completed for permanent plant changes required for implementation of FLEX strategies.	See Milestone Schedule
13	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
14	Complete installation of N-9000 RCP seals in 2 of 3 RCPs in each unit.	September, 2014
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.	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 12-207F 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

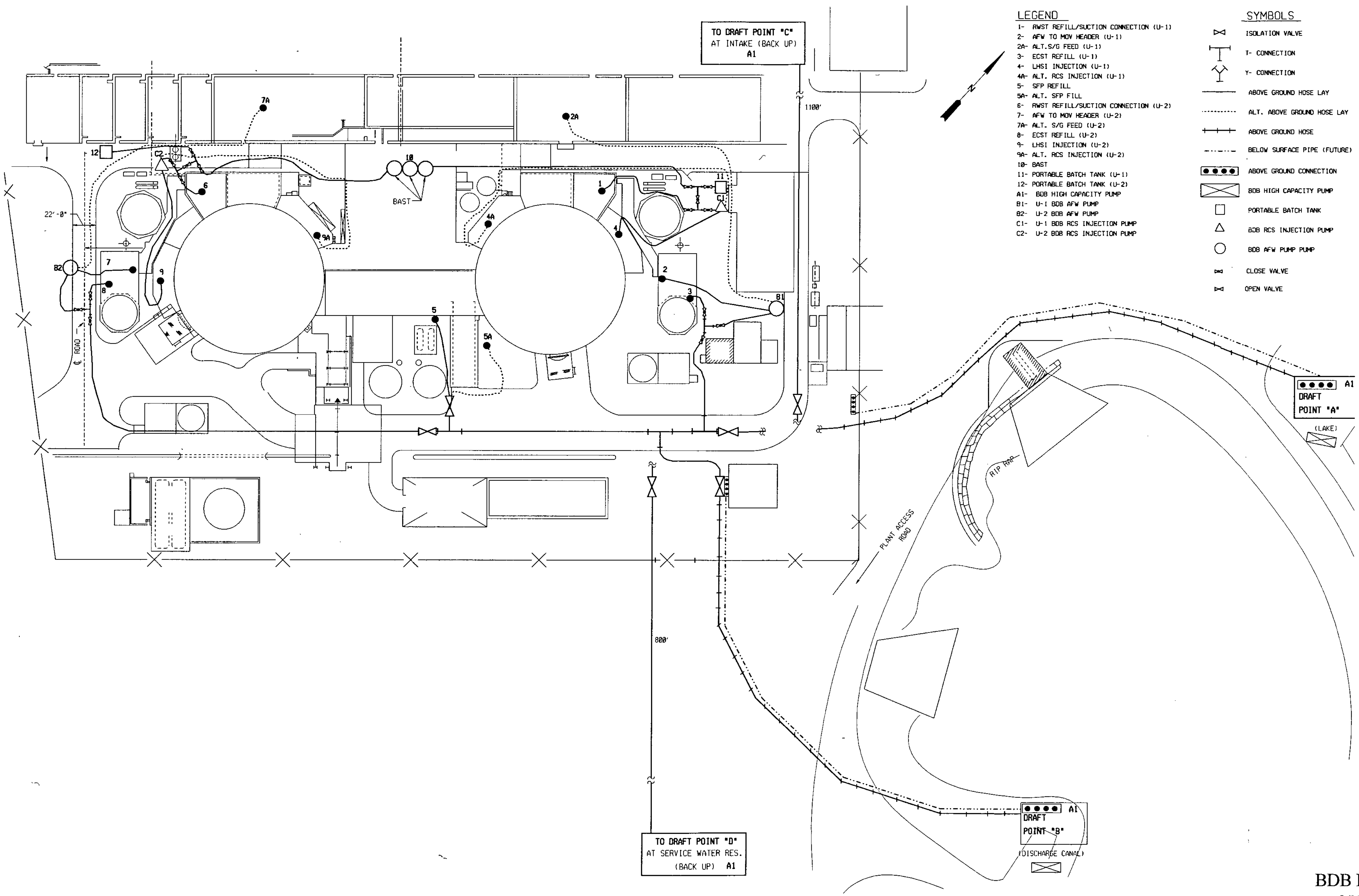


FIGURE 1
BDB EQUIPMENT AND HOSE LAYOUT
NORTH ANNA POWER STATION

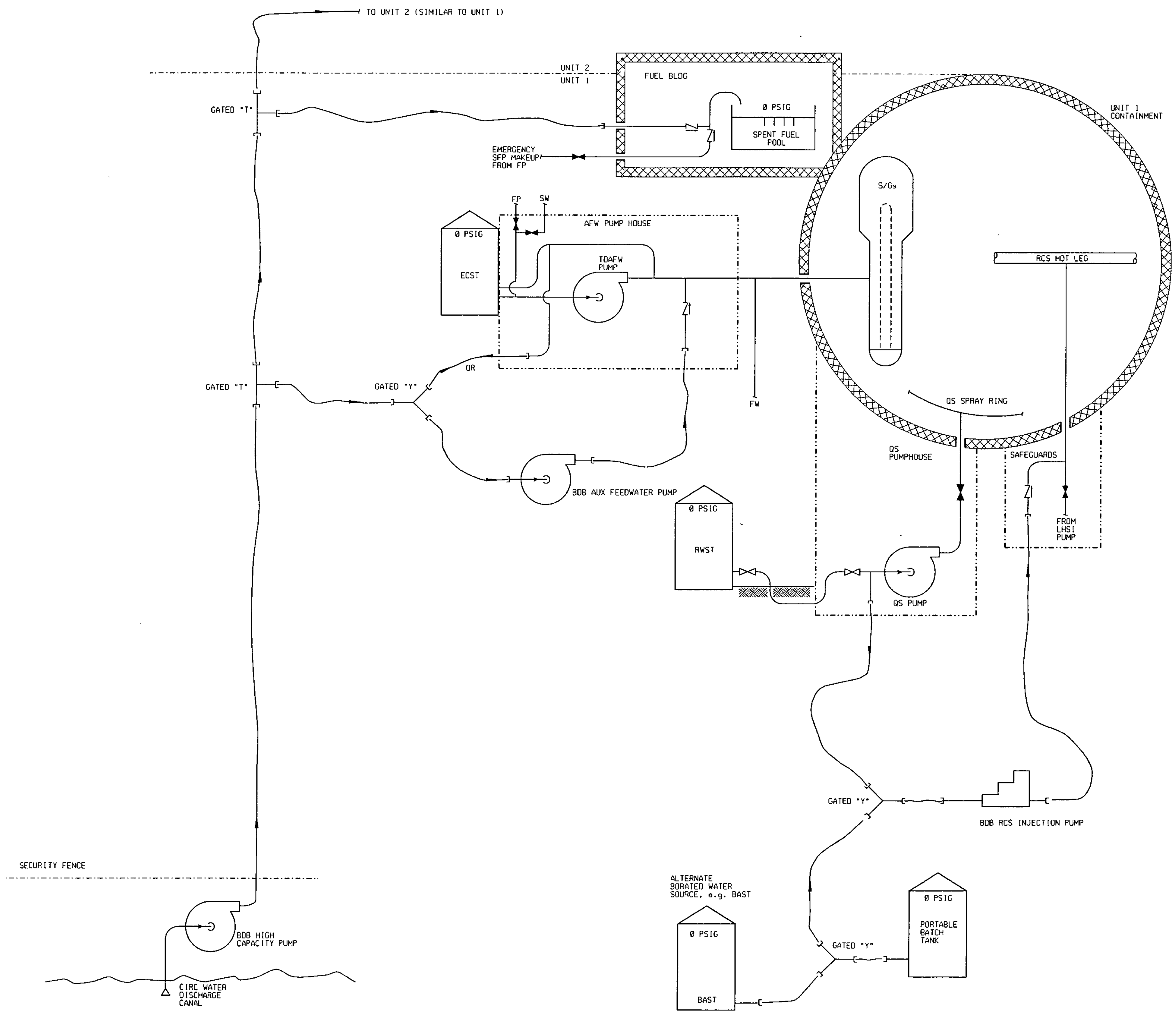


FIGURE 2
BDB FLEX STRATEGY PRIMARY
MECHANICAL CONNECTIONS FLOW DIAGRAM
NORTH ANNA POWER STATION

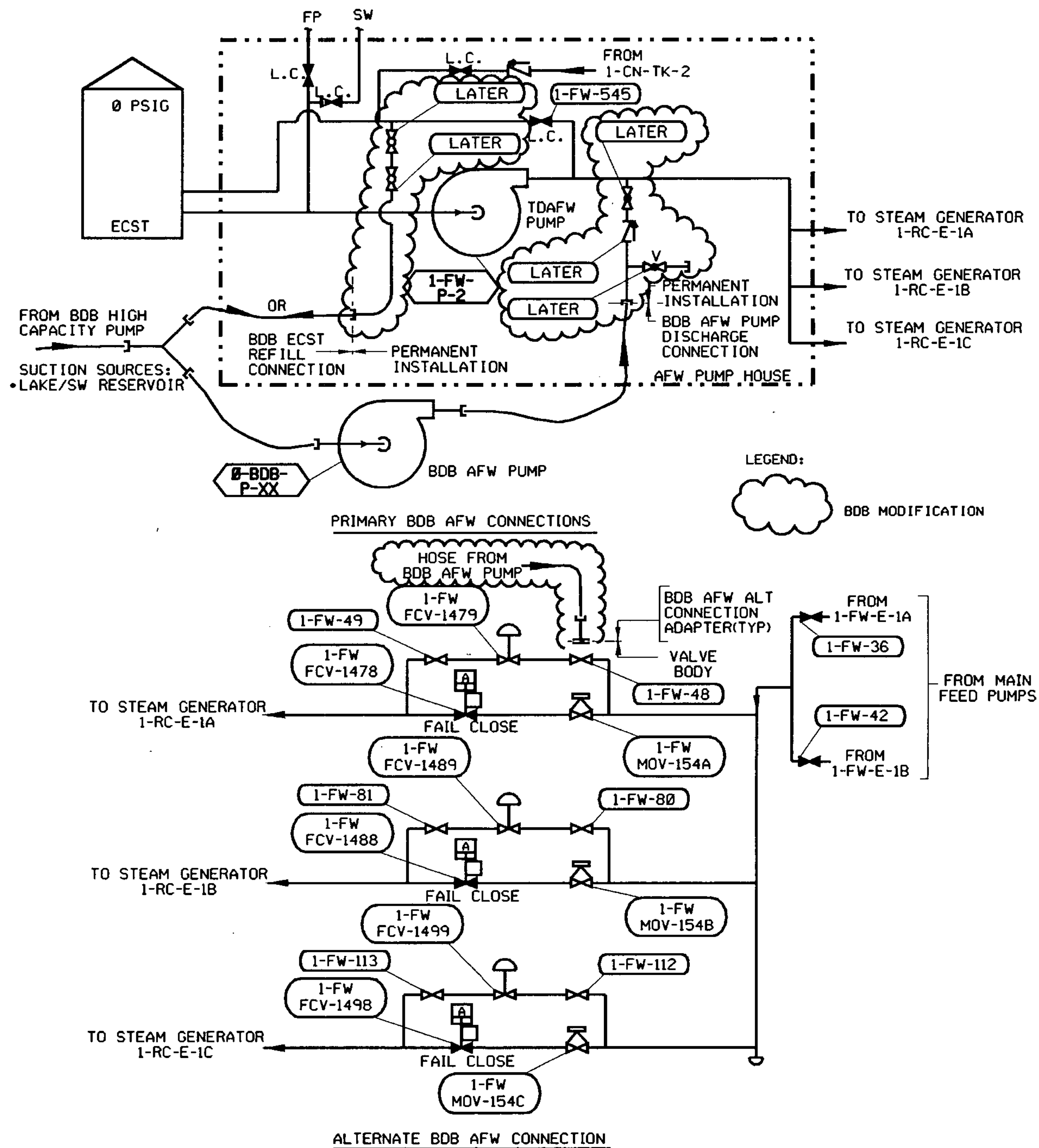


FIGURE 3
CORE COOLING AND DECAY HEAT REMOVAL
PRIMARY AND ALTERNATE MECHANICAL CONNECTIONS
NORTH ANNA POWER STATION

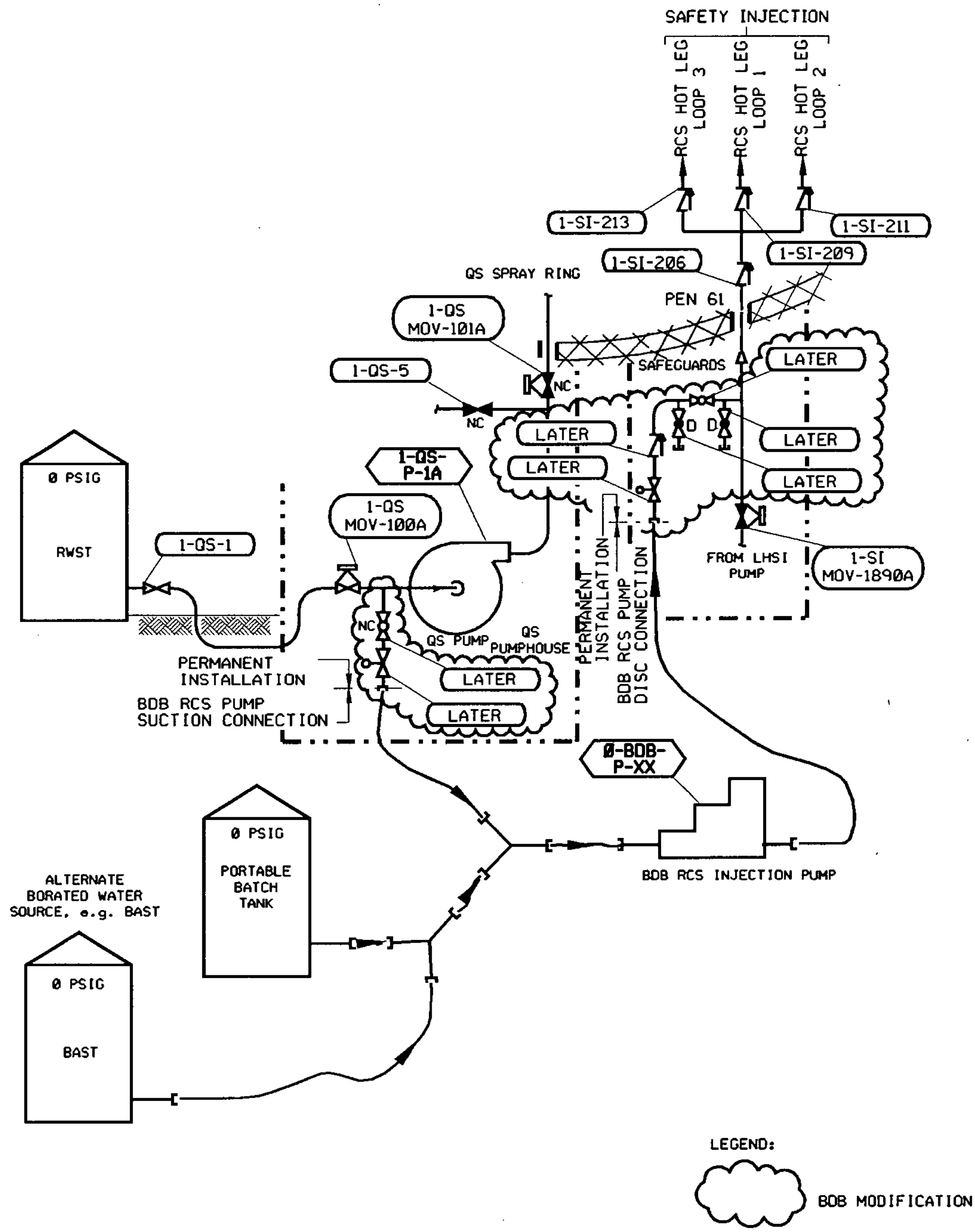


FIGURE 4
RCS INVENTORY AND REACTIVITY CONTROL MAKEUP
PRIMARY MECHANICAL CONNECTIONS
NORTH ANNA POWER STATION

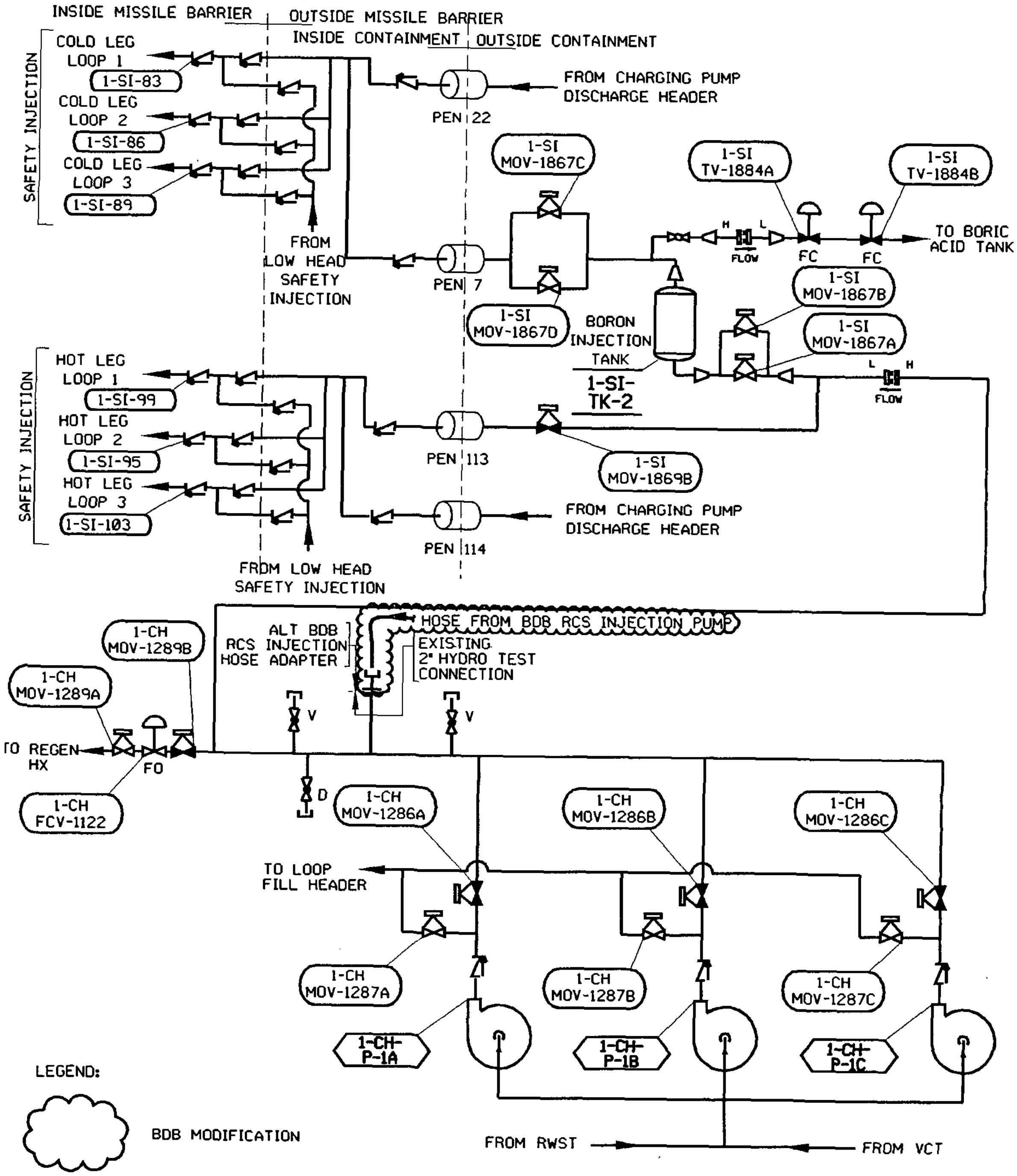


FIGURE 5
RCS INVENTORY AND REACTIVITY CONTROL MAKEUP
ALTERNATE MECHANICAL CONNECTION
NORTH ANNA POWER STATION

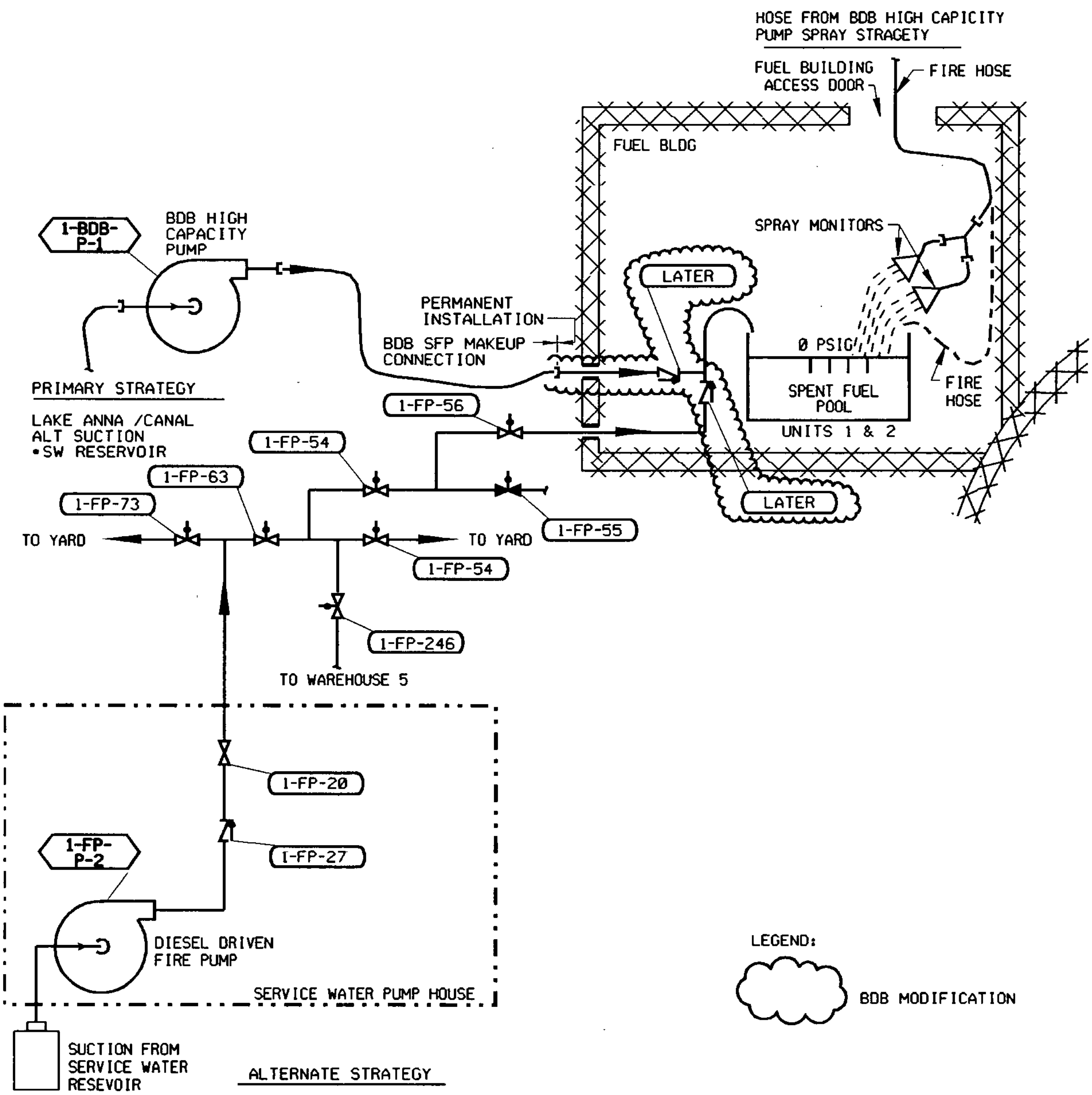


FIGURE 6
SPENT FUEL POOL COOLING
PRIMARY AND ALTERNATE MECHANICAL CONNECTIONS
NORTH ANNA POWER STATION

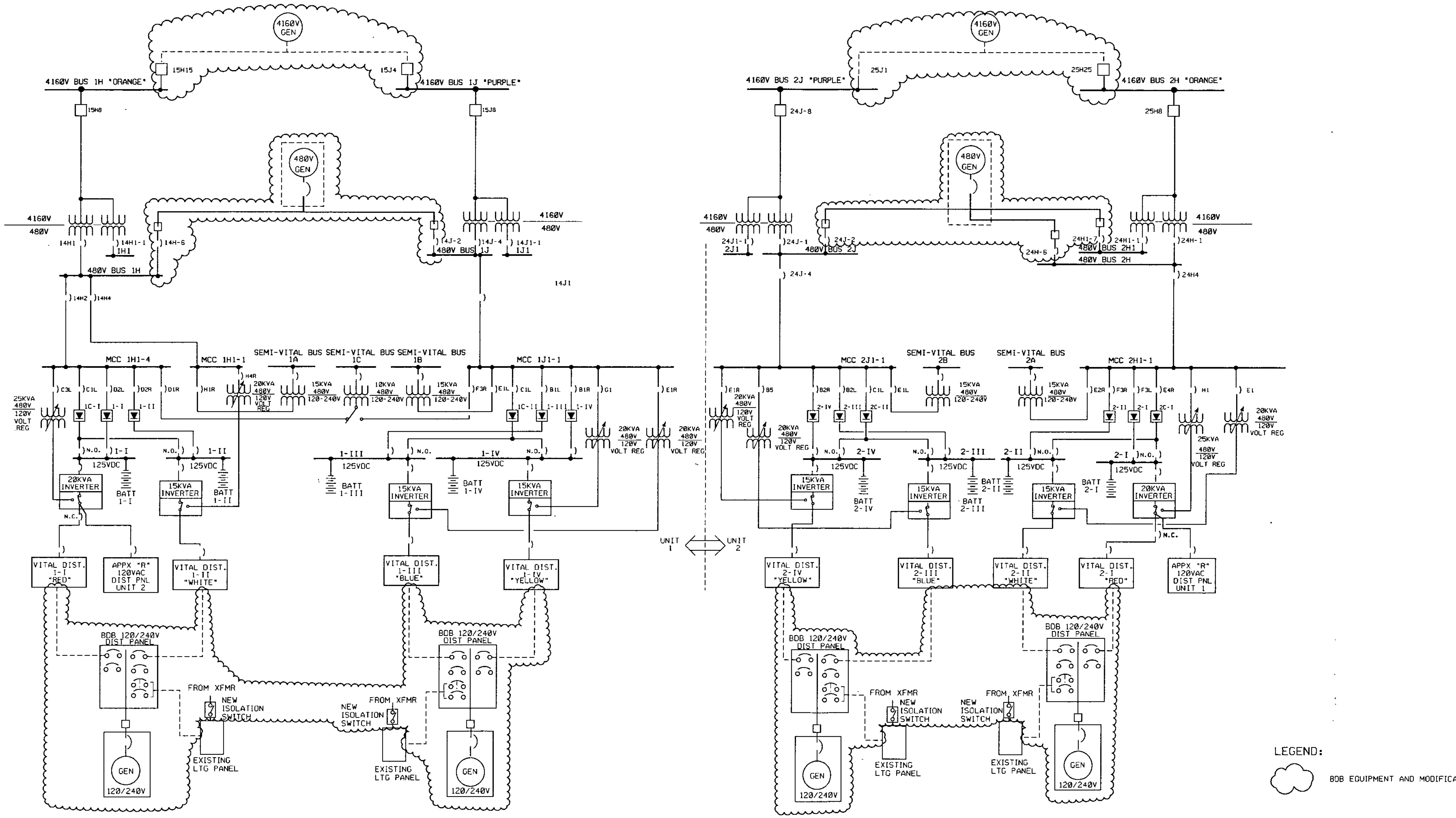
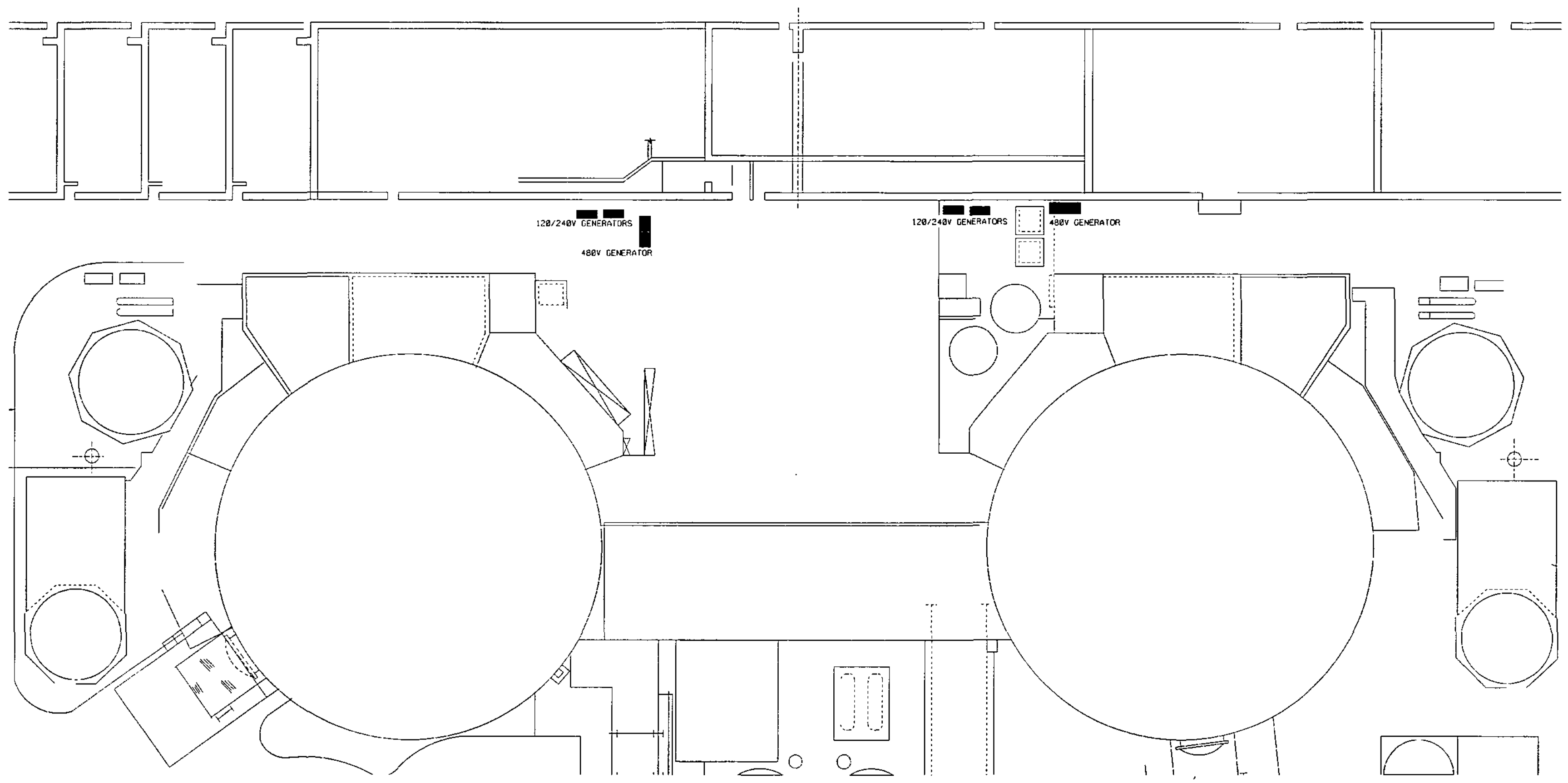
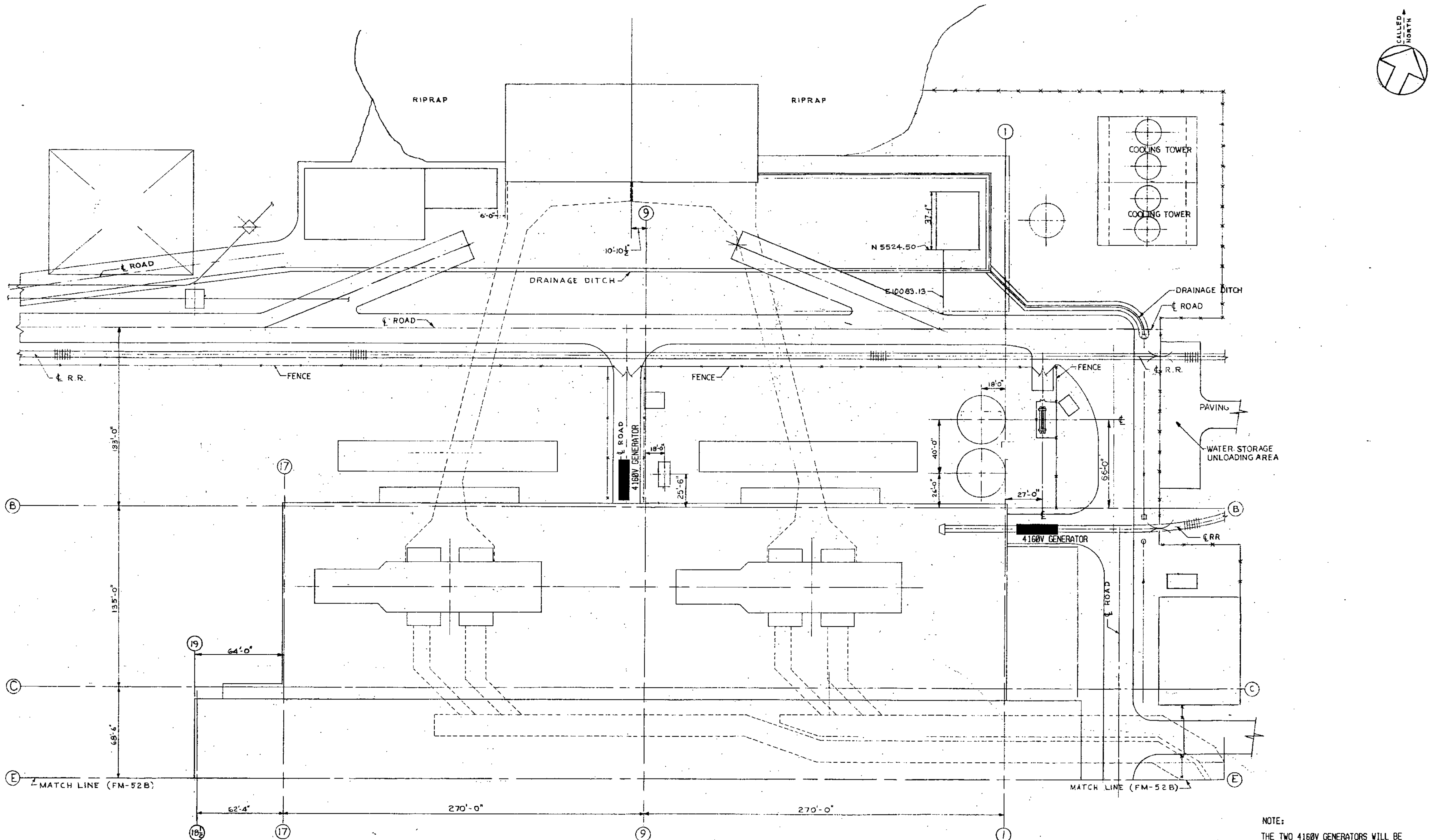


FIGURE 7
BDB FLEX STRATEGY ELECTRICAL
CONNECTIONS ONE-LINE DIAGRAM
NORTH ANNA POWER STATION



NOTE:
1. STAGING LOCATIONS ARE WITHIN THE GENERAL AREAS SHOWN.

FIGURE 8
120/240 AND 480 VAC
ELECTRICAL GENERATOR
DEPLOYMENT LAYOUT
NORTH ANNA POWER STATION



PLAN
SCALE = 1" = 30'-0"

NOTE:
THE TWO 4160V GENERATORS WILL BE DEPLOYED FROM THE REGIONAL RESPONCE CENTERS. TEMPORARY POWER CABLE WILL BE ROUTED TO THE EMERGENCY SWITCHGEAR ROOMS.

FIGURE 9
4160 VAC
ELECTRICAL GENERATOR
DEPLOYMENT LAYOUT
NORTH ANNA POWER STATION

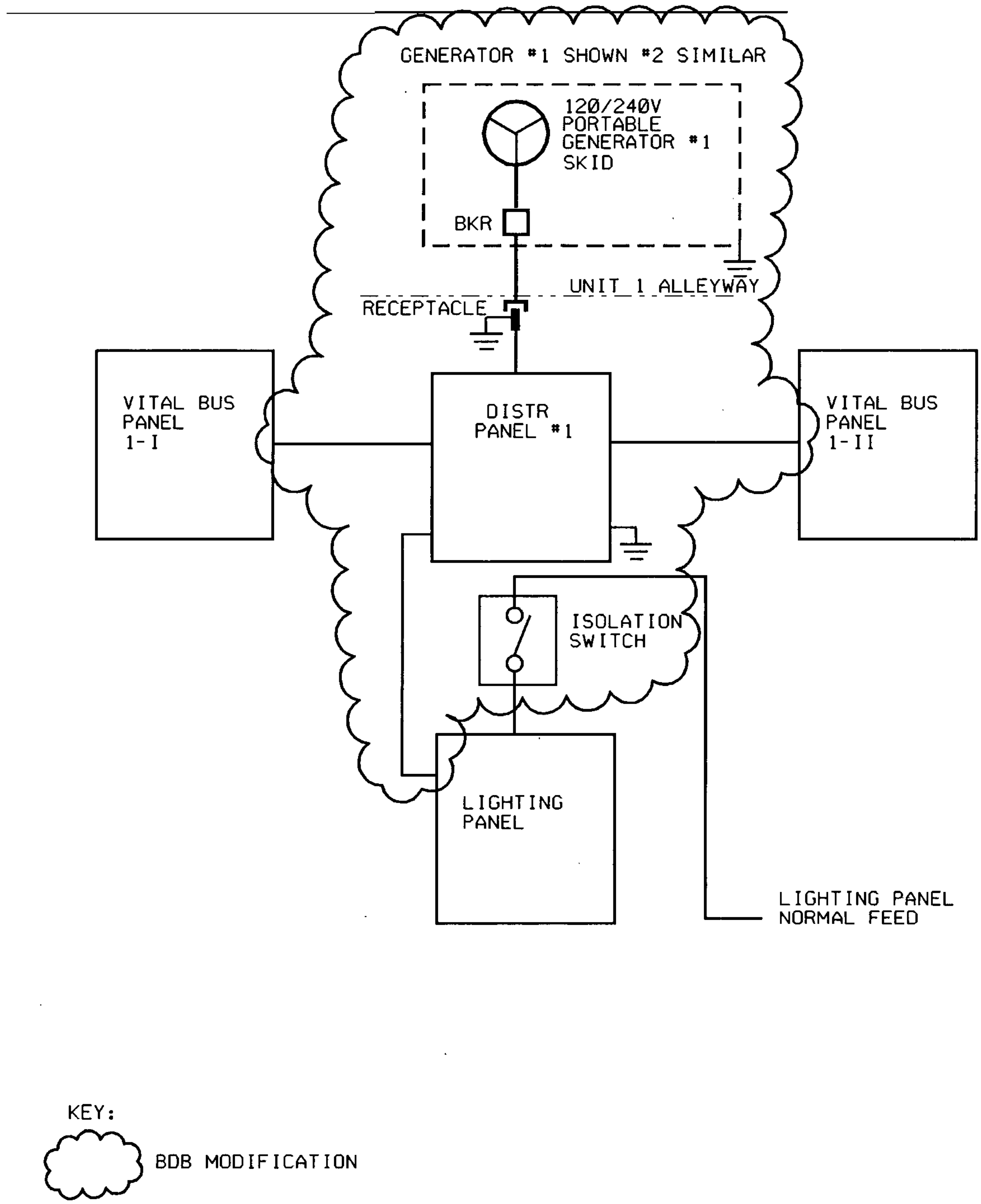


FIGURE 10
120/240 VAC
GENERATOR ELECTRICAL CONNECTIONS
NORTH ANNA POWER STATION

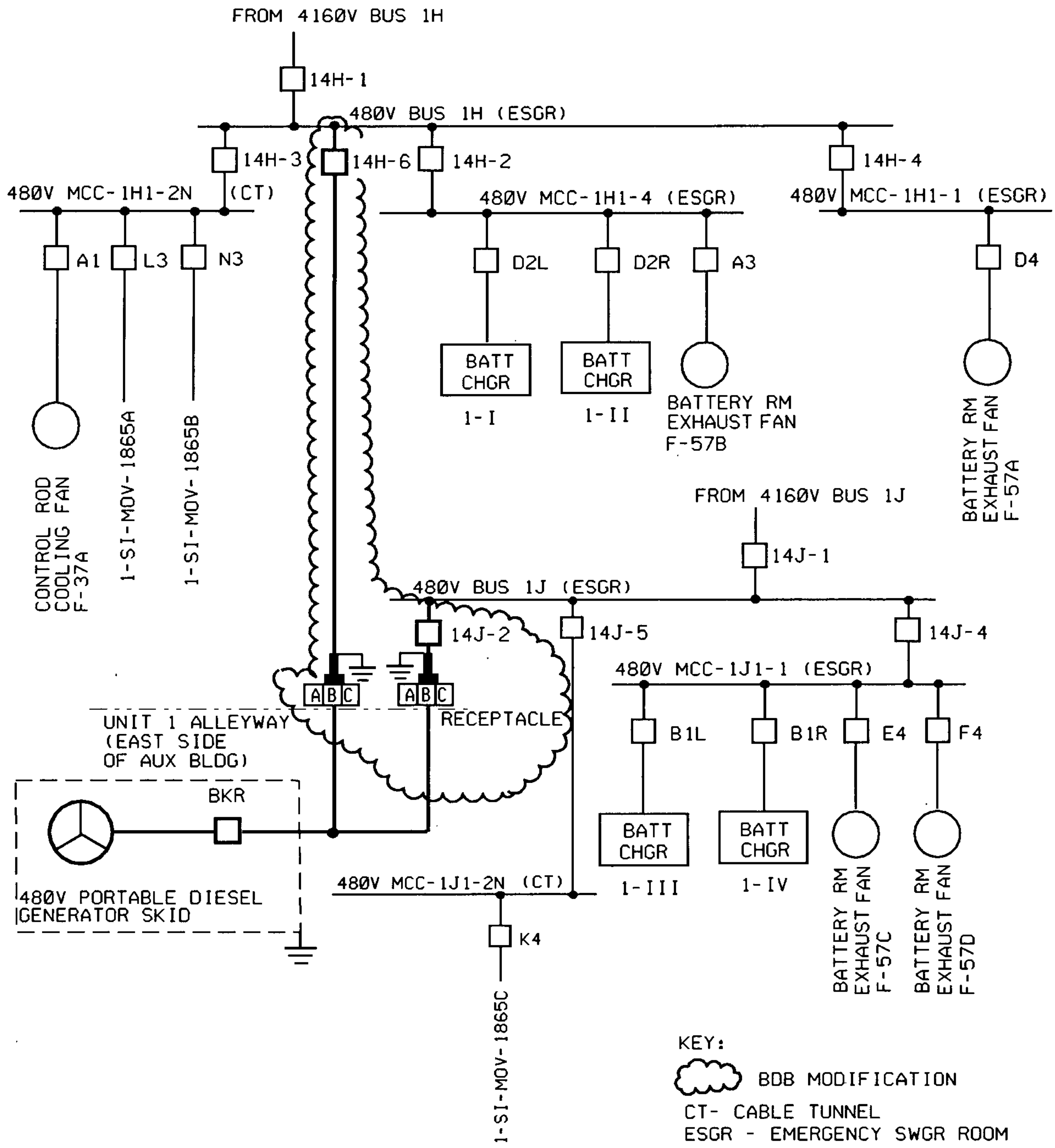


FIGURE 11
480 VAC
GENERATOR ELECTRICAL CONNECTIONS
NORTH ANNA POWER STATION UNIT 1

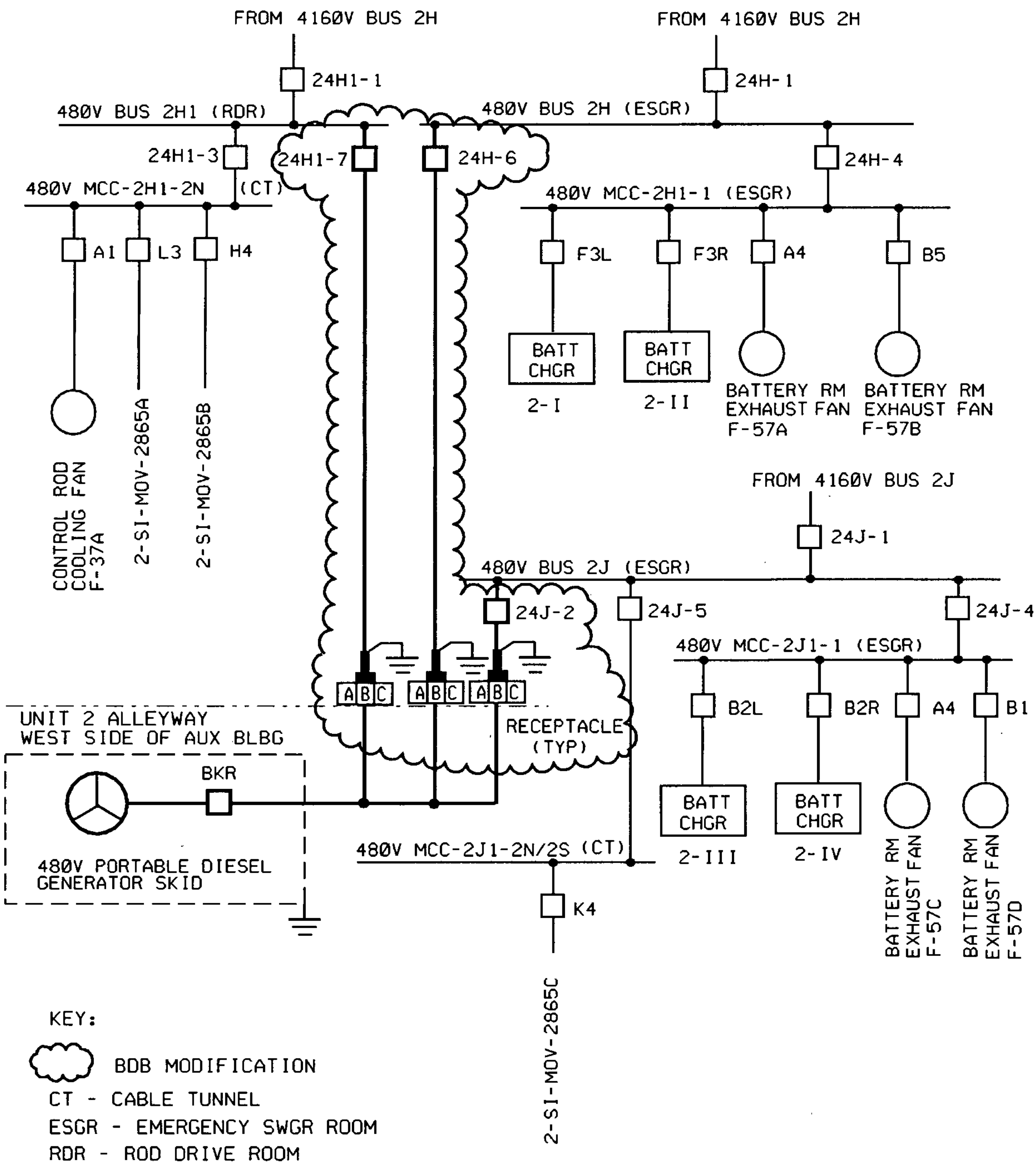


FIGURE 12
480 VAC
GENERATOR ELECTRICAL CONNECTIONS
NORTH ANNA POWER STATION UNIT 2