Exelon Generation

Order No. EA-12-049

RS-14-207

August 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: Third 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. Exelon Generation Company, LLC 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), dated February 28, 2014 (RS-14-009)

8. 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 No. 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. References 6 and 7 provided the first and second six-month status reports, respectively, pursuant to Section IV, Condition C.2, of Reference 1 for Clinton Power Station. The purpose of this letter is to provide the third 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 8.

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 August 2014.

Respectfully submitted,

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

Enclosure:

1. Clinton Power Station, Unit 1 Third 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
NRC Regional Administrator - Region III
NRC Senior Resident Inspector – Clinton Power Station, Unit 1
NRC Project Manager, NRR – Clinton Power Station, Unit 1
Ms. Jessica A. Kratchman, NRR/JLD/PMB, NRC
Mr. Jack R. Davis, NRR/DPR/MSD, NRC
Mr. Eric E. Bowman, NRR/DPR/MSD, NRC
Mr. Jeremy S. Bowen, NRR/DPR/MSD/MSPB, NRC
Mr. Robert L. Dennig, NRR/DSS/SCVB, NRC
Mr. John P. Boska, NRR/DPR/MSD/MSPB, NRC
Illinois Emergency Management Agency - Division of Nuclear Safety

Enclosure

Clinton Power Station, Unit 1

Third 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

(43 pages)

Enclosure

Clinton Power Station's Third 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

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 enclosure 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 National SAFER Response Center	Complete
Aug 2013	Submit 6 month update	Complete
Feb 2014	Submit 6 month update	Complete
Aug 2014	Submit 6 month update	Complete with this submittal
Feb 2015	Submit 6 month update	Not Started
	Modification Development	
Mar 2014	• Phase 2 modifications	Started
Dec 2014	National SAFER 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	Started
May 2015	FLEX equipment acquisition	Started
May 2015	Training completion	Started
May 2015	Unit 1 Implementation date	Not Started

4 Changes to Compliance Method

Change 1

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

Reason for Change: Engineering issues associated with staging both FLEX diesel generators in the same room required changing the N+1 FLEX generator storage plan.

Change: A table addressing the guidance in NEI 12-06 Sections 6 through 9 is included in Attachment 1.

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 11.3 and Section 5.3.1. 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 portable FLEX pumps and primary FLEX generator 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. The N+1 FLEX generator will be mounted on a trailer and stored in the seismically robust FLEX Storage Building. A truck capable of debris removal will also be staged in the FLEX Storage Building, should a condition arise requiring the N+1 generator to be deployed.
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 11.3 and Section 6.2.3.1. 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 portable FLEX pumps and portable N+1 FLEX generator will not be protected up to the PMF elevation. Sufficient time will be available to relocate the FLEX pumps and generator 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 Diesel Generator Building FLEX manifold 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 11.3 and Section 7.3.1. 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 11.3 and Section 8.3.1. 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 portable FLEX pumps and primary generator 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. The one exception is the foot travel from the plant to the storage building containing the FLEX pumps.
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 11.3 and Section 9.3.1. 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 2

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		
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 FLEX generator will be permanently staged and does not require deployment. The N+1 generator will be housed in a storage structure that meets NEI 12-06 Rev.0 storage requirements. A	• A permanently staged primary 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 independent electrical strategies with connection	**Phase 2** The FLEX electrical connections will be completed inside the Diesel Generator, Control, and Auxiliary Buildings, which are protected from all external hazards. **Phase 3**

heavy duty truck capable of clearing debris will be stored in the same location. Pre-staged cabling will be deployed from the FLEX generator to the Unit Substations that supply the components needed to meet the FLEX timeline.	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, • Installed 480 VAC bus panel inserts to simplify external electrical connections.	The electrical connection for an external generator from the National SAFER Response Center 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.
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. Water will be routed from the UHS to the plant via the unused seismically robust Unit 2 SX piping.	• One external water connection ties to the Unit 2 robust SX piping, • One internal water manifold for cooling/makeup water distribution, capable of being supplied from a separate external pump, • Various pipe branch connections and valve installations to support manifold distribution, • Pre-staged hoses with Storz fittings to support manifold to branch and valve connections.	**Phase 2** The FLEX mechanical connections will be completed inside the Diesel Generator, Control, and Auxiliary Buildings, which are protected from all external hazards. **Phase 3** The mechanical connection for an external pump from the National SAFER Response Center, 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.

Change 3

Attachment 1A - Sequence of Events Timeline

Reason for Change:

The timeline for "FLEX pump available for RPV makeup" was improved. This change ensures that the FLEX pump is available for RPV makeup when suppression pool temperature reaches 190°F (the threshhold established for elevated risk to the RCIC system) at approximately t_0 + 6.6 hrs. This change is also responsive to Confirmatory Item 3.2.1.3.A.

Item 25 on the timeline is reworded from "Connect Div 1 Day Tank 120 VAC portable pump" to "Commence FLEX generator and pump refueling operations" to more accurately state the task that requires future validation.

The time to commence lining up the FLEX pump should be at t_0 + 1 hr to ensure the subsequent time constraints can be met.

Changes:

1. The time "FLEX pump available for RPV makeup" occurs on the timeline at t_0 + 6 hrs, and is identified as a time constraint,
2. Reworded item 25 on the timeline,
3. Changed the Elapsed Time value for Item 10 "Commence UHS Pump Deployment" to 1 hr.

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	**1 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	
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**	**FLEX pump available for RPV makeup**	**Y**	**Confirmatory Item 3.2.1.3.A. Improved from previous update.**
19	6 hr	Open RCIC room doors	Y	
20	8 hr	Place FLEX suppression pool cooling strategy in service	Y	
21	8 hr	Makeup to Suppression Pool as needed	Y	
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**	**Commence FLEX generator and pump refueling operations**	**Y**	
26	24 hr	Commence recharging the ADS backup air bottles with a FLEX air compressor	Y	
27	24 hr	First piece of National SAFER Response Center 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 National SAFER Response Center equipment in spare capacity.	N	

Change 4

Attachment 2 – BWR Portable Equipment Phase 3

Reason for Change: Phase 3 portable equipment listed in the OIP needed to be updated.

Change:

Brought the Phase 3 portable equipment listing up to date with the National SAFER Response Center Equipment Technical Requirements Manual.

Change 5

Attachment 3 – Conceptual Sketches

Reason for Change: Changes to deployment plan and system alignments required updated sketches. Color versions of the figures are available on the ePortal.

Change:

Updated Figures 2 through 5 to reflect advances in the ongoing engineering design.

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.	See the February 2014 OIP Update for closure information. [Complete]
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.	[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.	Corporate Program Document, CC-AA-118 drafted. [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 - Revised]**
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 1 in this document. **[Complete - Revised]**

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	See Attachment 1 of this document. **[Complete - Revised]**

	hazard.	
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.	See the February 2014 OIP Update for closure information. [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.	See the February 2014 OIP Update for closure information. [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.	See the February 2014 OIP Update for closure information. [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.	Calculation 3C10-0485-001, Internal Flooding Analysis, evaluates flooding in various areas throughout the station due to postulated failures of moderate and high energy systems. One area of particular concern is the 702' elevation of the Control Building where Unit Substations 1F & 1G are located. These busses provide power to Suppression Cooling and Cleanup pumps 1SF01PA/B which will be used to establish suppression Pool cooling during the extended loss of AC event. From Calculation 3C10-0485-001 Revision 8 and 8A Internal Flooding Analysis (Reference 6) the flood level in the area of unit subs 1F & 1G is < 6" (specifically 5.8"). The unit substations are mounted on pads that are ~5" high, so based on the calc flooding in 702' would impact these busses. It

		should be noted that this calculation of flood level at 702' is conservative in that no credit is taken for floor drain sumps that are in the vicinity of the Unit Subs. The small amount of water intrusion that Unit Substations 1F and 1G could experience by the flooding described above would not impact the internal bus bars. Re-energizing the bus would still be possible after the occurrence of the design internal flooding event. [Complete]
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 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.	Refer to Figure 7. The B Staging Area is shown on the north side of the 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 external electrical and water connection). **[Complete - Revised]**
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 and the N+1 FLEX generator will be stored in a robust structure at the Unit 2 side of the Screen House. The primary FLEX generator and associated cabling will be stored in the robust Diesel Generator, Control, and Auxiliary buildings. **[Complete - Revised]**
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.	See the February 2014 OIP Update for closure information. [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.	120 VAC submersible 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 - Revised]**
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. [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.	In the primary strategy, 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. In the event the N+1 generator is used, it will be transported from the FLEX storage building at the Screen House to the A2 staging area outside the Diesel Generator building and connected to the in-plant electrical distribution system using cables deployed from within the Diesel Generator Building. Appropriate clothing will be pre-staged for outdoor actions. **[Complete - Revised]**
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 following was added to the site snow removal plan: New Fukushima Requirements NEI 12-06, Rev 0, August 2012, Diverse and Flexible Coping Strategies (Flex) Implementation Guide, Section 8.3.2.2 states: "For sites exposed to extreme snowfall and ice storms, provision should be made for snow/ice removal, as needed to obtain and transport FLEX equipment from storage to its location for deployment." In order to address this requirement, Clinton will make provisions for

		maintaining these areas open for vehicle and foot traffic during extreme weather events: 1. the area immediately south of the DG building, 2. the area around the FLEX building and its access doors on the Unit 2 side of the Screen House, 3. the vehicle and foot access routes between the DG building and the FLEX building, 4. the National SAFER Response Center staging area in the north contractor parking lot. 5. vehicle access route from the National SAFER Response Center staging area to the Screen House and area south of the DG Building. **[Complete - Revised]**
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 of MAAP4 is contained in document *Forwarding of Clinton MAAP Justification for ELAP Analysis Acceptability* (Attachment 4) and is available on the ePortal. [Complete]
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 of MAAP4 is contained in document *Forwarding of Clinton MAAP Justification for ELAP Analysis Acceptability* (Attachment 4) and is available on the ePortal. [Complete]
3.2.1.1.C	MAAP4 use must be consistent with June 2013 position paper.	Information that validates the use of MAAP4 is contained in document *Forwarding of Clinton MAAP Justification for ELAP Analysis Acceptability* (Attachment 4) and is available on the ePortal. [Complete]
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	Information that validates the use of MAAP4 is contained in document

	through 4-6 of the "MAAP4 Application Guidance, Desktop Reference for Using MAAP4 Software, Revision 2" (Electric Power Research Institute Report 1 020236).	*Forwarding of Clinton MAAP Justification for ELAP Analysis Acceptability* (Attachment 4) and is available on the ePortal. [Complete]
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 of MAAP4 is contained in document *Forwarding of Clinton MAAP Justification for ELAP Analysis Acceptability* (Attachment 4) and is available on the ePortal. The Clinton MAAP analysis report, CL-MISC-009 R3 MAAP Analysis to Support Initial FLEX Strategy (Reference 5), is available on the ePortal. Case 17 in the report was used to validate the timeline described in the February 2014 OIP update. [Complete]
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 validation 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 3 of this document. **[Complete - Revised]**
3.2.1.4.A	The licensee has not yet completed the analyses to demonstrate adequate head and flow will be provided by the FLEX pumps for cooling strategies.	FLEX pump hydraulic analysis is in calculation IP-M-0809. Rev. 0 is approved but is based on a higher flow/head requirement. Rev. 1 will document the current 3000 gpm. This revision will be part of EC 392339 Rev. 1 and will be placed on the ePortal upon approval. [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.	See the February 2014 OIP Update for closure information. [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.	Item 1 - In reference to part 1 relating to the concern that electrical equipment remains protected (from an electrical power standpoint – e.g., power fluctuations), the protection of the equipment is not altered from the original design. The equipment will be provided power through protective relays at the source, unit substation breakers. The power source, the FLEX DG, is a 500kW Cummins diesel generator set QSX15 series engine model DFEK. The units are equipped with a "PowerCommand" control, which is an integrated generator set control system that provides governing, voltage regulation, engine protection and operator interface functions. This includes a "Integral AmpSentry Protective" relay which provides a full range of alternator protection functions that are matched to the alternator. In addition, a three phase sensing, full wave rectifier voltage regulation system is included which provides a control of the FLEX DG output for stable operation with all load types. Item 2 – The FLEX strategy provides for uninterrupted operation of the Division 1 Nuclear System Protective System (NSPS). This system provides power to the level and pressure instruments listed in the OIP for the RPV, containment, and suppression pool, as well as RCIC system parameters. These parameters can be monitored directly in the main control room. Suppression pool, containment, and drywell temperature indications are correlated from RTD resistance readings taken in the main control room. The FLEX strategy restores AC power to those instrument loops from

		the FLEX generator, once it is placed in service. [Complete]
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. [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 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.	The potential for wetwell air space temperatures exceeding the 185°F design limit will be included in a future 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. [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. [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. [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 assessment correspondence (ADAMS Accession Nos. ML 12306A 199 and ML 13056A 135).	Upgrades to communication systems that resulted from the communications 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	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 N+1 generators staged at the site. [Complete]

	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.	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 calculation EAD-FLEXGEN-1 (Reference 4) is included on the ePortal. [Complete]
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.	See the February 2014 OIP Update for closure information. [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.	See the February 2014 OIP Update for closure information. [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. Clinton Power Station MAAP Justification for ELAP Analysis Acceptability (Response to Letter Dated October 13, 2013 from Jack R. Davis, Director Mitigating Strategies Directorate, Office of Nuclear Reactor Regulation, regarding endorsement of MAAP Code)
4. EAD-FLEXGEN-1 Electrical Loading and Rating in KW for the FLEX Generator

5. CL-MISC-009 R3 MAAP Analysis to Support Initial FLEX Strategy
6. 3C10-0485-001 Revision 8 and 8A Internal Flooding Analysis
7. Clinton Power Station's First Six Month Update for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated August 28, 2013.
8. Clinton Power Station's Second Six Month Update for the Implementation of Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated February 28, 2014.

9 Attachments

1. FLEX Equipment Protection per NEI 12-06 **(Revised)**
2. BWR Portable Equipment Phase 3
3. Conceptual Sketches
4. Forwarding of Clinton Power Station MAAP Justification for ELAP Analysis Acceptability

10 Figures

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

Attachment 1
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 stored 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 stored 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, the N+1 generator, 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, the N+1 generator, 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 stored 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 stored 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.

Attachment 2
BWR Portable Equipment Phase 3

BWR Portable Equipment Phase 3 Generic Equipment							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
Note: The equipment listed is the generic equipment list provided by the National SAFER Response Center and even though we may not require this equipment in our plan it will be available and could be utilized in the phase 3 time period. **The Phase 3 portable equipment table will be updated once all of the equipment has been procured and placed in inventory.**							
List portable equipment	*Core*	*Containment*	*SFP*	*Instrumentation*	*Accessibility*		
Medium Voltage Diesel Generator	X	X	X	X	X	1 MW output at 4160 Vac, three phase Note 1	
Low Voltage Diesel Generator	X	X	X	X	X	1100 kW output at 480 Vac, three phase Note 2	
High Pressure Injection Pump	X					2000 psi shutoff head, 60 gpm capacity	
SG/RPV Makeup Pump	X					500 psi / 500 gpm	
Low Pressure / Medium Flow Pump	X	X	X			300 psi shutoff head, 2500 gpm max flow	
Low Pressure / High Flow Pump	X		X			150 psi shutoff head, 5000 gpm max flow	
Cable / Electrical	X	X	X			Various as determined by AREVA document # 51 - 9199717 - 005	
Hose / Mechanical Connections	X	X	X			Various as determined by AREVA document # 51 - 9199717 - 005	

BWR Portable Equipment Phase 3 Generic Equipment							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
Note: The equipment listed is the generic equipment list provided by the National SAFER Response Center and even though we may not require this equipment in our plan it will be available and could be utilized in the phase 3 time period. **The Phase 3 portable equipment table will be updated once all of the equipment has been procured and placed in inventory.**							
List portable equipment	*Core*	*Containment*	*SFP*	*Instrumentation*	*Accessibility*		
Lighting Towers					X	40,000 lumens	
Diesel Fuel Transfer						500 gallon air-lift container	
Diesel Fuel Transfer Tank						264 gallon tank, with mounted AC/DC pumps	
Portable Fuel Transfer Pump						60 gpm after filtration	
Electrical Distribution System						4160 V, 250 MVA, 1200 A	
Note 1: 1 MW is the individual generator output, and 2 MW is the total standard output to be supplied by the Phase 3 MV generators to satisfy identified load demands. The total output is created by connection of several smaller generators in parallel. Loads in excess of 2 MW are planned to be addressed as additional generators classified as non-generic equipment (see Section 8.4). Note 2: The 1100 kW unit is derated to 1000 kW.							

Phase 3 Response Equipment/Commodities	
Item	**Notes**
Radiation Protection Equipment • Survey instruments • Dosimetry • Off-site monitoring/sampling	The National SAFER Response Center will not stock this type of equipment but this equipment will be requested from site to site and utility to utility on an as required basis.
Commodities • Food • Potable water	The National SAFER Response Center will not stock these commodities but they will be requested from site to site and utility to utility on an as required basis.

BWR Portable Equipment Phase 3 Site Specific							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	*Core*	*Containment*	*SFP*	*Instrumentation*	*Accessibility*		
2500/5000 GPM Suction Booster Pumps	X	X	X			The Suction Booster Lift Pump will assist in providing 26 feet of suction lift to the Low Pressure Medium Flow Pumps and the Low Pressure High Flow Pumps.	

Attachment 3
Conceptual Sketches

Figure 1 - RCIC Operation During Phase 2

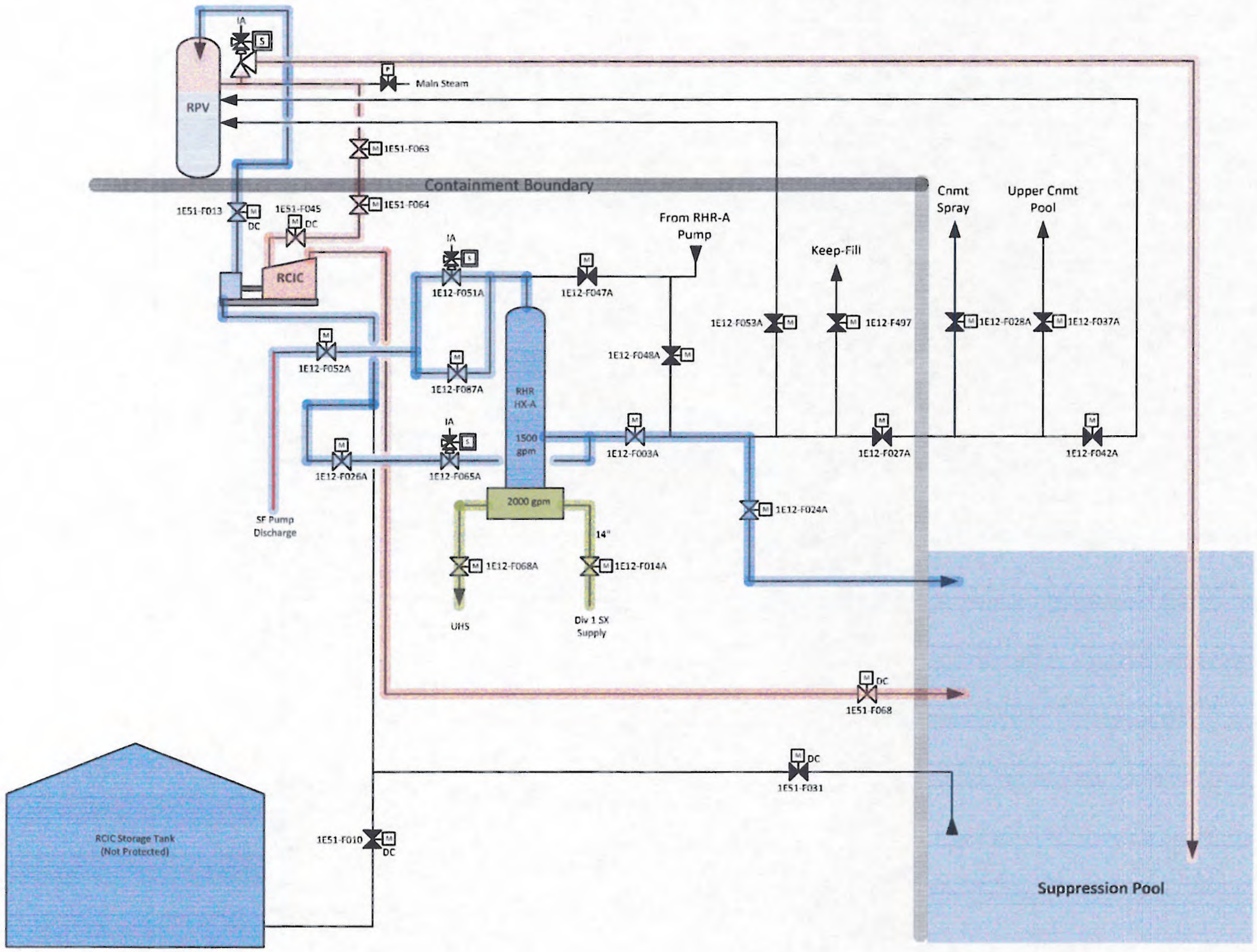


Figure 2 - Suppression Pool Cooling and Low Pressure RPV Makeup from Suppression Pool

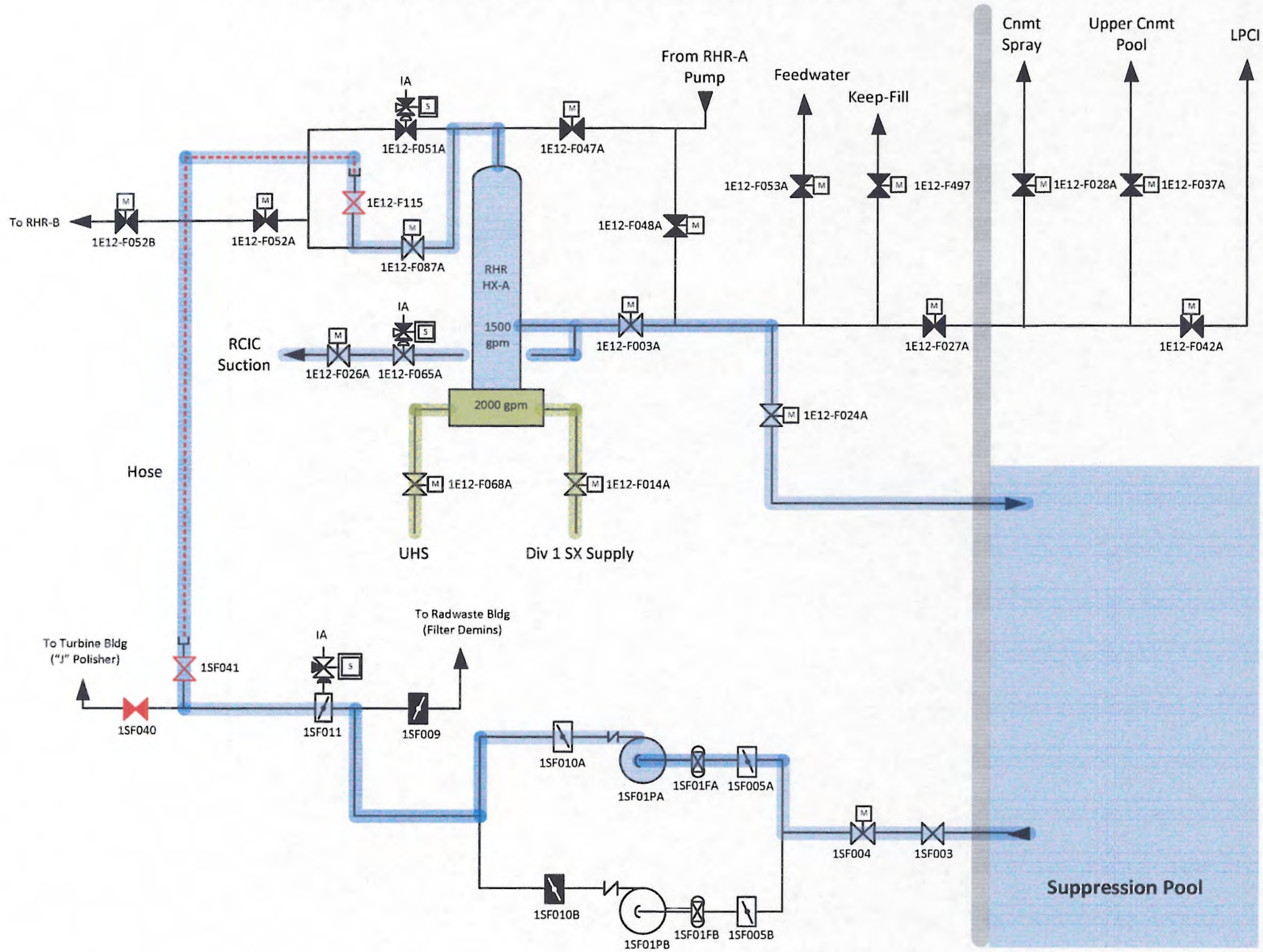


Figure 3 - Supply from Ultimate Heat Sink

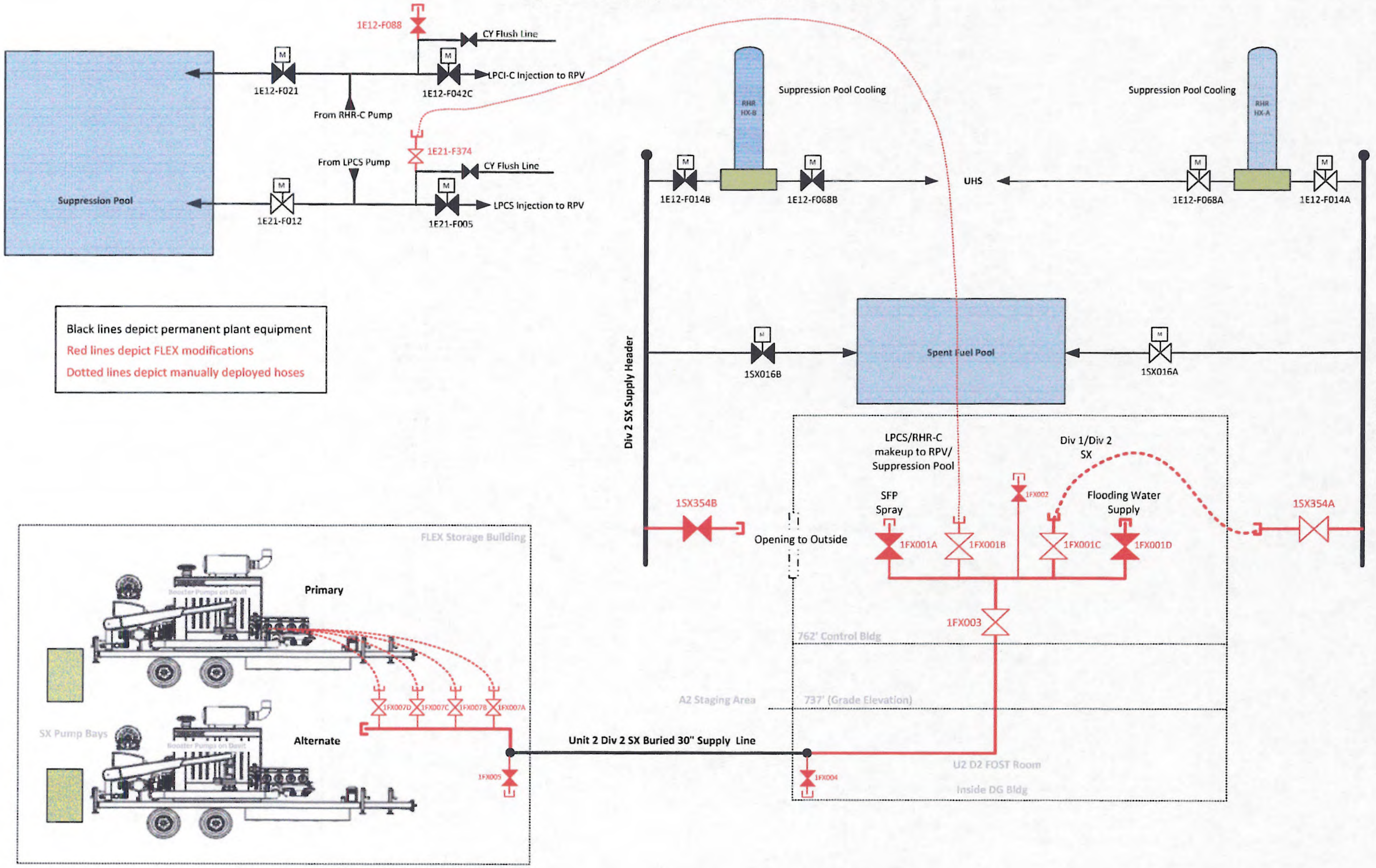


Figure 4 - Electrical Strategy

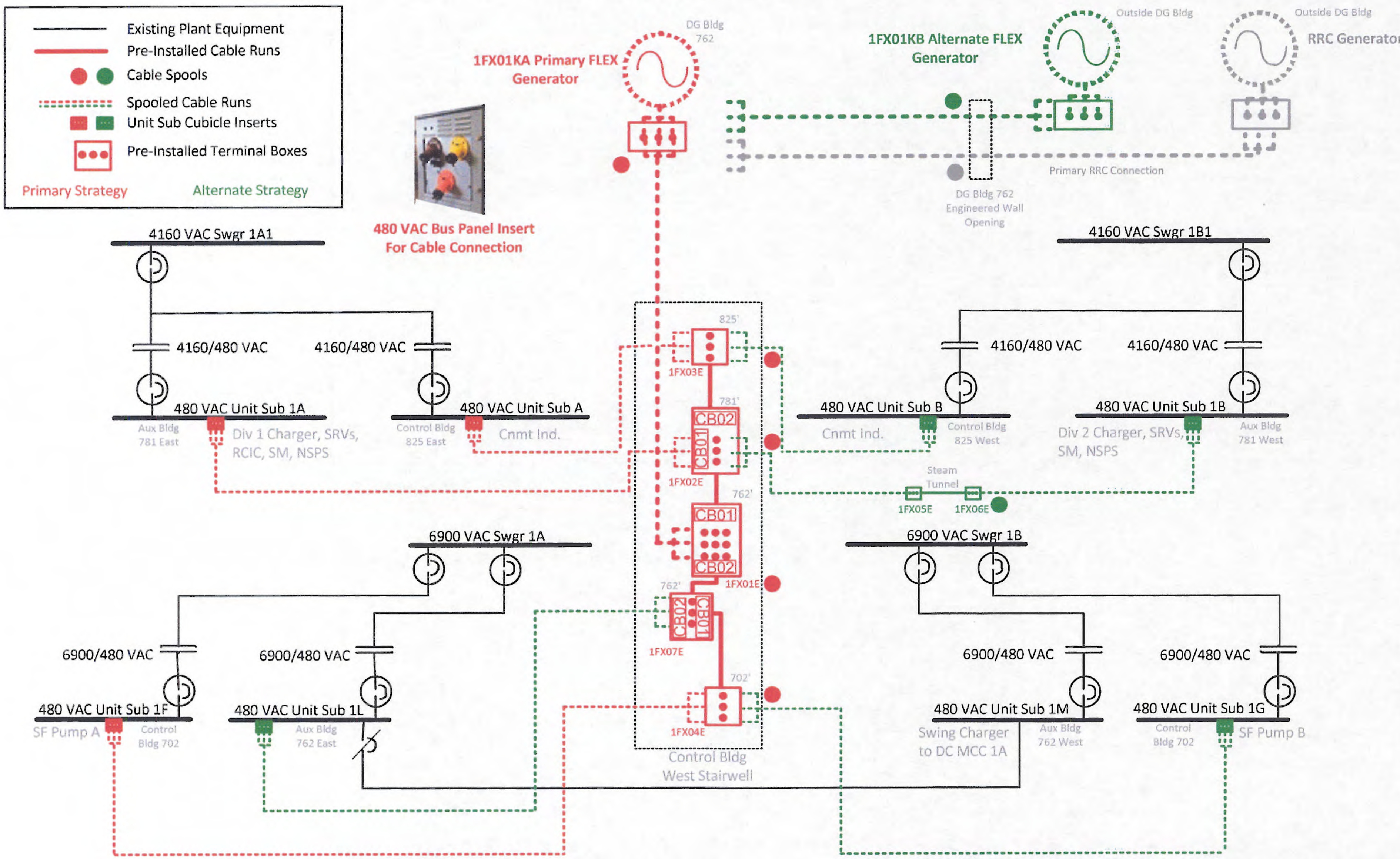


Figure 5 - FLEX ADS Air Supply

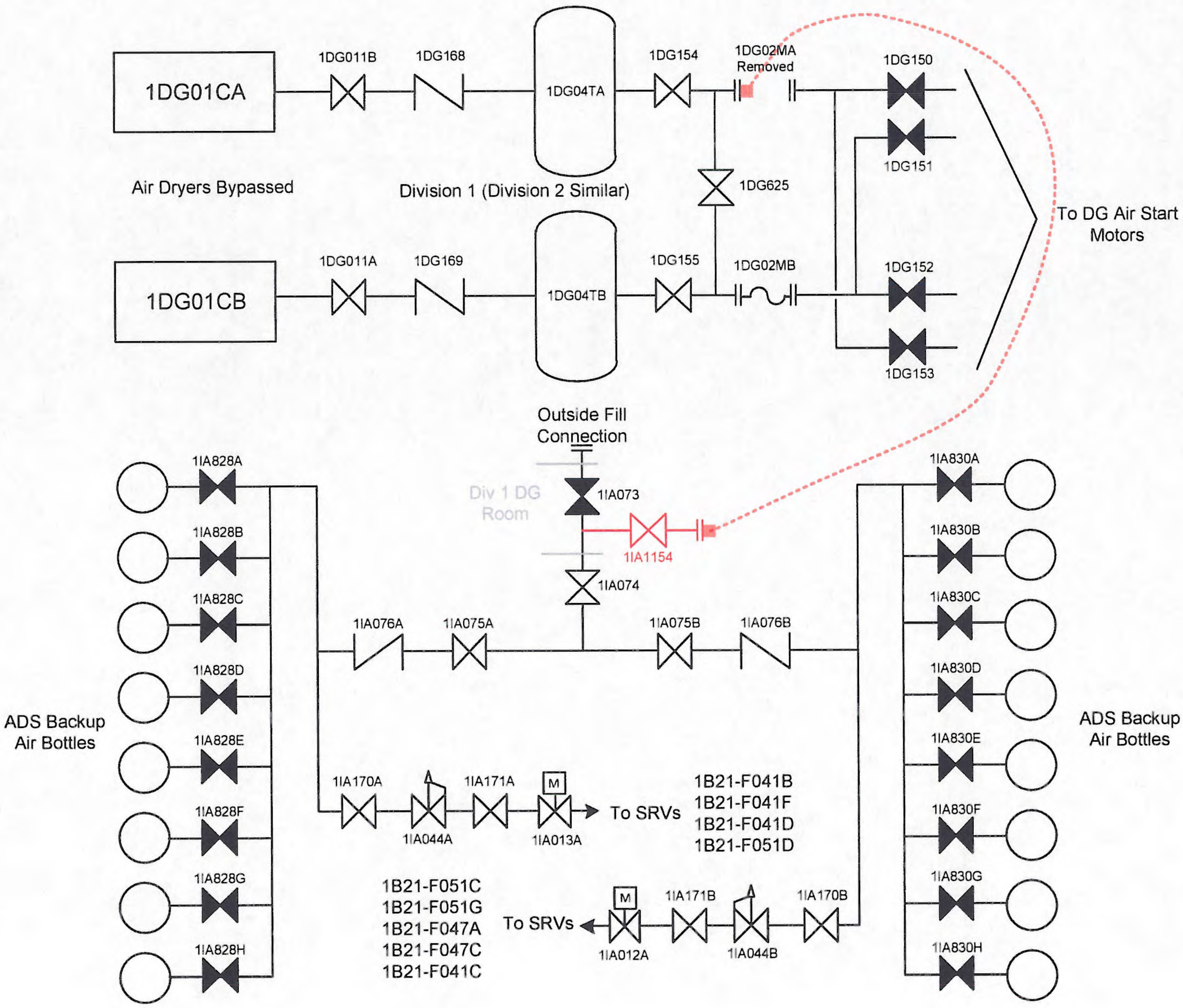


Figure 6 - FLEX Fuel Oil Supply

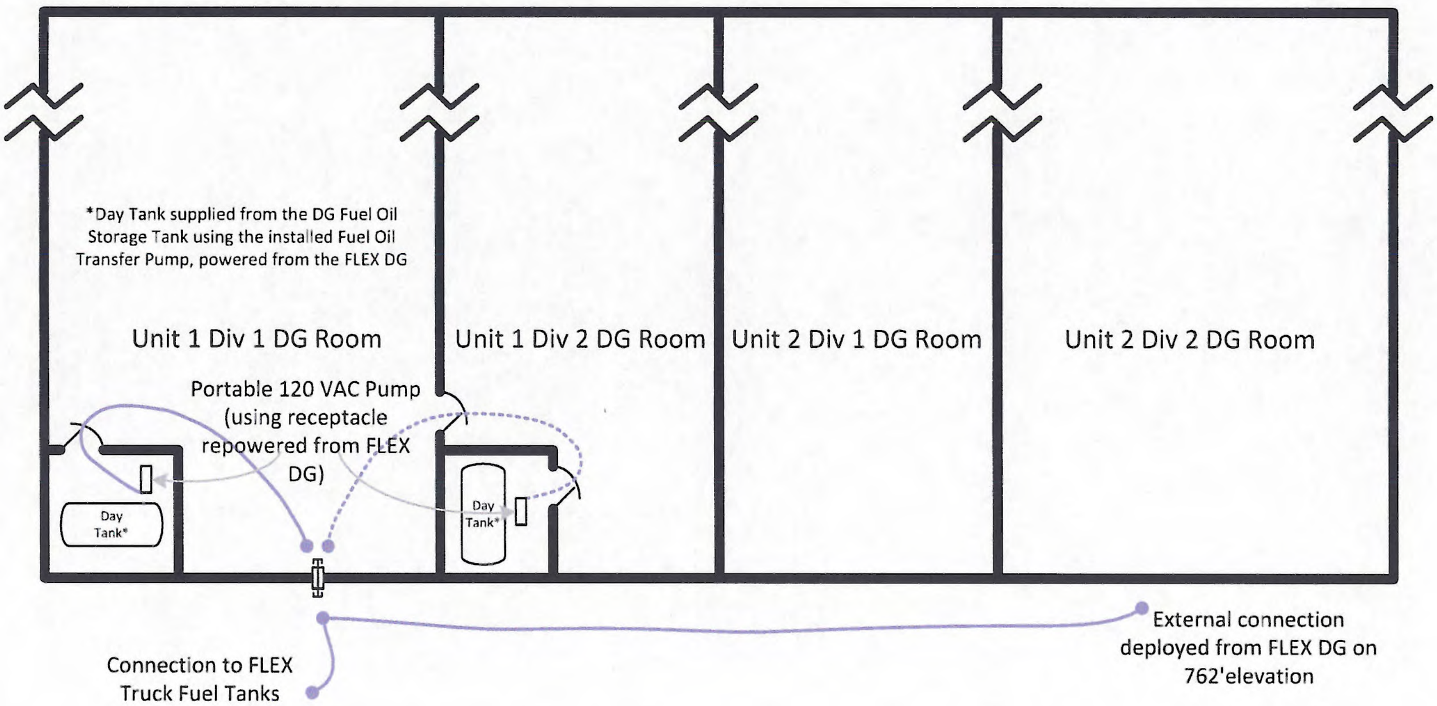
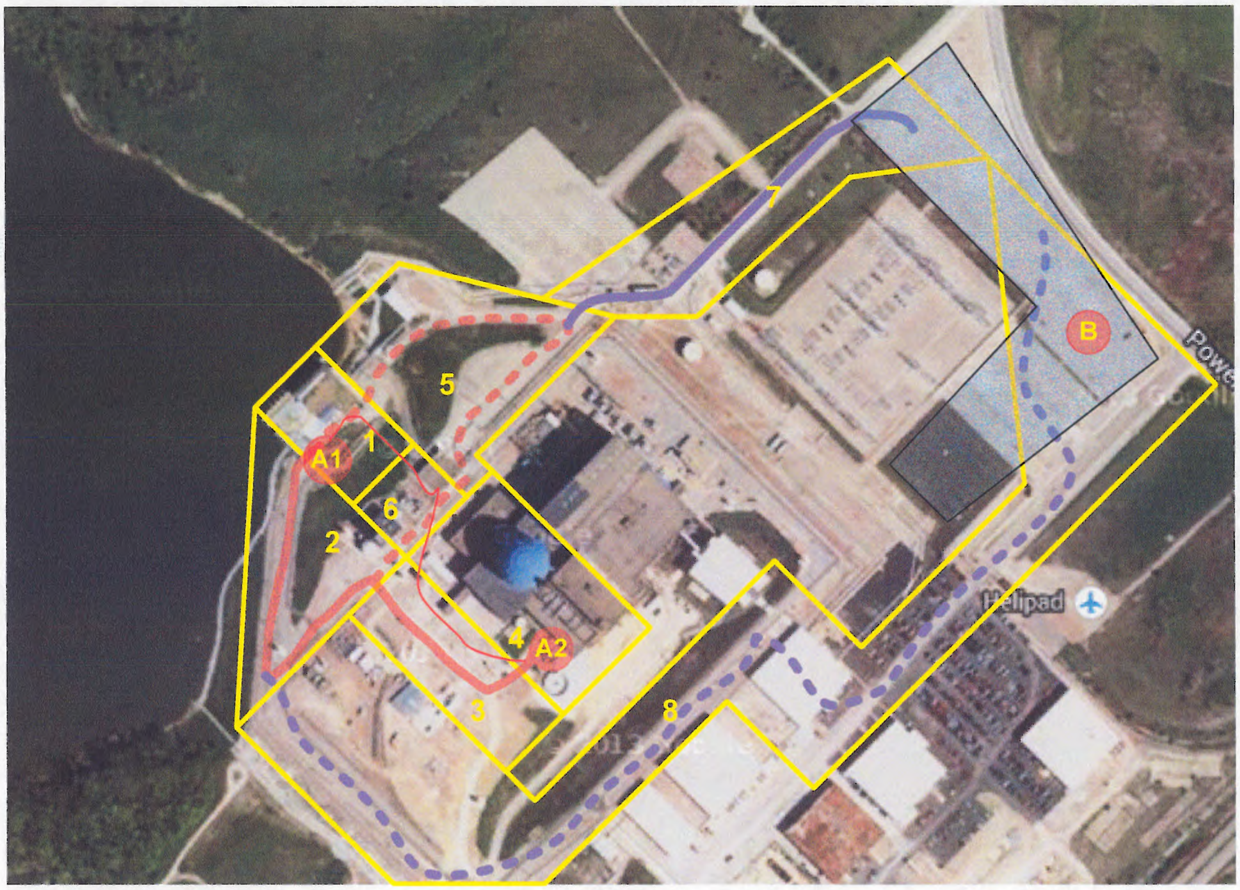


Figure 7 - FLEX Deployment Conceptual Sketch



- **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 National SAFER Response Center 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 National SAFER Response Center 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.

Attachment 4

FORWARDING OF CLINTON POWER STATION MAAP JUSTIFICATION FOR ELAP ANALYSIS ACCEPTABILITY

Enclosed is a completed ELAP response template for the Clinton Power Station (CPS) to justify the use of MAAP4 for the determination of the ELAP timeline.

The following restrictions and limitations apply to the template:

- No containment vent is included in the ELAP response
- The prescribed strategy for ELAP response (including portable pump flow rates) was provided by Exelon in the February 2013 Beyond Design Basis External Event Integrated Plan submittal
- No check has been made regarding the procedural adequacy, the timing for alignment, or flow curves for the portable pump

The operability of RCIC for the calculated plant conditions is not justified by this template. Separate justification needs to be provided for the RCIC operability under the calculated RPV and containment conditions, e.g., as part of this evaluation, RCIC NPSH has not been verified to be adequate over the duration of the MAAP analysis.

Clinton Power Station Response

In response to the letter of October 3, 2013 from Jack Davis (NRR) to Joe Pollock (NEI), the following responses have been developed regarding the use of the Modular Accident Analysis Program (MAAP) for estimating accident progression timing in support of the Overall Integrated Plan for Clinton.

(1) From the June 2013 position paper, benchmarks must be identified and discussed which demonstrate that MAAP4 is an appropriate code for the simulation of an ELAP event at your facility.

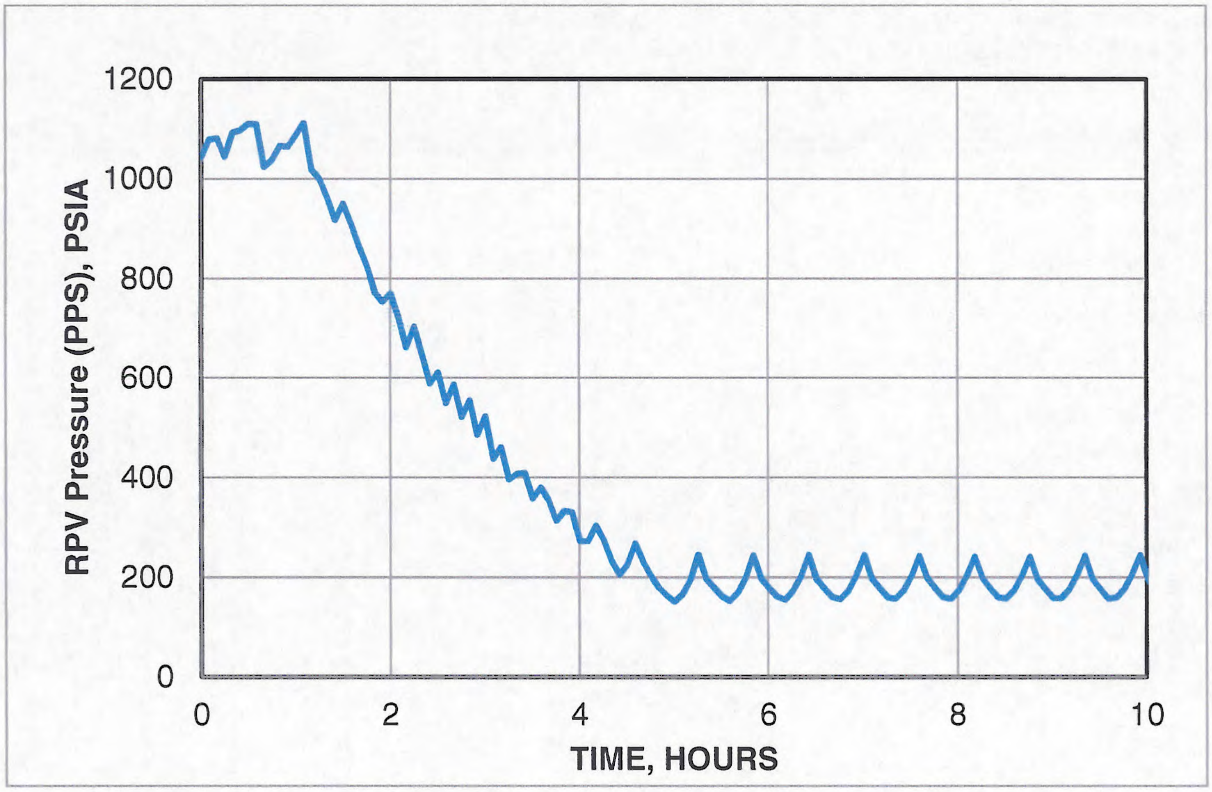
Response to item 1:

Generic response provided by EPRI BWR Roadmap "Technical Basis for Establishing Success Timelines in Extended Loss of AC Power Scenarios in Boiling Water Reactors Using MAAP4," (EPRI Product ID 3002002749).

(2) The collapsed level must remain above Top of Active Fuel (TAF) and the cool down rate must be within technical specification limits.

Response to item 2:

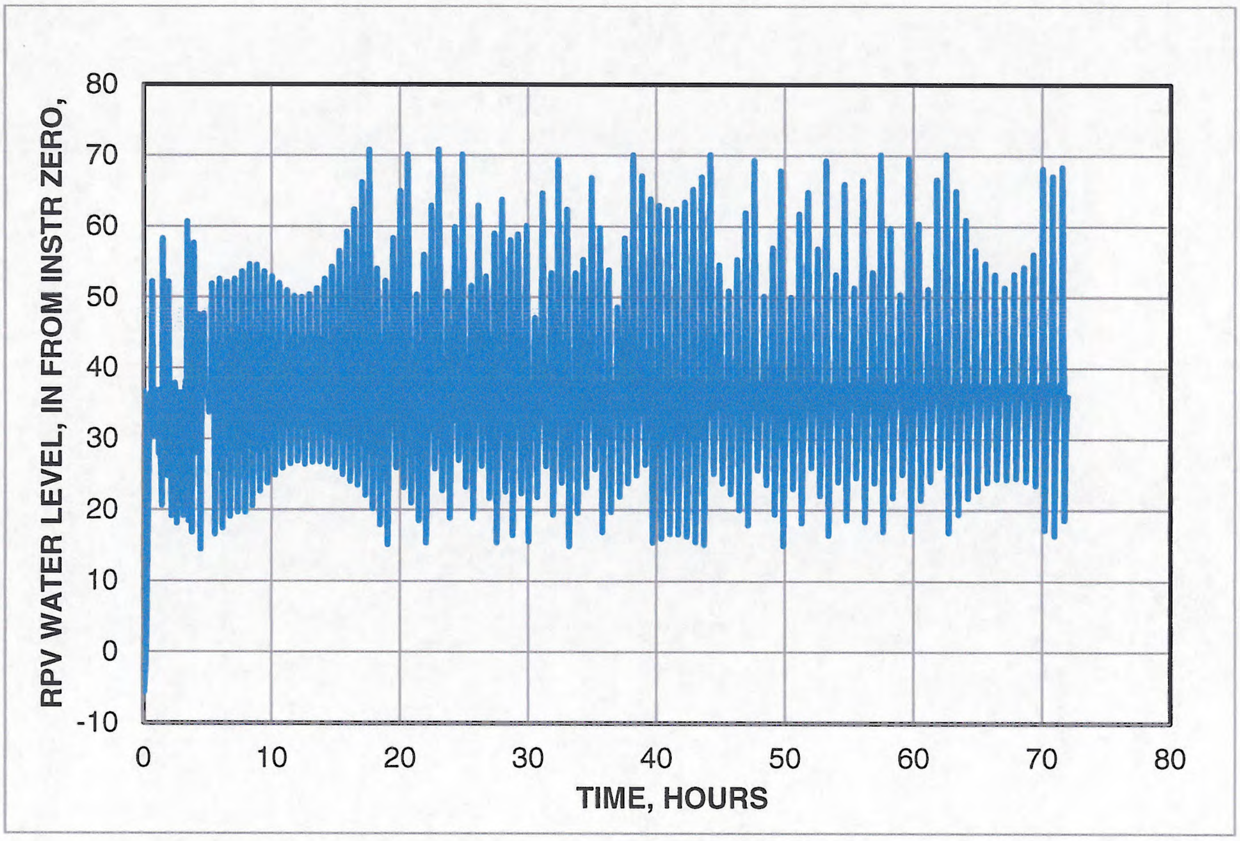
Attachment 1A of the Clinton Integrated Plan (Feb 2013) states that the operators would commence a cooldown of the RPV at 1 hr at a rate of 50 °F/hr which is within the technical specifications limit of 100°F/hr. The following plot of the RPV pressure from the MAAP analysis confirms this cooldown rate for the supporting MAAP calculation.



MAAP Calculation of RPV Pressure During RPV Depressurization

For the representative MAAP run (Case 17), the collapsed RPV water level inside the shroud remains above TAF for the duration of the analysis. The plot below shows that the lowest RPV level, calculated by MAAP, is approximately -10" below instrument zero. (TAF is located at -162" relative to instrument zero[1].) As shown in the following plot, the collapsed RPV water level remains at least 12' above TAF for the duration of the analysis.

(1) Instrument zero is at +521" above vessel zero.



MAAP Calculation of Collapsed RPV Water Level Inside the Shroud

(3) MAAP4 must be used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper.

Response to item 3:

MAAP analysis performed for Clinton was carried out in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper, EPRI Technical Report 3002001785, "Use of Modular Accident Analysis Program (MAAP) in Support of Post-Fukushima Applications".

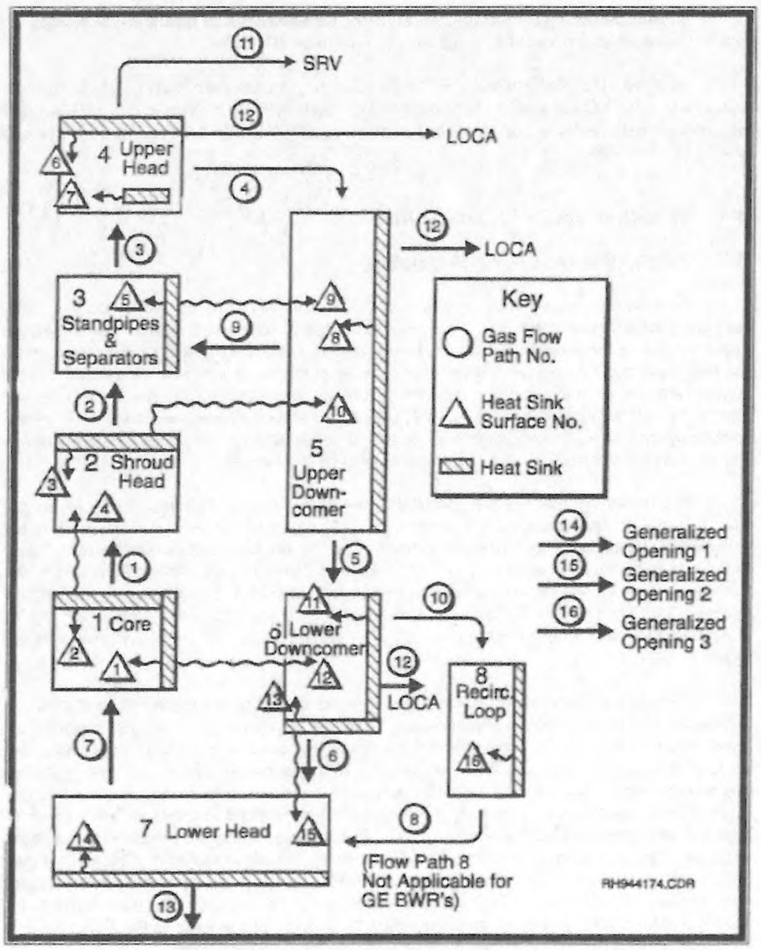
(4) In using MAAP4, the licensee must identify and justify the subset of key modeling parameters cited from Tables 4-1 through 4-6 of the "MAAP4 Application Guidance, Desktop Reference for Using MAAP4 Software, Revision 2" (Electric Power Research Institute Report 1020236). This should include response at a plant-specific level regarding specific coding options and parameter choices for key models that would be expected to substantially affect the ELAP analysis performed for that licensee's plant. Although some suggested key phenomena are identified below, other parameters considered important in the simulation of the ELAP event by the vendor / licensee should also be included.

a. Nodalization
b. General two-phase flow modeling
c. Modeling of heat transfer and losses
d. Choked flow

e. Vent line pressure losses
f. Decay heat (fission products / actinides / etc.)

Response to item 4:

a. The reactor vessel nodalization is fixed by the MAAP code and cannot be altered by the user, with the exception of the detailed core nodalization. The Clinton MAAP 4.0.5 parameter file divides the core region into 5 equal volume radial regions (See NCHAN) and 13 axial regions (See NAXNOD). The axial nodalization represents 10 equal-sized fueled nodes (see NROWS), 1 unfueled node at the top (see NNFT), and 2 unfueled nodes at the bottom (see NNFB). The figure below, taken from the MAAP Users Manual, illustrates the vessel nodalization scheme.

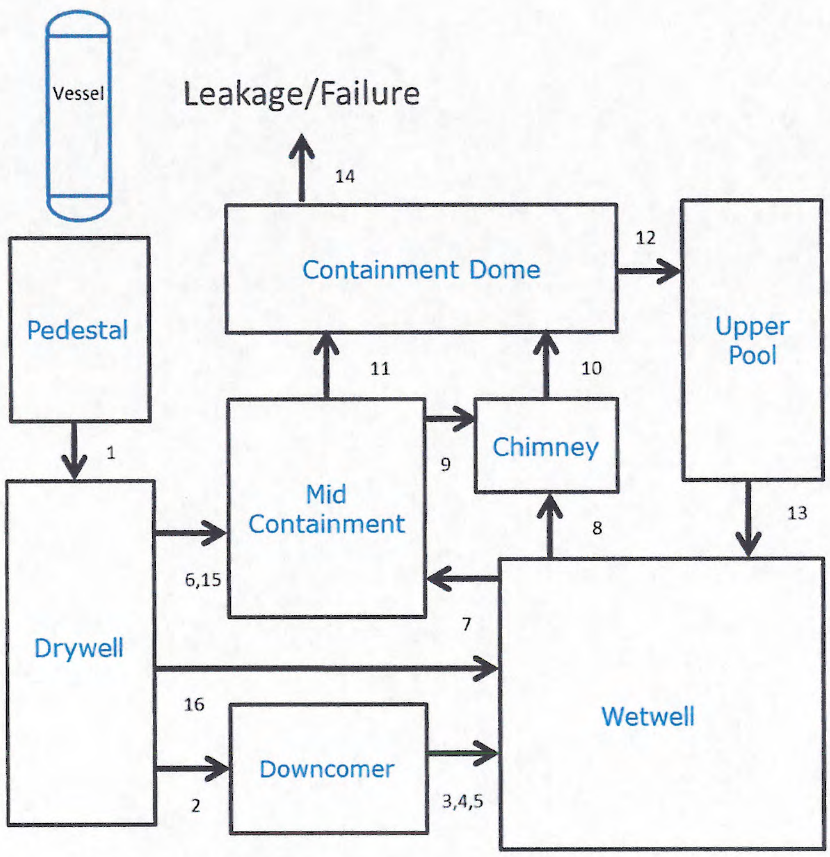


Containment nodalization is defined by the user. The standard nodalization scheme is used in the Clinton MAAP 4.0.5 parameter file and represents the following individual compartments:

1. Reactor pedestal region
2. Drywell
3. Drywell vents to suppression chamber
4. Suppression chamber (wetwell)
5. Containment chimney
6. Containment dome

7. Containment middle compartment
8. Upper containment pool

The figure below illustrates the Clinton containment nodalization along with an identification of containment flow junctions.



Junction	Description
1	Pedestal to Drywell Connection
2	Drywell to Vent/Downcomer
3	Lower Downcomer Vent to Wetwell
4	Middle Downcomer Vent to Wetwell
5	Upper Downcomer Vent to Wetwell
6	Drywell to Mid Containment Vacuum Breakers
7	Wetwell to Mid Containment
9	Mid Containment to Chimney
10	Chimney to Dome
11	Mid Containment to Dome
12	Dome to Upper Pool
13	Upper Pool to Wetwell
14	Dome Leakage/Failure to Environment
15	Drywell Leakage to Containment
16	Drywell to Wetwell Hydrogen Mixing

b. General two-phase flow from the reactor vessel is described in the EPRI BWR Roadmap. In the case of the scenario outlined in the integrated plan, flow can exit the RPV via the open SRV(s) and from the assumed recirculation pump seal leakage. Flow from SRV will be single-phase steam and flow from the recirc pump seal or other RPV leakage will be single-phase liquid due to the location of the break low in the RPV with RPV level continued to be maintain above TAF. Upon exiting the RPV, the seal leakage will flash a portion of the flow to steam based on saturated conditions in the drywell, creating a steam source and a liquid water source to the drywell. As described in the BWR Roadmap (EPRI Product ID 3002002749) there are two parameters that can influence the two-phase level on the RPV. The following table confirms that the parameter values match the recommended values as outlined in the roadmap.

Parameter Name	Value Used in the Clinton MAAP Analysis	EPRI Recommended Value
FCO	1.5248	1.5248
FCHTUR	1.53	1.53

c. Modeling of heat transfer and losses from the RPV are described in the EPRI BWR Roadmap. The parameters that control these processes, as defined in the Roadmap, are provided below with the values selected to represent Clinton.

Parameter Name	Value Used in the Clinton MAAP Analysis	Comment
QC0 – not-thru-insulation heat transfer from RPV during normal operation.	3.42E6 BTU/hr	Plant specific value based on drywell heat removal to coolers during normal operation. Typical values range between 1-2 MW (3.4E6 to 6.8E6 BTU/hr).
FINPLT – number of plates in reflective insulation	2	Plant-specific value
XTINS – average reflective insulation thickness	0.25 ft	Plant-specific value

At the request of the NRC, the following information, as used in the MAAP analysis, is provided.

Parameter Definition	Parameter Name in MAAP	Value Used in the Clinton MAAP Analysis
Power level, MWth	QCR0	3473 MWth
Initial CST water volume, gal	VCST0 (ft3)	126,241 gal
Initial CST water temperature, F	HCST (enthalpy)	91.4°F
Initial suppression pool water mass, lbm	Calculated from input	8,067,000
Initial suppression pool water level, ft	XWRB0(i), where i is node number for wetwell	19.42 ft
Initial suppression pool water temperature, F	TWRB0(i), where i is node number for wetwell	95.0°F
Drywell free volume, ft3	VOLRB(i), where I is node number for drywell	214,663 ft3
Wetwell free volume, ft3	VOLRB(i) – volume of suppression pool water from initial pool mass	287,805 ft3
Containment vent pressure, psia	Refer to MAAP analysis document	N/A (containment is not vented)
RCIC max flow rate, gpm	WVRCIC	600 gpm
Max FLEX pump flow rate, gpm	Refer to MAAP analysis document	2000 gpm
Lowest set SRV flow rate, lb/hr	Derived from SRV area, ASRV	924,933 lb/hr
Lowest set SRV pressure, psia	PSETRV	1117.31 psia
Recirc pump seal leakage, gpm	Value that was used to define LOCA area, ALOCA	100 gpm
Total leakage used in the transient, gpm	Value that was used to define LOCA area, ALOCA	100 gpm

d. Choked flow from the SRV and the recirculation pump seal leakage is discussed in the EPRI BWR Roadmap. The parameters identified that impact the flow calculation are listed below with input values identified.

Parameter Name	Value Used in the Clinton MAAP Analysis	EPRI Recommended Value
ASRV – effective flow area for relief valve	0.1181 ft2 (based on rated flow at pressure)	Plant-specific value
ALOCA – seal leakage area	1.55E-3 ft2 (100 gpm at normal conditions)	Plant-specific value
FCDBRK – discharge coefficient for seal leakage	0.75	0.75

e. Vent line pressure loss can be represented in two ways. The actual piping flow area can be input along with a discharge coefficient (FCDJ). An alternative method would be to calculate the effective flow are given the estimated piping losses, and input a loss coefficient of 1.0. For the Clinton MAAP analysis, no venting of containment is modeled.

f. Decay heat in MAAP is discussed in the EPRI BWR Roadmap (EPRI Product ID 3002002749). Input parameters used to compute the decay heat are identified in the roadmap and are listed in the following table along with their values used in the Clinton analysis.

Parameter Name	Value used in the Clinton MAAP analysis	EPRI recommended value
FENRCH – normal fuel enrichment	0.0369	Plant-specific value
EXPO – average exposure	14,550 MW-day/ton	Plant-specific value
FCR – total capture rate of U-238 / total absorption rate	0.324	Plant-specific value
FFAF – total absorption rate / total fission rate	2.37	Plant-specific value
FQFR1 – fraction of fission power due to U-235 and PU-241	0.476	Plant-specific value
FQFR2 – fraction of fission power due to PU-239	0.437	Plant-specific value
FQFR3 – fraction of fission power due to U-238	0.087	Plant-specific value
TIRRAD – average effective irradiation time for entire core	26,280 hours	Plant-specific value

(5) 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. In either case, the analysis should include a plot of the collapsed vessel level to confirm that TAF is not reached (the elevation of the TAF should be provided) and a plot of the temperature cool down to confirm that the cool down is within tech spec limits.

Response to item 5:

The MAAP analysis performed in support of the Clinton Integrated Plan is documented in calculation CL-MISC-009 Rev. 3 and is available on the ePortal. Case 17 was the specific MAAP run selected to represent the scenario as described in the February 2014 NRC OIP update.