Exelon Generation.

Order No. EA-12-049

RS-14-009

February 28, 2014

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

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Second Six-Month 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)

References:

1. NRC Order Number EA-12-049, " Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012
2. NRC Interim Staff Guidance JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," Revision 0, dated August 29, 2012
3. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, dated August 2012
4. Exelon Generation Company, LLC'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
5. Exelon Generation Company, LLC 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), dated February 28, 2013 (RS-13-019)
6. Exelon Generation Company, LLC First Six-Month 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 August 28, 2013 (RS-13-117)
7. NRC letter to Exelon Generation Company, LLC, Clinton Power Station, Unit 1 – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC Nos. MF0901), dated December 17, 2013

On March 12, 2012, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order (Reference 1) to Exelon Generation Company, LLC (EGC). Reference 1 was immediately effective and directs EGC 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 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an overall integrated plan pursuant to Section IV, Condition C. Reference 2 endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial status report regarding mitigation strategies. Reference 5 provided the Clinton Power Station, Unit 1 overall integrated plan.

Reference 1 requires submission of a status report at six-month intervals following submittal of the overall integrated plan. Reference 3 provides direction regarding the content of the status reports. Reference 6 provides the first six-month status report pursuant to Section IV, Condition C.2, of Reference 1 for Clinton Power Station. The purpose of this letter is to provide the second six-month status report pursuant to Section IV, Condition C.2, of Reference 1, that delineates progress made in implementing the requirements of Reference 1. The enclosed report provides an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, or need for relief and the basis, if any. The enclosed report also addresses the NRC Interim Staff Evaluation Open and Confirmatory Items contained in Reference 7.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact David P. Helker at 610-765-5525.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 28th day of February 2014.

Respectfully submitted,

Glen T. Kaegi

Glen T. Kaegi
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure:

1. Clinton Power Station, Unit 1 Second Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

cc: Director, Office of Nuclear Reactor Regulation
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Enclosure

Clinton Power Station, Unit 1

Second Six-Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

(33 pages)

Enclosure

Clinton Power Station's Second Six Month Status Report for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events

(33 pages)

1 Introduction

Clinton Power Station developed an Overall Integrated Plan (Reference 1), documenting the diverse and flexible strategies (FLEX), in response to Reference 2. This attachment provides an update of milestone accomplishments since submittal of the Overall Integrated Plan, including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

2 Milestone Accomplishments

None

3 Milestone Schedule Status

The following provides an update to Attachment 2 of the Overall Integrated Plan. It provides the activity status of each item, and whether the expected completion date has changed. The dates are planning dates subject to change as design and implementation details are developed.

Original Target Completion Date	Activity	Status {Include date changes in this column}
	Submit 60 Day Status Report	Complete
	Submit Overall Integrated Implementation Plan	Complete
	Contract with RRC	Complete
Aug 2013	Submit 6 month update	Complete
Feb 2014	Submit 6 month update	Complete with this submittal
Aug 2014	Submit 6 month update	Not Started
Feb 2015	Submit 6 month update	Not Started
	Modification Development	
Mar 2014	• Phase 2 modifications	Started
Dec 2014	Regional Response Center Operational	Started
	Procedure development	
Feb 2015	Strategy procedures	Started

Feb 2015	Validate Procedures (NEI 12-06, Sect. 11.4.3)	Not Started
May 2015	Maintenance procedures	Not Started
Feb 2015	Staffing analysis	Not Started
	Modification Implementation	
May 2015	• Phase 2 modifications	Started
May 2015	Storage plan and construction	Not Started
May 2015	FLEX equipment acquisition	Started
May 2015	Training completion	Not Started
May 2015	Unit 1 Implementation date	Not Started

4 Changes to Compliance Method

Note:

In the discussions below, italics are used to highlight the significant changes.

Change 1

General Integrated Plan Elements BWR - Provide a sequence of events and identify any time constraint required for success including the technical basis for the time constraint. – Item 2 Containment Analysis.

Reason for Change: This discussion is updated to include results from MAAP analysis of the containment strategy using a higher suppression pool temperature as the trigger for suppression pool makeup (SPMU) from the upper containment pool. The increase in the trigger temperature provides additional time to supply the SPMU valves with AC power from a FLEX generator. The change has a negligible effect on the overall containment response.

Change: As part of the implementation plan of NEI 12-06, the BWROG performed evaluations of generic Boiling Water Reactor (BWR) response to Extended Loss of AC Power (ELAP) events to demonstrate the efficacy of the FLEX strategies. Reference 3 provides the results of those evaluations for several representative BWR plant designs.

Several Clinton Modular Accident Analysis Program (MAAP) [Reference 4] cases were run to analyze methods of containment heat removal, including containment venting, suppression pool feed and bleed, and suppression pool cooling using a FLEX strategy. The MAAP cases indicate an alternate suppression pool cooling method provides the fewest operational challenges while providing margin to the primary containment design pressure limit. UHS temperature was designated at 91.4°F in the alternate suppression pool cooling cases.

The following time constraints were used as MAAP input parameters, or were identified in the FLEX suppression pool cooling *MAAP Case 17* results:

a. RPV pressure is reduced to a pressure band of 150-250 psig at a rate of 50°F/hr starting at t_0 + 1 hr.

b. Suppression Pool Heat Capacity Temperature Limit (HCTL) is reached in t_0 + 3.5 hours. Emergency Depressurization is not required since RCIC is being used for level control during SBO conditions per CPS 4402.01, EOP-6 PRIMARY CONTAINMENT CONTROL [Reference 5].

c. Suppression Pool Makeup (SPMU) from the upper containment pool is designated to occur at *190°F* suppression pool temperature to extend the time required to establish the suppression pool cooling lineup, and to allow time for a FLEX generator to provide AC power to the SPMU valves in the containment. *Electrical power to the SPMU valves is available at t_0 + 5.5 hrs.*

d. The suppression pool cooling lineup is designated to occur at t_0 + 8 hrs to provide the maximum time for establishing a suppression pool cooling lineup using a FLEX strategy, while maintaining acceptable containment parameter values. The service water tube side flow from the FLEX pump was designated at 2000 gpm, and the shell side suppression pool flow was designated at 1500 gpm. *These flow rates are within the capacities of the pumps supplying suppression pool and cooling water flow.* The peak suppression pool temperature in this case is *209.41°F* at t_0 + 19.02 hours. This value is well below the acceptable suction temperature established in the BWROG feasibility study for RCIC operation in a prolonged station blackout [Reference 6]. Peak containment pressure is 24.9 psia at t_0 + 45.9 hours, compared to containment design pressure of 29.7 psia.

e. Suppression pool makeup from an external source was designated to maintain level between the values of 23 ft. and 23 ft 9 in. The first injection of makeup occurs at t_0 + 8.02 hours.

Change 2

Maintain Core Cooling - BWR Portable Equipment Phase 2

Reason for Change: This discussion is updated to 1) describe a change in the method used to supply the ADS valves with motive air after the backup air bottles are exhausted, 2) change the RPV pressure assumed for makeup from a FLEX pump from 50 psig to 60 psig, and 3) include a discussion concerning injection of raw water into the RPV.

Change: During Phase 2, high pressure RPV makeup is provided from RCIC and RPV pressure control is provided from RCIC and the SRVs. A pre-staged 480 VAC generator will be lined up to the Division 1 AC distribution system to repower the Division 1 battery charger and enable the continued use of RCIC, SRVs, and vital instrumentation. *An installed Diesel Generator Starting Air Compressor will be aligned to make up to the ADS backup air bottles, if required (Figure 5).*

Alternatively, a separate generator can be lined up to the swing battery charger to maintain the Division 1 DC bus energized [Reference 7].

Once the suppression pool lineup is completed, RCIC suction will be shifted to the RHR heat exchanger shell outlet using installed RHR steam condensing mode piping (Figure 1). This action limits the RCIC system exposure to elevated suppression pool temperature to the first eight hours of the event. The maximum water temperature the RCIC pump is exposed to is 200.7°F according to the MAAP analysis. Once the RCIC suction is shifted the RCIC suction water temperature is 138°F.

To accomplish low pressure RPV makeup when RCIC is no longer available, the suppression pool cooling return path can be directed to the RPV using installed RHR system LPCI valve. Additionally, external water connections will be provided to a location that supports connection to the modified Low Pressure Core Spray (LPCS) [Reference 8] and the Residual Heat Removal (RHR) C [Reference 9] injection header. A pre-staged section of fire hose allows the final connection from the external water supply to the injection header (see Figure 3). The injection valves for these two systems are located outside the primary containment and can be operated manually with the handwheel or electrically via the FLEX generator. *Raw water flow to the RPV from LPCS or RHR-C is directed inside the core shroud. The potential for blockage of fuel bundle flow orifices is minimized using these systems. Additionally, the procedure for low pressure RPV and suppression pool makeup will provide a prioritized list of cleaner water sources using equipment that may be available after the event has occurred [Confirmatory Item 3.2.1.4.B].*

RPV pressure will need to be further reduced to approximately *60* psig with SRVs to achieve the flow rate necessary from the external water connection. The supply to the external water connections is described in the Safety Function Support Phase 2 section. The Suppression Pool Cleanup and Transfer Pump and the external connection will each be capable of meeting the decay heat boil-off rate, plus the assumed system leakage from reactor recirculation pump seals.

Core cooling can be maintained indefinitely with RCIC first, then the suppression pool cooling pump with SRVs controlling RPV pressure, and finally the pre-staged diesel driven pump with SRVs controlling RPV pressure [Reference 4].

Change 3

Maintain Core Cooling - BWR Portable Equipment Phase 2 – Identify Modifications

Reason for Change: Clinton identified a simpler method (Figure 5) of supplying air to ADS valves when the Backup Air Bottles are exhausted.

Change:

Identify modifications	*List modifications*
	• Two diverse external connections for a portable diesel powered pump to supply low pressure RPV makeup water in the plant. • The LPCS and RHR-C injection header flush line will be modified with a connection point for the low pressure water supply. • Piping will be installed to support the connection of the external connections to the LPCS and RHR-C injection headers. • *A tee will be installed in the ADS Backup Air Bottles charging line in the Division 1 Diesel Generator room to allow an installed Division 1 or Division 2 Diesel Generator Starting Air Compressor to supply motive air to ADS valves when the backup air bottles are exhausted.* • The electrical support and cooling/makeup water support modifications needed for the core cooling function are discussed in the Safety Function Support section.

Change 4

Maintain Core Cooling - BWR Portable Equipment Phase 2 - Storage / Protection of Equipment

Reason for Change: Provide more detail concerning storage and protection of equipment.

Change: A table addressing the guidance in NEI 12-06 Sections 6 through 9 is included in Attachment 2.

Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent buildings is contained in Section 3 of this document, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to Clinton Power Station. *With respect to a seismic event, the storage plan does not require clearing debris from a haul path since the FLEX pumps and generators are pre-staged near their connection points. FLEX cables, hoses and permanent plant equipment used in the mitigating strategies are all designed to be protected from the seismic event, or will be analyzed or upgraded to ensure their survival.*
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* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent buildings is contained in Section 3 of this document, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to Clinton Power Station. *With respect to flooding, the storage building housing the FLEX pumps will not be protected up to the PMF elevation. Sufficient time will be available to relocate the FLEX pump to a higher elevation in advance of the rising lake level. The haul path for relocating the FLEX pump will not be affected by the flood. Since the FLEX pump connection will be submerged, hoses with sufficient capacity to provide the required flow rate will be deployed with the FLEX pump. The hoses will connect to the Regional Response Center connection point to supply the required flow for the mitigating strategies. Station procedures governing high lake level will contain guidance for maintaining ELAP response capability during a flooding event.*
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent buildings is contained in Section 3 of this document, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be

	developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to Clinton Power Station.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent buildings is contained in Section 3 of this document, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to Clinton Power Station. *With respect to snow, ice, and extreme cold, the storage plan does not require clearing snow or ice from a haul path since the FLEX pumps and generators are prestaged near their connection points. All operator actions during the first hours of the event are performed indoors; either inside the plant or inside the FLEX storage building at the Screen House.*
High Temperatures	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent buildings is contained in Section 3 of this document, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to Clinton Power Station.

Change 5

Safety Functions Support - BWR Portable Equipment Phase 2

Reason for Change: This discussion is updated to correct the electrical deployment timeline and tie it to energizing the 480 VAC MCC that supplies the SPMU valves.

Change:

Electrical Support

Key portions of the Division 1, Division 2, and non-divisional 480 VAC distribution system will be able to be re-energized from a pre-staged primary or alternate FLEX generator. Either generator independently will enable maintaining DC power for RCIC, SRV controls and vital instrumentation, and provide AC power for hydrogen igniters, SPMU valves and Suppression Pool Cleanup and Transfer pumps (Figure 4).

The primary and alternate FLEX generator and cabling will be permanently housed in the Unit 2 side of the Control and Diesel Generator buildings, so deployment will not be impeded by a beyond design basis external event (BDBEE). Where necessary to meet the requirements of the timeline, some connecting cabling will be pre-routed from the vicinity of the primary and alternate FLEX generators to the vicinity of the required 480 VAC unit substations which will have connection points for an external source of power. Where supported by the timeline and staffing, some cabling will be manually deployed at the time of the event.

Once the event is identified as an ELAP/LUHS, operations personnel will line up and start the primary or alternate FLEX generator and perform a lineup that enables key 480 VAC components, including the SPMU valves and Division 1 battery charger, to be re-energized by *t_0+5.5 hrs.*

Change 6

Safety Functions Support - BWR Portable Equipment Phase 2 – Deployment Conceptual Design

Reason for Change: This discussion is updated to describe the deployment methods for electrical and mechanical connections.

Change:

Deployment Conceptual Design (Figure 7 contains a deployment conceptual sketch)		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
	Electrical Support (Figure 4)	
The primary and alternate FLEX generator will be permanently staged and do not require deployment. Pre-staged cabling will be deployed from the FLEX generator to the Unit Substations that supply the components needed to meet the FLEX timeline.	• A permanently staged primary and alternate 480 VAC generator able to supply necessary portions of the 480 VAC distribution system to repower the Division 1 battery charger *or the swing battery charger* and other needed AC loads. • *Two electrical connection points able to supply necessary portions of the 480 VAC distribution system from an external source to repower the Division 1 battery charger or the swing battery charger to supply DC MCC 1A, and other needed AC loads.* • Pre-routed *and pre-staged* cabling with cam-lock connectors	***Phase 2*** *The FLEX electrical connections will be completed inside the Diesel Generator Building, which is protected from all external hazards.* ***Phase 3*** *The electrical connection for an external generator from the Regional Response Center (RRC) to the required portions of the installed 480 VAC system will be deployed , if needed, from within the Diesel Generator Building through an engineered opening in external wall to the outside "A2" staging area.* *An alternate connection point and cabling will be located inside*

		the protected Control Building.
Cooling/Makeup Water Support (Figure 3)		
The diesel driven pumps will be housed in a storage structure that meets NEI 12-06 Rev.0 storage requirements. A heavy duty truck capable of clearing debris will be stored in the same location.	Two external water connections.	***Phase 2*** *The FLEX mechanical connections will be completed inside the Control Building, which is protected from all external hazards.* ***Phase 3*** *The mechanical connection for an external pump from the Regional Response Center (RRC), if needed, to the SX system will be inside a robust building on the Unit 2 side of the Screen House adjacent to the "A1" staging area.* *An alternate connection will be deployed from within the Diesel Generator Building through an engineered opening in the external wall to the outside "A2" staging area using a hose pre-staged for this purpose inside the protected Diesel Generator Building.*
The proposed means of routing the water from the UHS to the plant is via the unused seismically robust Unit 2 SX piping.	Connection to the Unit 2 SX supply piping from the UHS FLEX pump.	

Change 7

Attachment 1A - Sequence of Events Timeline

Reason for Change:

1. The timeline for energizing key components from a FLEX generator was set at t_0 + 5 hrs. This was overly restrictive since the DC coping analysis [Reference 10] extended Division 1 battery life to 6 hours. The coping analysis itself was conservative in that 6 hours includes consideration of a battery aging factor. Eliminating the battery aging factor extends the coping time further to 8 hours.
2. An additional MAAP run (Case 17) was performed to analyze the effect on containment response of moving the SPMU trigger from 180°F to 190°F suppression pool temperature. 190°F corresponds to approximately 5.5 hours on the timeline.
3. Preliminary calculation of diesel generator fuel consumption rate and tank capacity should provide a minimum of 10 hours of run time. Assuming the generator is started at 4 hours, refueling is required at T_0+14 hours.

Change: The time to open the SPMU valves occurs on the timeline at t_0 + 5.5 hrs. This is the time at which a FLEX generator needs to be aligned to energize key 480 VAC busses. FLEX fuel oil supply shifted from T_0+8 hrs. to T_0+14 hrs. since the generator and pump fuel capacities will provide at least this much time.

Action item	Elapsed Time	Action	Time Constraint Y/N	Remarks / Applicability (if blank then no change from OIP submittal)
	0	Event starts, Scram, Recirc Pumps Trip	NA	
1	Level 2 +30 sec	RCIC has started and begins to inject	NA	
2	10 min	Control level and pressure per procedures	Y	
3	29 min	Bypass RCIC leak detection isolation logic	Y	
4	1 hr	Defeat Low RCIC Steam Supply Pressure Isolation per CPS 4410.01C001, Defeating RCIC Interlocks	N	
5	1 hr	Initiate CPS 4200.01C003, Monitoring CNMT Temperatures During A SBO	N	
6	1 hr	Complete CPS 4200.01C002, DC Load Shedding During A SBO	Y	
7	1 hr	Initiate Beyond Design Basis FLEX Strategies	Y	
8	1 hr	Begin RPV depressurization to 150 psig with SRVs at 50°F/hr. Control RPV pressure between 150 and 250 psig.	Y	
9	1 hr	Commence Lining Up FLEX generator	N	
10	2 hr	Commence UHS Pump Deployment	N	
11	2 hr	Place ADS Backup Air Bottles in service per CPS 3101.01, Main Steam (MS, IS & ADS).	Y	
12	5.5 hr	Energize MCC 1A3	N	
13	*5.5 hr*	*Open the SPMU valves*	*Y*	*Time derived from allowing suppression pool temperature to reach 190°F before dumping the upper containment pool. Containment response analyzed in Rev 3 of the MAAP analysis.*
14	5.5 hr	Energize MCC 1A1	N	

15	5.5 hr	Startup Div 1 Battery Charger and supply DC MCC 1A	Y	
16	5.5 hr	Energize Hydrogen Igniter Distribution Panel (MCC 1A1)	N	
17	5.5 hr	Energize DG MCC 1A and Standby Lighting Cabinet 1LL70EA	N	
18	6 hr	Open RCIC room doors	Y	
19	8 hr	Place FLEX suppression pool cooling strategy in service	Y	
20	8 hr	Makeup to Suppression Pool as needed	Y	Time changed from 12 hours to 8 hours in the August 2013 update.
21	*8 hr*	*FLEX pump available for RPV makeup*	*N*	*Confirmatory Item 3.2.1.3.A*
22	12 hr	Initiate supplemental MCR ventilation per CPS 4200.01C001, MCR Cooling During A SBO	N	
23	12 hr	Commence Spent Fuel Pool makeup (>86 gpm) as needed	Y	
24	12 hr	Establish Fuel Bldg steam vent path	N	
25	*14 hr*	*Connect Div 1 Day Tank 120 VAC portable pump*	*Y*	*Preliminary calculation of fuel consumption rate and tank capacity should provide a minimum of 10 hours of run time. Assuming the generator is started at 4 hours, refueling is required at T_0+14 hours.*
26	24 hr	Commence recharging the ADS backup air bottles with a FLEX air compressor	Y	
27	24 hr	First piece of RRC equipment arrives at the staging area	N	
28	30 hr	Establish RCIC Pump Room compensatory action (portable fan)	Y	
29	24-72 hr	Continue to maintain critical functions of core cooling (via RCIC), containment (via alternate suppression pool cooling) and SFP cooling (FLEX pump injection to SFP). Utilize initial RRC equipment in spare capacity.	N	

Change 8

Attachment 3 – Conceptual Sketches

Reason for Change: Changes to deployment plan and system alignments required updated sketches.

Change:

Figures 1 through 7 of this document.

Change 9

Extent to which the guidance, JLD-ISG-2012-01 and NEI 12-06, are being followed.

Reason for Change: Address Open Item 3.2.4.8.A in the Clinton Interim Staff Evaluation.

Change:

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**	*The use of pre-staged FLEX generators is an acceptable alternate approach to NEI 12-06 and JLD-ISG-2012-01 for complying with Order EA-12-049 for the following reasons:* *The location chosen for pre-staging the generators is protected from each of the hazards delineated in NEI 12-06. The guidance Section 11.3.2 for storage of FLEX equipment provides for storing equipment such that it can be operated in place. Additionally, the portable and mounted electrical boxes and cables used to connect the FLEX generator to the installed 480 VAC distribution system are stored in accordance with NEI 12-06 Sections 5 through 9 in the same area as the generators.* *The decision to pre-stage the generators in the location that would otherwise be the deployment destination provides the operators with the fewest challenges implementing the electrical strategy. The Mark III containment strategy for Clinton requires 480 VAC power at t_0 + 5.5 hours and suppression pool cooling in service using a FLEX pump to supply essential service water to an RHR heat exchanger in t_0 + 8 hours. Pre-staging the generators allows resources to be applied to establishing the required electrical and mechanical lineups that would otherwise be used deploying the generator from a remote location.*

5 Need for Relief/Relaxation and Basis for the Relief/Relaxation

Clinton Power Station expects to comply with the order implementation date and no relief/relaxation is required at this time.

6 Open Items from Overall Integrated Plan and Draft Safety Evaluation

The following tables provide a summary of the open items documented in the Overall Integrated Plan or the Draft Safety Evaluation (SE) and the status of each item.

Overall Integrated Plan Open Item	Status
Initial calculations were used to determine the fuel pool timelines. Formal calculations will be performed to validate this information during development of the spent fuel pool cooling strategy detailed design, and will be provided in a future six (6) month update.	[Not Started]
Analysis of deviations between Exelon's engineering analyses and the analyses contained in BWROG document is expected to be completed, documented on Attachment 1B, and provided to the NRC in the August 2013 six (6) month status update.	[Completed]
The times to complete actions in the Events Timeline are based on operating judgment, the conceptual designs, and the current supporting analyses. The final timeline will be time validated once detailed designs are completed, procedures are developed, and the results will be provided in a future six (6) month update.	[Not Started]
Identification of storage locations and creation of the administrative program are open items. Closure of these items will be documented in a six (6) month update.	[Not Started]
Habitability conditions will be evaluated and a strategy will be developed to maintain Main Control Room habitability. The strategy and associated support analyses will be submitted in a future six (6) month update.	Will be tracked under Confirmatory Items 3.2.4.2.B and 3.2.4.6.A. [Closed]
Battery room conditions will be evaluated and a strategy will be developed to maintain acceptable conditions. The strategy and associated support analyses will be submitted in a future six (6) month update.	Will be tracked under Confirmatory Item 3.2.4.2.A. [Closed]
Inverter room conditions will be evaluated and a strategy will be developed to maintain acceptable conditions. The strategy and associated support analyses will be submitted in a future six (6) month update.	Will be tracked under Confirmatory Item 3.2.4.2.C. [Closed]
The need for further analysis of fuel building conditions during an ELAP/LUHS and mitigating actions is an open item. Closure of this item will be documented in a future six (6) month update.	Will be tracked under Confirmatory Item 3.2.2.A. [Closed]
Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to Clinton Power Station.	[Not Started]

Draft Safety Evaluation Open Items		
Item Number	**Description**	**Status**
3.1.4.2.C	No information was provided in the Integrated Plan to address the ultimate heat sink and the potential that the flow path may be affected by ice blockage or formation of frazil ice due to extreme low temperatures.	The FLEX pump will take suction from an existing opening on the Screen House deck that was designed for a Unit 2 Shutdown Service Water (SX) Pump. This location bypasses the Unit 1 traveling screens and is not susceptible to frazil ice. It is not susceptible to ice blockage since the inlet to the Screen House is at elevation 670', 5 feet below the design water level of the UHS. The occurrence of an estimated ice thickness of 10" in the intake area when the water level is at elevation 675' would not block the flow into the Screen House. The availability of the FLEX pump water supply will not be affected by ice formation in the Screen House area. Additional protection against any probable ice blockage in the intake area is provided with the installation of a warming line at the inlet to the Screen House, designed to maintain a minimum water temperature of 40°F during winter operation. [Complete]
3.2.4.8.A	On page 6 of their six-month update, dated August 28, 2013 (Agencywide Documents Access and Management System (ADAMS) ML 13241 A241), the licensee states that they are proposing to pre-stage both the primary and alternate FLEX generator in the Unit 2 side of the Control/Diesel Generator building. This use of pre-staged generators appears to be an alternative to NEI 12-06. In a future submittal update the licensee will need to document the proposed method as an alternate to NEI 12-06, along with a stronger justification addressing how the approach maintains the flexibility to respond to an undefined event and provide power to the necessary equipment.	See Change 9 in this document. [Complete]

Draft Safety Evaluation Confirmatory Items		
Item Number	**Description**	**Status**
3.1.1.1.A	Each section of the Integrated Plan describing protection of equipment from the hazards makes reference to NEI 12-06, Section 11 rather than to the protection guidance described in NEI 12-06 for the applicable hazard; that is 6.2.3.1 for floods, 7.3.1 for wind, etc. The licensee's proposed protection strategy needs to be specific for each hazard.	See Attachment 2 of this document. [Complete]
3.1.1.2.A	The Integrated Plan did not provide sufficient information to conclude that for each mitigation strategy discussed, operators would have access only through seismically robust structures to deploy the strategy. As an example, on page 27 of the Integrated Plan, the deployment plan describes using hoses to connect the FLEX alternate suppression pool cooling pump to the suppression pool and RHR heat exchanger connections. Licensee needs to address this issue generically.	The deployment plan for each of the mitigating strategies requires personnel access and hose/cable routing through only seismically robust structures. [Complete]
3.1.1.2.B	It was not evident from the review of the Integrated Plan whether or not electrical power would be necessary to move or to deploy mitigation strategies (e.g., to open the door from a storage location). If necessary, provisions would be necessary to provide that power source.	The design of the storage building at the Screen House will specify access doors that can be manually operated. If this proves to be impractical, then a portable generator will be stored in the building to provide the necessary electrical power. [Complete]
3.1.1.3.A	The licensee should develop a reference source that provides approaches for obtaining necessary instrument readings for instruments in addition to the existing guidance for the suppression pool temperature instrument. The suppression pool cleanup and transfer pumps will require a strategy to provide control power to the pump motor supply breakers.	Containment and Drywell temperature readings are included in the procedure for obtaining Suppression Pool temperature readings. Suppression Pool Cleanup and Transfer Pump supply breakers can be closed manually without DC power. [Complete]
3.1.1.3.B	The licensee discussed how internal flooding is mitigated for ECCS pump cubicles, but it is not clear whether or not other mitigation strategies may be susceptible to the internal flooding hazard.	Results of internal flooding analysis will be included in the August 2014 update. [Started]
3.1.1.4.A	With regard to the use of off site resources, no information was provided regarding the identification of the local arrival	Refer to Figure 7. The B Staging Area is shown on the north side of the

	staging area or a description of the methods to be used to deliver the equipment to the site. During the audit process, the licensee stated that information will be provided in a future 6-month update to address the issue.	property. Two access routes into the protected area are shown, and each of those routes can reach the A Staging Areas (A1 for UHS access and primary water connection, A2 for an electrical and alternate water connection). [Complete]
3.1.2.1.A	On page 4, in the section of its Integrated Plan regarding key assumptions associated with implementation of FLEX strategies, the licensee explained that primary and secondary storage locations for FLEX equipment have not been selected. Storage locations must be selected that protect FLEX equipment from all hazards.	FLEX pumps and associated equipment will be stored in a robust structure at the Unit 2 side of the Screen House. FLEX generators and associated cabling will be stored in the robust Diesel Generator, Control, and Auxiliary buildings. [Complete]
3.1.2.2.A	With regard to deployment during flood conditions, the licensee stated that transportation routes from the equipment storage area to the FLEX staging areas are not yet identified. The licensee also stated that the identification of storage areas is part of a self identified open item.	During flooding conditions the FLEX pumps will be moved from the storage building at the Screen House and relocated to higher ground, in advance of the rising lake level, on the Screen House access road. (See Figure 7) [Complete]
3.1.2.2.B	The Integrated Plan did not address the potential need to remove accumulated water from structures in the event that installed sump pumps are not available.	Diesel powered trash pumps will be stored in the robust Control Building. Accumulated water can be pumped to the unused Unit 2 Diesel Generator Fuel Oil Storage Tank rooms in the Diesel Generator Building basement. [Complete]
3.1.2.3.A	The administrative program and procedures for deployment from storage and staging areas in flood conditions or after a tornado are not yet developed.	The administrative program and procedures for deployment from storage and staging areas in flood conditions or after a tornado will be described in a future 6-month update. [Not Started]
3.1.4.2.A	The licensee does not address the effects of snow, ice, and extreme cold on the ability of plant personnel to perform manual operations.	All manual actions in the early hours of the event are performed indoors, either in the plant or in the FLEX storage building. Appropriate clothing will be pre-staged for outdoor actions, such as refueling the FLEX DG and

		Pump. [Complete]
3.1.4.2.B	Although debris removal and haul requirements are addressed as previously discussed in this report, there is insufficient information in the Integrated Plan to conclude the licensee will conform to guidance with respect to the removal of snow and ice from haul pathways and staging areas.	The site Snow Removal Plan will be revised to staff appropriately when there is a significant threat to off-site power sources. [Started]
3.2.1.1.A	Need benchmarks to demonstrate that the Modular Accident Analysis Program (MAAP4) is the appropriate code for simulation of ELAP.	Information that validates the use MAAP4 will be included in a future 6-month update. [Started]
3.2.1.1.B	Collapsed level must remain above Top of Active Fuel and cool down rate must meet technical specifications.	Information that validates the use MAAP4 will be included in a future 6-month update. [Started]
3.2.1.1.C	MAAP4 use must be consistent with June 2013 position paper.	Information that validates the use MAAP4 will be included in a future 6-month update. [Started]
3.2.1.1.D	In using MAAP4, the licensee must identify and justify the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP4 Application Guidance, Desktop Reference for Using MAAP4 Software, Revision 2" (Electric Power Research Institute Report 1020236).	Information that validates the use MAAP4 will be included in a future 6-month update. [Started]
3.2.1.1.E	The specific MAAP4 analysis case that was used to validate the timing of mitigating strategies in the Integrated Plan must be identified and should be available on the ePortal for NRC staff to view. Alternately, a comparable level of information may be included in the supplemental response.	Information that validates the use MAAP4 will be included in a future 6-month update. [Started]
3.2.1.3.A	The sequence of events timeline is not final. The licensee stated that the final sequence of events timeline will be time validated once detailed designs are completed and procedures are developed. The licensee stated that the results will be provided in a future 6-month update.	Results of timeline vaidation will be included in a future 6-month update. [Not Started]
	Also, the final sequence of events timeline needs to identify when the FLEX pump is staged to supply backup for RCIC.	FLEX pump availability for RCIC backup included in Change 7 of this document. [Complete]
3.2.1.4.A	The licensee has not yet completed the analyses to	FLEX pump flow analysis will be

	demonstrate adequate head and flow will be provided by the FLEX pumps for cooling strategies.	included in a future 6-month update. [Started]
3.2.1.4.B	The concerns related to raw water injection by FLEX strategies are being addressed by the Boiling Water Reactor Owners Group and the resulting evaluation will be included in a future 6-month update.	Raw water flow to the RPV from LPCS or RHR-C is directed inside the core shroud. The potential for blockage of fuel bundle flow orifices is minimized using these systems. Additionally, the procedure for low pressure RPV and suppression pool makeup will provide a prioritized list of cleaner water sources using equipment that may be available after the event has occurred. [Complete]
3.2.1.5.A	Additional information is needed to address the associated measurement tolerances/accuracy of instrumentation used to monitor portable/FLEX electrical power equipment to ensure that: 1) the electrical equipment remains protected (from an electrical power standpoint- e.g., power fluctuations) and 2) the operator is provided with accurate information to maintain core cooling, containment, and spent fuel cooling.	The RFP for the FLEX generators will specify the need to have instrumentation and protection for the generator. This will remain open until we have the final contract for the equipment. [Started]
3.2.2.A	The licensee stated that evaluation of the spent fuel pool area for steam and condensation had not yet been performed. The results of this evaluation and the vent path strategy, if needed, will be provided in a future 6-month update.	Evaluation of Spent Fuel Pool Area for steam and condensation will be included in a future 6-month update. [Not Started]
3.2.3.A	The licensee plans to circulate suppression pool water through the shell side of an RHR heat exchanger using abandoned RHR steam condensing mode piping. It is not clear how the abandoned RHR piping used will be returned to an operable status. The licensee stated the plan to restore and maintain the RHR piping to operable status will be provided in a future 6-month update.	The plan to restore and maintain the RHR piping to operable status will be provided in a future 6-month update. [Not Started]
3.2.3.B	It is not clear from the licensee's Integrated Plan that current maintenance and testing for the suppression pool cleanup and transfer pumps would conform to the standards for FLEX equipment because the pumps are not currently relied upon to mitigate accidents or transients or the consequences of a beyond-design-basis event.	The plan for maintenance and testing for the suppression pool cleanup and transfer pumps to conform to the standards for FLEX equipment will be included in a future 6-month update. [Not Started]
3.2.3.C	The expected peak temperatures predicted by MAAP4 calculations are 185.06 degrees F for the wetwell air space and 253.8 degrees F for the drywell. The wetwell air space	The potential for wetwell air space temperatures exceeding the 185°F design limit will be included in a future

	peak is marginally above the 185 degree F limit for the containment. Because there are unresolved concerns with the MAAP4 analyses, the licensee will need to address the potential for wetwell air space temperatures exceeding the 185 degree F design limit.	6-month update. [Started]
3.2.4.2.A	The information provided in the Integrated Plan regarding battery room ventilation did not address potential temperature increases/decreases on the station batteries due to loss of battery ventilation resulting from an ELAP. A discussion is also needed on hydrogen limits in battery room while charging the batteries during Phase 2 and 3.The licensee stated that battery room ventilation information will be provided in a future 6-month update.	Battery room ventilation information regarding temperature and hydrogen concerns will be provided in a future 6-month update. [Not Started]
3.2.4.2.B	The licensee stated on page 41 regarding phase 2 main control room cooling that further analysis is needed to develop strategies. These strategies and supporting analysis are to be provided in a future 6-month update	Main Control Room cooling information will be provided in a future 6-month update. [Not Started]
3.2.4.2.C	On page 41, in the section of the Integrated Plan regarding safety function support, phase 2, the licensee stated that inverter room conditions will be evaluated and a strategy will be developed to maintain acceptable conditions. The strategy and associated support analyses will be submitted in a future 6-month update	Inverter Room cooling information will be provided in a future 6-month update. [Not Started]
3.2.4.2.D	In general, the discussion of ventilation in the submittal provides insufficient information on the impact of elevated temperatures, as a result of loss of ventilation and/or cooling, on the support equipment being credited as part of the ELAP strategies (e.g., electrical equipment in the RCIC pump rooms). As an example, there is no discussion regarding whether the initial temperature condition assumed the worst-case outside temperature with the plant operating at full power. No list was provided or referenced of electrical components located in the pump rooms that are necessary to ensure successful operation of required pumps. Also, no information was provided regarding the qualification level for temperature and pressure for these electrical components for the duration that the pumps are assumed to perform its mitigating strategies function. During the audit process, the licensee explained that these issues will be addressed by providing information in a 6-month update.	The impact of elevated temperature on equipment credited as part of the ELAP strategies will be included in a future 6-month update. [Not Started]
3.2.4.4.A	Confirm upgrades to communication system that resulted from the licensee communications assessment. Reference	Upgrades to communication systems that resulted from the communications

	assessment correspondence (ADAMS Accession Nos. ML 12306A199 and ML 13056A135).	assessment will be confirmed in a future 6-month update. [Started]
3.2.4.6.A	On page 41 of the Integrated Plan, in the section describing safety function support for phase 2, the licensee stated that habitability conditions will be evaluated and a strategy will be developed to maintain Main Control Room habitability.	Main Control Room habitability information will be provided in a future 6-month update. [Not Started]
3.2.4.8.B	On page 50, in the Integrated Plan, the submittal includes a table that lists additional equipment, "Medium Voltage and Low Voltage Diesel Generators", for phase 3; however, this equipment is not discussed in the body of the Integrated Plan. It is not clear from the information presented in the plan regarding; when and how the "Medium Voltage and Low Voltage Diesel Generators" identified in the table would be used, what loads would be served, or what generating capacity would be provided. The licensee stated the strategies for the deployment of phase 3 equipment would be developed and incorporated into pre-planned guidance. The guidance will provide flexible and diverse direction for the acquisition, deployment, connection, and operation of the equipment.	The 500 KW "Low Voltage Diesel Generator" will be connected to an external electrical connection point and will supply the 480 VAC electrical distribution system as shown in Figure 4. The generator will serve as a redundant source to the primary and alternate generators staged at the site. [Complete] Guidance for deployment of planned "Medium Voltage Diesel Generator" (4 kV) generators will be included in a future 6-month update. [Not Started]
3.2.4.8.C	The Integrated Plan does not provide information or references regarding sizing calculations for the FLEX generators to demonstrate they can adequately provide power to the assumed loads. The licensee's response addressed this issue by stating that the FLEX generator sizing calculations will be submitted in a future 6-month update.	The FLEX generator sizing calculations will be provided on the eportal for the August 2014 update. [Not Started]
3.2.4.9.A	The licensee did not address assessing and maintaining fuel quality for fuel oil supplies to the FLEX equipment.	Fuel oil quality concerns will be addressed in a future 6-month update. [Not Started]
	Also, the licensee did not address a concern with regard to providing an indefinite fuel supply.	The fuel oil strategy uses the installed diesel generator storage tanks to replenish the FLEX diesel driven equipment. The fuel oil level equivalent to a 7-day supply at the maximum post-LOCA load demand for the Division 1 Diesel Generator is 51,000 gallons (primary

		strategy), for the Division 2 Diesel Generator is 45,000 gallons (alternate strategy). The quantity of fuel oil required in either the primary or alternate strategy can be served by the respective fuel oil storage tank for well beyond 7 days. The Emergency Response Organization would be able to transfer fuel oil, if needed, from the opposite division, and another 29,500 gallons of fuel oil in the Division 3 storage tank could be used as well. [Complete]
3.4.A	The Integrated Plan failed to provide any information as to how conformance with NEI 12-06, Section 12.2 guidelines 2 through 10 will be met regarding the capabilities of the off site resources.	Clinton has established a contract with Pooled Equipment Inventory Company (PEICo) and has joined the Strategic Alliance for FLEX Emergency Response (SAFER) Team Equipment Committee for off-site facility coordination. The contract with SAFER addresses items in NEI 12-06 section 12.2. [Complete]

7 Potential Draft Safety Evaluation Impacts

There are no potential impacts to the Draft Safety Evaluation identified at this time.

8 References

The following references support the updates to the Overall Integrated Plan described in this enclosure.

1. Clinton Power Station's 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)," dated February 28, 2013.
2. 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.
3. BWROG report NEDC- 33771P Rev 2, "GEH Evaluation of FLEX Implementation Guidelines Rev 2"
4. CL-MISC-009 Rev 3 MAAP Analysis to Support FLEX Initial Strategy
5. CPS 4402.01, EOP-6 PRIMARY CONTAINMENT CONTROL
6. 0000-0143-0382-R1, DRF 0000-0143-0380, "BWROG RCIC System Operation in Prolonged Station Blackout – Feasibility Study"
7. Clinton UFSAR Section 8.1.3.4

8. CPS Drawing M05-1073, Sheet 001, Rev AG, LOW-PRESSURE CORE SPRAY (LPCS) (LP)
9. CPS Drawing M05-1075, Sheet 003, Rev AG, RESIDUAL HEAT REMOVAL (RH)
10. EC 391824 FLEX Battery Coping Study

9 Attachments

1. NSSS Significant Reference Analysis Deviation Table (Attachment 1B in the Overall Integrated Plan Report Template).
2. FLEX Equipment Protection per NEI 12-06

10 Figures

1. RCIC Operation During Phase 2
2. Suppression Pool Cooling and Low Pressure RPV Makeup from Suppression Pool
3. Supply from Ultimate Heat Sink
4. Electrical Strategy
5. FLEX ADS Air Supply
6. FLEX Fuel Oil Supply
7. FLEX Deployment Conceptual Sketch

Attachment 1
NSSS Significant Reference Analysis Deviation Table
(Attachment 1B in the Overall Integrated Plan Report Template)

Item	Parameter of Interest	NEDC-33771P Rev 2 Value	NEDC-33771P Page	Plant Applied Value	Design Value	Gap and Discussion
NEDC-33771P Rev 2 Appendix S is closest to the Clinton strategy for Maintaining Containment Integrity. Differences between the GEH SHEX case and the MAAP analysis of the Clinton strategy are listed below.						
Input Parameter Values						
1	Core thermal power	Note 1	20	3473 MWT	NA	The GEH model BWR 6 Mark III plant has larger decay heat load than Clinton by 26.9%. The SHEX input parameter values for the GEH model plant differ in some cases from the MAAP input parameter values for Clinton due to differences in assumptions and some design differences. Despite these differences the SHEX case for the model plant and the MAAP case for Clinton demonstrate the effectiveness of suppression pool cooling in reducing suppression pool temperature and stabilizing containment pressure and temperature as shown in Figures S-1, S-2, and S-3 in NEDC-33771P Revision 2.
2	Heat Sink Temperature	Note 1	21	91.4°F	NA	
3	Primary System Leakage	Note 1	20	100 gpm	NA	
4	RPV Depressurization Rate	Note 1	20	50°F/hr	NA	
5	Drywell Free Volume	Note 1	20	215,000 ft^3	NA	
6	Initial Drywell Temperature	Note 1	20	150°F	NA	
7	Initial Drywell Pressure	Note 1	20	15.3 psia	NA	
8	Initial Drywell Humidity	Note 1	20	55%	NA	
9	Wetwell Free Volume	Note 1	20	1,512,341 ft^3	NA	
10	Initial Wetwell Pressure	Note 1	20	14.31 psia	NA	
11	Suppression Pool Volume	Note 1	20	130,000 ft^3	NA	
12	Containment Pool Volume	Note 1	20	15,000 ft^3	NA	
13	Containment Pool Initial Temperature	Note 1	20	100°F	NA	
14	Suppression Pool Temperature	Note 1	20	95°F	NA	

15	Heat Removal (BTU/sec-°F)	Note 1	21	200.8 – 202.4 [Q_{RHRHX} (BTU/hr)/(3600*(Supp Pool Temp-RHR HX Shell Out Temp))]	NA	SHEX uses a heat removal constant to characterize the RHR heat exchanger. MAAP uses Clinton specific RHR heat exchanger details. The Clinton heat removal value was calculated from MAAP data for comparison.
16	RCIC Suction Source	Note 1	21	• < t_0 + 8 hrs – Suppression Pool • ≥ t_0 + 8 hrs – RHR heat exchanger outlet (138°F)	NA	In the Clinton strategy, RCIC suction is shifted from the suppression pool to the RHR heat exchanger shell outlet at t_0 + 8 hrs. This action limits the RCIC system exposure to elevated suppression pool water temperature.
Resultant Parameter Values						
17	Maximum Suppression Pool Temperature	Note 1	33	209.44°F (t_0 + 19.02 hrs)	185°F	The decay heat load of the GEH model BWR 6 Mark III plant drives suppression pool temperature to [Note 1] by the time suppression pool cooling is started at t_0 + 8 hrs. This causes containment and drywell pressure to reach a higher value than the Clinton strategy. In the Clinton strategy, suppression pool temperature is 200.5°F when cooling is started at t_0 + 8 hrs. It continues to rise and peaks at *209.41°F* at t_0 + 19.02 hrs, when the heat transfer rate in the RHR heat exchanger matches the decay heat input.
18	Maximum Wetwell Temperature	Note 1	33	185.06°F (t_0 + 43.8 hrs)	185°F	
19	Maximum Wetwell Pressure	Note 1	33	24.9 psia (t_0 + 45.9 hrs)	29.7 psia	
20	Maximum Drywell Temperature	Note 1	33	253.79°F (t_0 + 71.7 hrs)	330°F	
21	Maximum Drywell Pressure	Note 1	33	29.12 psia (t_0 + 47.8 hrs)	44.7 psia	

Note 1: The NEDC-33771P Rev 2 values are proprietary but can be found on the referenced pages of the document.

Attachment 2
FLEX Equipment Protection per NEI 12-06

5.3.1 Protection of FLEX Equipment (Seismic)	
1. FLEX equipment should be stored in one or more of following three configurations:	
a. In a structure that meets the plant's design basis for the Safe Shutdown Earthquake (SSE)(e.g., existing safety-related structure).	FLEX equipment will be installed in structures designed to survive a SSE.
b. In a structure designed to or evaluated equivalent to ASCE 7-10, Minimum Design Loads for Buildings and Other Structures.	NA
c. Outside a structure and evaluated for seismic interactions to ensure equipment is not damaged by non-seismically robust components or structures.	NA
2. Large portable FLEX equipment such as pumps and power supplies should be secured as appropriate to protect them during a seismic event (i.e., Safe Shutdown Earthquake (SSE) level).	FLEX pumps and generators will be installed to survive a SSE.
3. Stored equipment and structures should be evaluated and protected from seismic interactions to ensure that unsecured and/or non-seismic components do not damage the equipment.	FLEX equipment will be protected and stored in areas where the potential for seismic interactions with unsecured and/or non-seismic equipment is minimal.
6.2.3.1 Protection of FLEX Equipment (Flooding)	
These considerations apply to the protection of FLEX equipment from external flood hazards:	
1. The equipment should be stored in one or more of the following configurations:	
a. Stored above the flood elevation from the most recent site flood analysis. The evaluation to determine the elevation for storage should be informed by flood analysis applicable to the site from early site permits, combined license applications, and/or contiguous licensed sites.	FLEX equipment will be stored above the PMF elevation with the exception of the FLEX pumps and associated equipment, and the haul/debris removal vehicle.
b. Stored in a structure designed to protect the equipment from the flood.	NA
c. FLEX equipment can be stored below flood level if time is available and plant procedures/guidance address the needed actions to relocate the equipment. Based on the timing of the limiting flood scenario(s), the FLEX equipment can be relocated to a position that is protected from the flood, either by barriers or by elevation, prior to the arrival of the potentially damaging flood levels. This should also consider the conditions on-site during the increasing flood levels and whether movement of the FLEX equipment will be possible before potential inundation occurs, not just the ultimate flood height.	FLEX pumps and associated equipment, and the haul/debris removal vehicle will be stored below the PMF elevation. Procedures governing high lake level will include guidance for relocating this equipment ahead of rising lake level.

2. Storage areas that are potentially impacted by a rapid rise of water should be avoided.	Rapid rise in lake level is not a credible event.
7.3.1 Protection of FLEX Equipment (Wind)	
These considerations apply to the protection of FLEX equipment from high wind hazards:	
1. For plants exposed to high wind hazards, FLEX equipment should be stored in one of the following configurations:	
a. In a structure that meets the plant's design basis for high wind hazards (e.g., existing safety-related structure).	FLEX equipment will be installed in structures that will survive the design basis wind.
b. In storage locations designed to or evaluated equivalent to ASCE 7-10, Minimum Design Loads for Buildings and Other Structures given the limiting tornado wind speeds from Regulatory Guide 1.76 or design basis hurricane wind speeds for the site. Given the FLEX basis limiting tornado or hurricane wind speeds, building loads would be computed in accordance with requirements of ASCE 7-10. Acceptance criteria would be based on building serviceability requirements not strict compliance with stress or capacity limits. This would allow for some minor plastic deformation, yet assure that the building would remain functional.	NA
• Tornado missiles and hurricane missiles will be accounted for in that the FLEX equipment will be stored in diverse locations to provide reasonable assurance that N sets of FLEX equipment will remain deployable following the high wind event. This will consider locations adjacent to existing robust structures or in lower sections of buildings that minimizes the probability that missiles will damage all mitigation equipment required from a single event by protection from adjacent buildings and limiting pathways for missiles to damage equipment.	NA
• The axis of separation should consider the predominant path of tornados in the geographical location. In general, tornadoes travel from the West or West Southwesterly direction, diverse locations should be aligned in the North-South arrangement, where possible. Additionally, in selecting diverse FLEX storage locations, consideration should be given to the location of the diesel generators and switchyard such that the path of a single tornado would not impact all locations.	NA
• Stored mitigation equipment exposed to the wind should be adequately tied down. Loose equipment should be in protective boxes that are adequately tied down to foundations or slabs to prevent protected equipment from being damaged or becoming airborne. (During a tornado, high winds may blow away metal siding and metal deck roof, subjecting the equipment to high wind forces.)	NA
c. In evaluated storage locations separated by a sufficient distance that minimizes the probability	NA

that a single event would damage all FLEX mitigation equipment such that at least N sets of FLEX equipment would remain deployable following the high wind event. (This option is not applicable for hurricane conditions).	
• Consistent with configuration b., the axis of separation should consider the predominant path of tornados in the geographical location.	NA
• Consistent with configuration b., stored mitigation equipment should be adequately tied down.	NA
8.3.1 Protection of FLEX Equipment (Snow, Ice, Cold)	
These considerations apply to the protection of FLEX equipment from snow, ice, and extreme cold hazards:	
1. For sites subject to significant snowfall and ice storms, portable FLEX equipment should be stored in one of two configurations:	
a. In a structure that meets the plant's design basis for the snow, ice and cold conditions (e.g., existing safety-related structure).	FLEX equipment will be installed in structures that will survive the design basis for snow, ice, and cold.
b. In a structure designed to or evaluated equivalent to ASCE 7-10, Minimum Design Loads for Buildings and Other Structures for the snow, ice, and cold conditions from the site's design basis.	NA
c. Provided the N FLEX equipment is located as described in a. or b. above, the N+1 equipment may be stored in an evaluated storage location capable of withstanding historical extreme weather conditions and the equipment is deployable.	NA
2. Storage of FLEX equipment should account for the fact that the equipment will need to function in a timely manner. The equipment should be maintained at a temperature within a range to ensure its likely function when called upon. For example, by storage in a heated enclosure or by direct heating (e.g., jacket water, battery, engine block heater, etc.).	FLEX pumps and generators and their storage location will include appropriate heating.
9.3.1 Protection of FLEX Equipment (High Temperature)	
The equipment should be maintained at a temperature within a range to ensure its likely function when called upon.	FLEX pumps, generators, and the haul/debris removal vehicle, and their storage locations will include appropriate cooling such that the equipment will run without overheating.

Figure 1
RCIC Operation During Phase 2

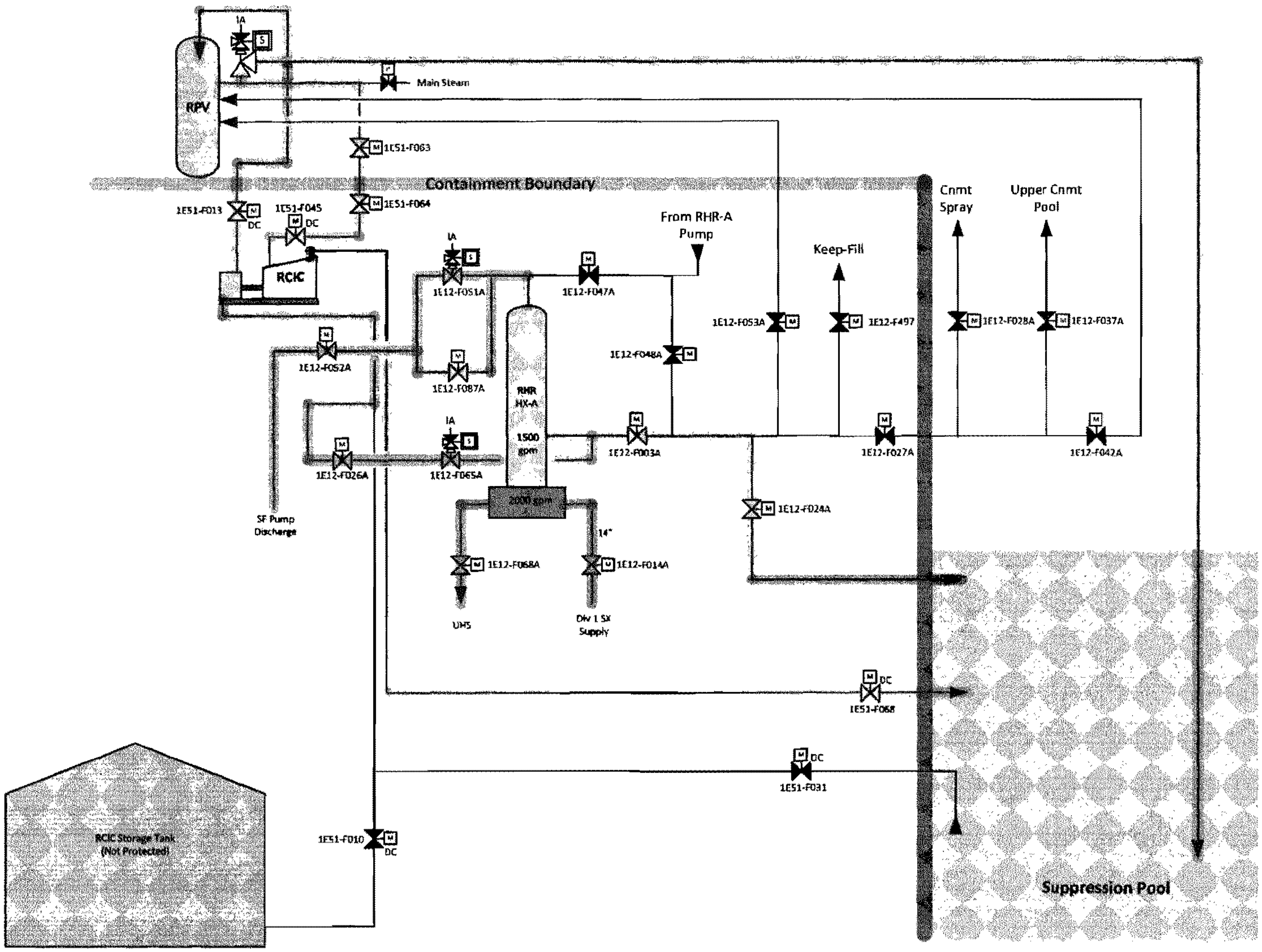


Figure 2
Suppression Pool Cooling and Low Pressure RPV Makeup from Suppression Pool

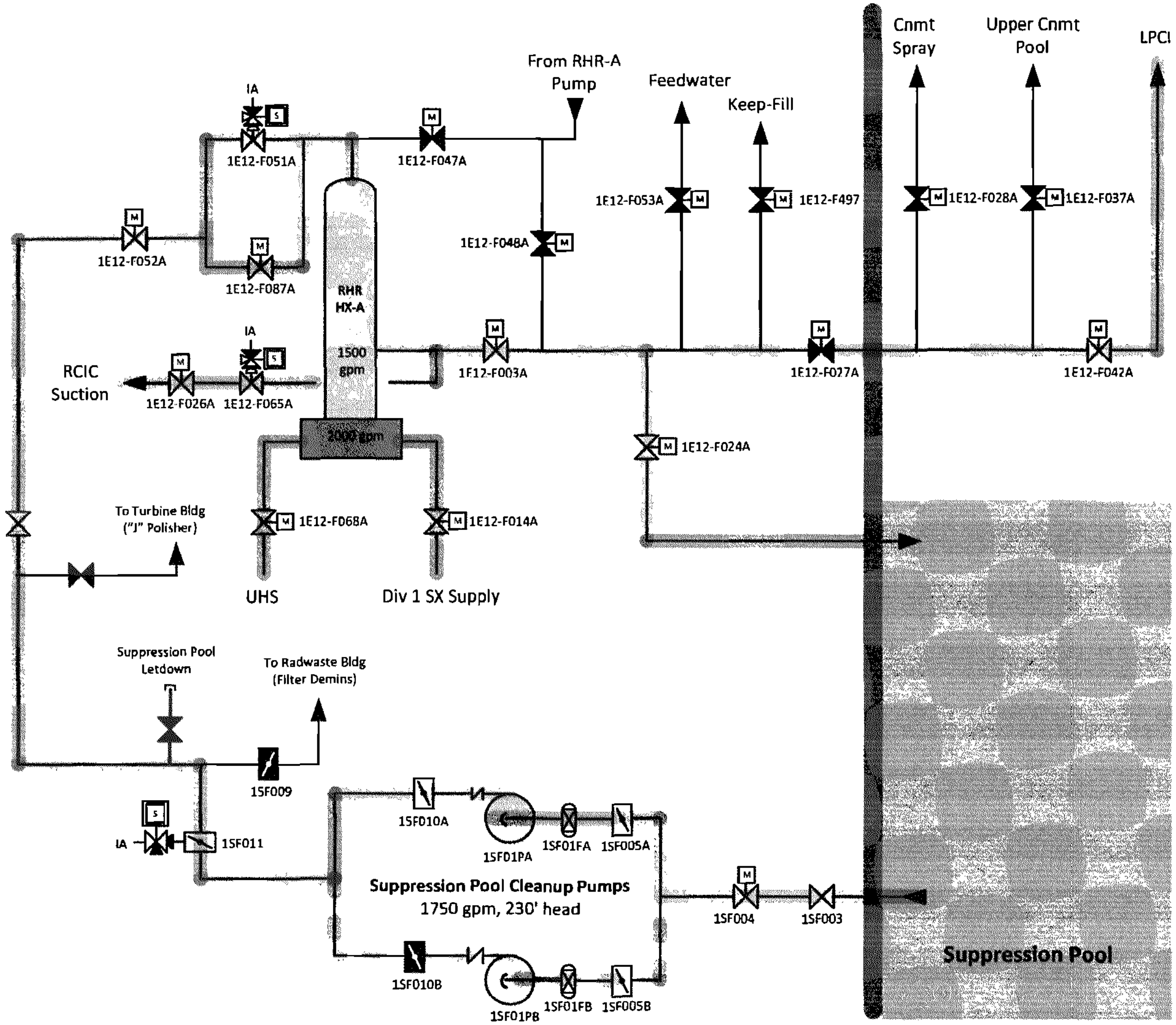


Figure 3
Supply from Ultimate Heat Sink

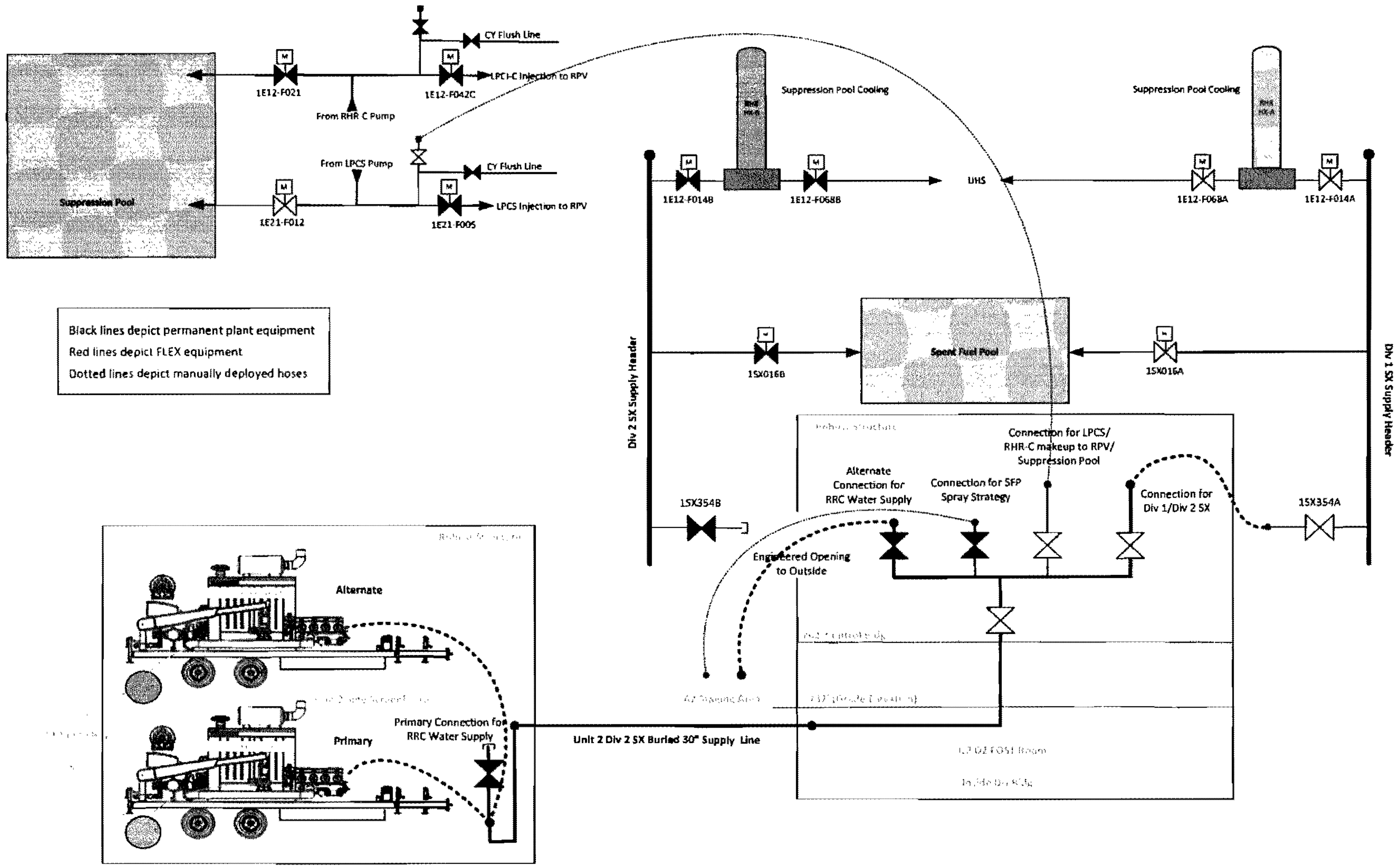


Figure 4
Electrical Strategy

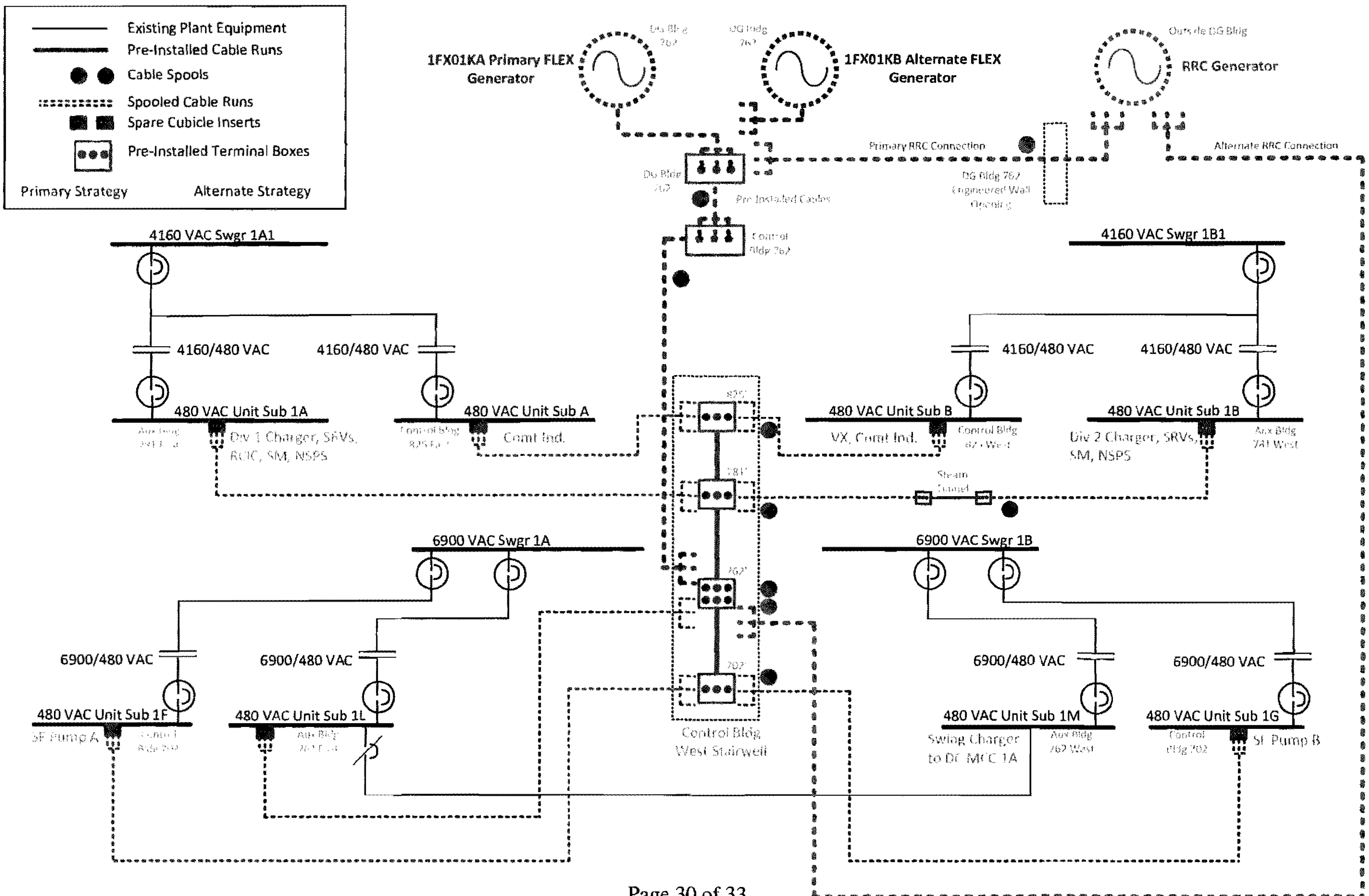


Figure 5
FLEX ADS Air Supply

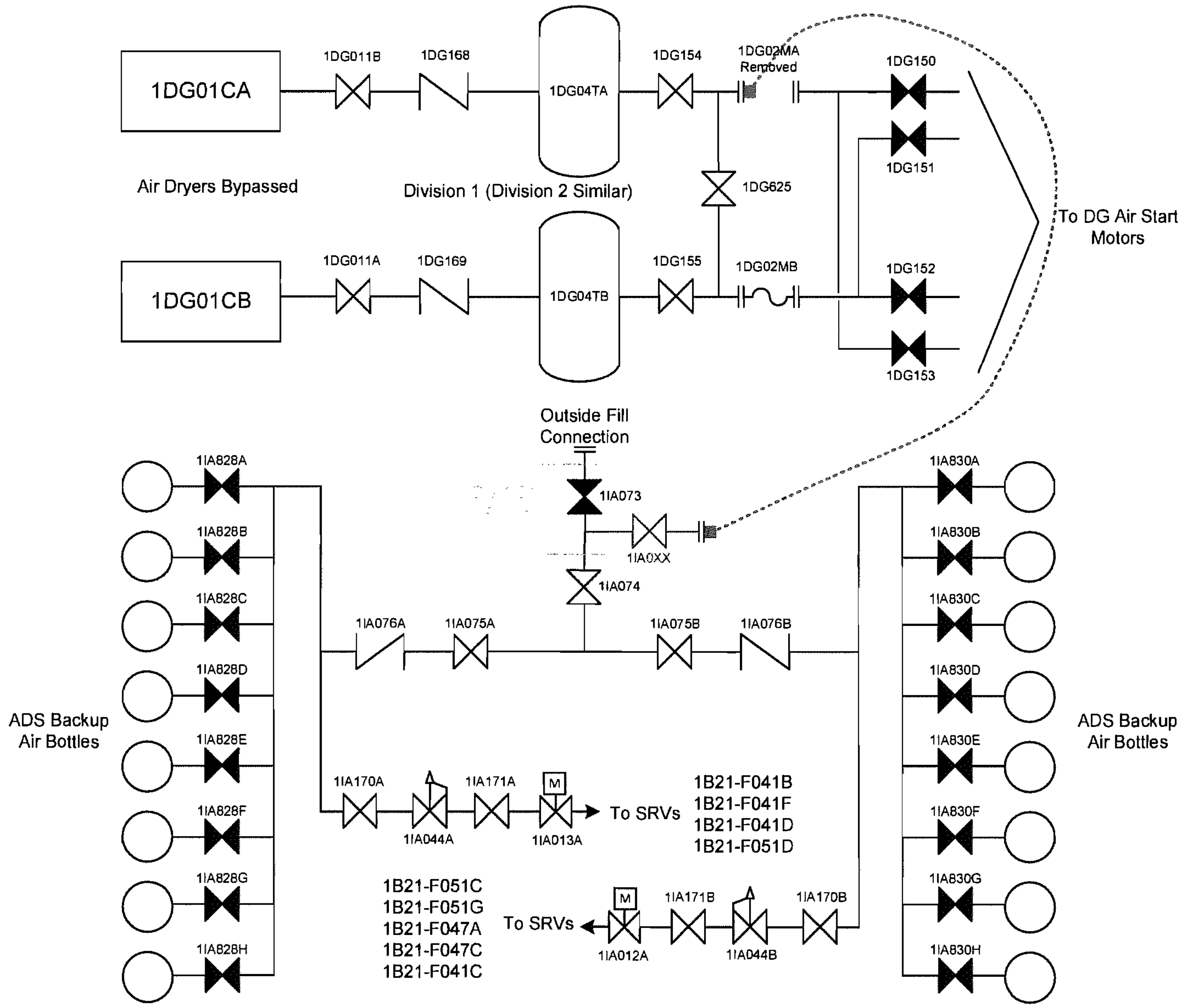


Figure 6
FLEX Fuel Oil Supply

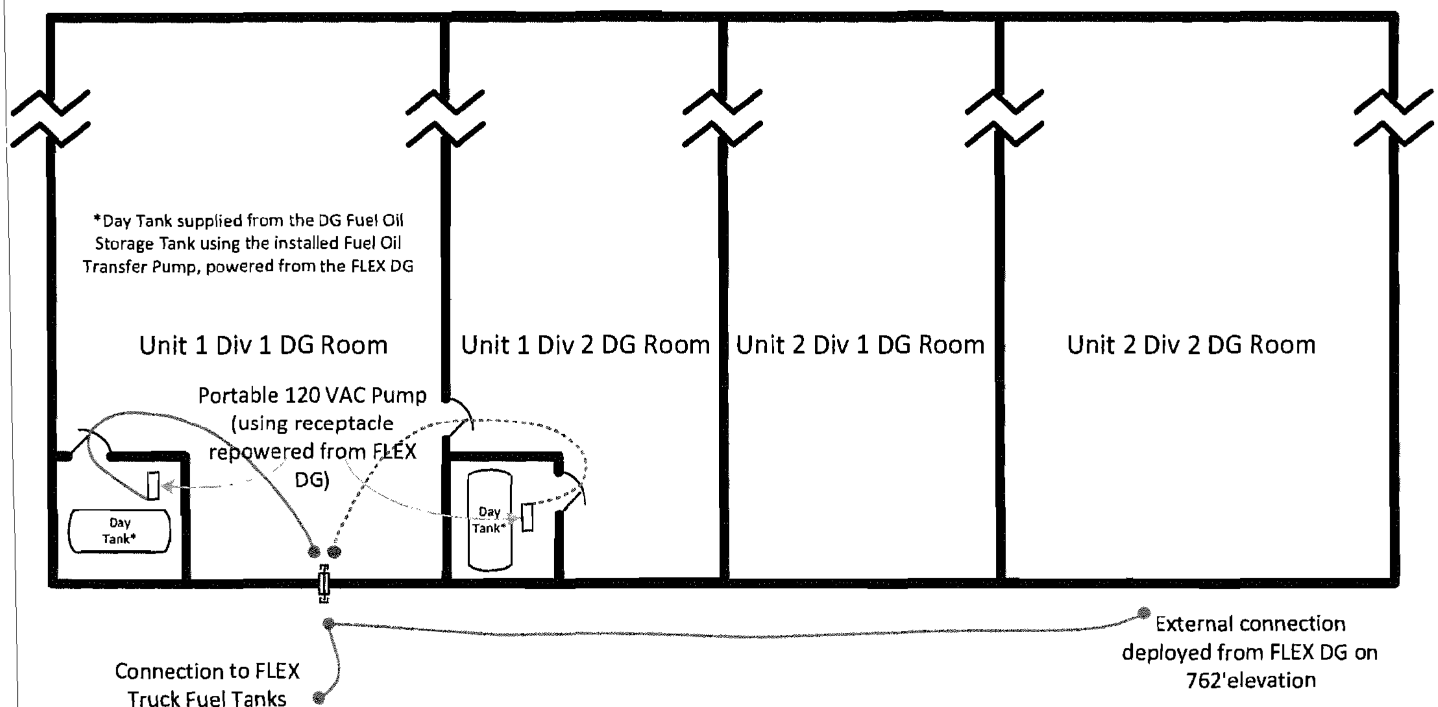
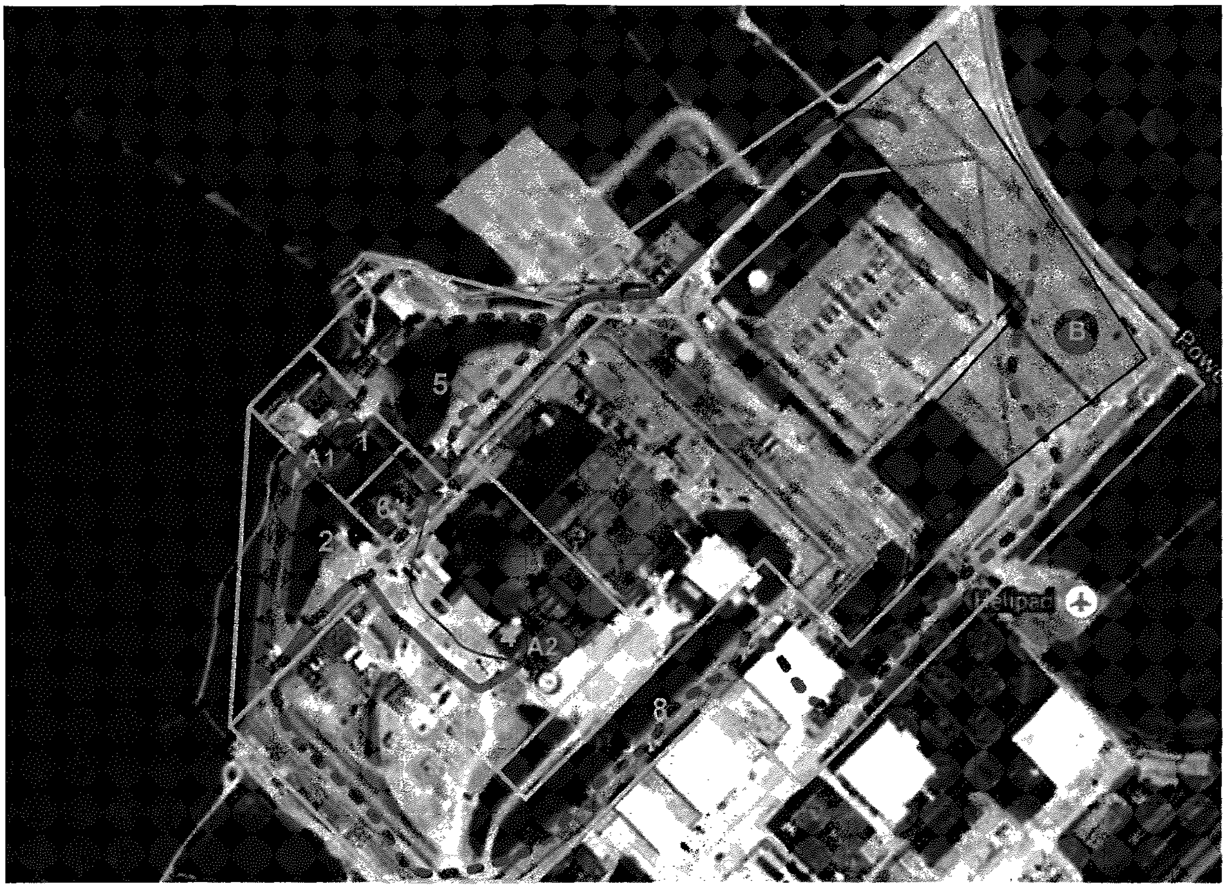


Figure 7
FLEX Deployment Conceptual Sketch



- **A1 Staging Area**
  Storage building housing the prestaged FLEX pumps, hose trailers, and F-750 truck used for debris removal. Operators need to travel on foot to this location to gain access to the building to lineup the FLEX pump.
- **A2 Staging Area**
  External water and electrical connection used for RRC redundant equipment, and is the location of the source of fuel oil to refill the FLEX pumps.
- **Pedestrian Travel Route** ———
  Personnel travelling on foot to the A1 Staging Area follow a route that includes areas 3, 4, 5, and 1. The primary or alternate vehicle routes can be used as well.
- **Phase 2 Primary Vehicle Travel Route**
  The primary travel route between A1 and A2 Staging Area includes areas 1, 2, 3, and 4.
- **Phase 2 Alternate Vehicle Travel Route**
  The alternate travel route between A1 and A2 Staging Area includes areas 1, 5, 6, 2, 3, and 4.
- **B Staging Area**
  The laydown area for Phase 3 equipment arriving from the RRC or other locations.
- **Phase 3 Primary Vehicle Travel Route**
  The primary travel route from the B staging area to the A1 and A2 staging areas includes area 7 before it connects to the on-site deployment route.
- **Phase 3 Alternate Vehicle Travel Route**
  The alternate travel route from the B staging area to the A1 and A2 staging areas includes area 8 before it connects to the on-site deployment route.