



Order No. EA-12-049

RS-14-010

February 28, 2014

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

Dresden Nuclear Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

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-13-020)
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-13-119)
7. NRC letter to Exelon Generation Company, LLC, Dresden Nuclear Power Station, Units 2 and 3 – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC Nos. MF1046 and MF1047), dated November 22, 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.

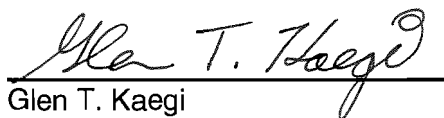
Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an overall integrated plan pursuant to Section IV, Condition C. Reference 2 endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial status report regarding mitigation strategies. Reference 5 provided the Dresden Nuclear Power Station, Units 2 and 3 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 Dresden 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
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure:

1. Dresden Nuclear Power Station, Units 2 and 3 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

Dresden Nuclear Power Station, Units 2 and 3

**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**

(19 pages)

Enclosure

Dresden'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

1 Introduction

Dresden Nuclear Power Station (Dresden) developed an Overall Integrated Plan (Reference 1 in Section 8), 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}	Revised Target Completion Date
	Submit 60 Day Status Report	Complete	
	Submit Overall Integrated Implementation Plan	Complete	
	Contract with RRC	Complete	
	Submit 6 month updates		
August 2013	Update 1	Complete	
February 2014	Update 2	Complete with this submittal	
August 2014	Update 3	Not started	
February 2015	Update 4	Not started	
August 2015	Update 5	Not started	
February 2016	Update 6	Not started	

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Original Target Completion Date		Activity	Status {Include date changes in this column}	Revised Target Completion Date
August 2016		Update 7	Not started	
		Submit Completion Report		
Unit 2	Unit 3	Modification Development		
Oct 2014	Sept 2015	<ul style="list-style-type: none"> • Phase 1 modifications 	Note 1	
Oct 2014	Sept 2015	<ul style="list-style-type: none"> • Phase 2 modifications 	Note 1	
Oct 2014	Sept 2015	<ul style="list-style-type: none"> • Phase 3 modifications 	Note 1	
Unit 2	Unit 3	Modification Implementation		
Nov 2015	Nov 2016	<ul style="list-style-type: none"> • Phase 1 modifications 	Note 1	
Nov 2015	Nov 2016	<ul style="list-style-type: none"> • Phase 2 modifications 	Note 1	
Nov 2015	Nov 2016	<ul style="list-style-type: none"> • Phase 3 modifications 	Note 1	
		Procedure development		
Nov 2015		<ul style="list-style-type: none"> • Strategy procedures 	Note 1	
Nov 2015		<ul style="list-style-type: none"> • Validate Strategy Procedures (NEI 12-06, Sect. 11.4.3) 	Note 1	
Nov 2015		<ul style="list-style-type: none"> • Maintenance procedures 	Note 1	
Jul 2015		Staffing analysis	Note 1	
Nov 2015		Storage Plan and construction	Note 1	
Nov 2015		FLEX equipment acquisition	Note 1	
Nov 2015		Training completion	Note 1	
Jul 2015		Regional Response Center Operational	(will be a standard date from RRC)	
Nov 2015		Unit 2 Implementation date	Note 1	
Nov 2016		Unit 3 Implementation date	Note 1	

Note(s):

1. Exelon will update the status of ongoing and future milestones in the Integrated Plan for DNPS during a scheduled six (6) month update. This update will include any changes to the milestone schedule as submitted in the February 28, 2013 Integrated Plan.

4 Changes to Compliance Method

A review of seismic events identified a downstream dam failure would adversely affect the FLEX strategies identified in the August 2013 update. The pumps identified in the August 2013 6-month update for FLEX strategies during worst postulated dam failure would lose suction during a downstream dam failure (Dresden UFSAR Section 9.5). The overall Dresden strategy has been modified as a result of this review. Attachment 2 provides a sketch of the conceptual design described below.

The revised strategy for all events except flooding will utilize the Suppression Pools as the initial FLEX water source. Electrically driven FLEX pumps will be pre-staged in or near each of the 4 ECCS Corner Rooms in the Reactor Building. Temporary hoses will be used to connect the pumps to existing piping which communicates with the Suppression Pools. Water from the FLEX Pumps will be directed through a combination of existing piping and temporary hoses to supply makeup needs for the Isolation Condenser (IC) Shell-side, RPV and Spent Fuel Pool of both Units. The Suppression Pools will be used in succession to supply the initial FLEX makeup requirements. Water from the Ultimate Heat Sink will subsequently be made available through portable submersible pumps to supply makeup after the Suppression Pools are exhausted.

Power to the pre-staged FLEX pumps will be supplied from pre-staged diesel generators located near the Reactor Building. Temporary cables will be routed from a diesel generator through proposed penetrations in the Reactor Building wall and then connected to the appropriate FLEX pump. After a FLEX pump is operating (time critical action, 2.5 hours) personnel will be able to route additional temporary cables from the generator to supply the safety related 480 VAC busses in the Reactor Building. The 480 VAC safety related busses will then be available to power desired loads such as Standby Liquid Control (SBLC) pumps for high pressure RPV injection and battery chargers. The pre-staged diesel generators will be housed in robust structures to provide protection for all events except flood.

Flood coping strategy employs a diesel driven portable FLEX pump. Because the flood event is precipitation based there is time to prepare. The pump will be placed on a floating platform inside the Reactor Building. The pump suction source will be flood waters surrounding the Reactor Building. Pump discharge will be routed through temporary hoses to the IC Makeup header. This header will be used as a supply header for other hoses to supply makeup needs for RPV makeup and Spent Fuel Pool. A portable diesel generator will be placed on the 2/3 Reactor Building Trackway Interlock roof. The output of the diesel generator will be connected to the safety related 480 VAC busses in the Reactor Building via temporary cables. The 480 VAC safety related busses will then be available to power desired loads.

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

Dresden Nuclear 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.

Section Reference	Overall Integrated Plan Open Item	Status
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Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Section Reference	Overall Integrated Plan Open Item	Status
Sequence of Events (page 5-6)	The times to complete actions in the Events Timeline are based on operating judgment, conceptual designs, and current supporting analyses. The final timeline will be time validated once detailed designs are completed and procedures developed.	Not Started
Sequence of Events (page 5)	Analysis of deviations between Exelon's engineering analyses and the analyses contained in BWROG Document NEDC-33771P, "GEH Evaluation of FLEX Implementation Guidelines," and documentation of results on Att. 1B, "NSSS Significant Reference Analysis Deviation Table." Planned to be completed and submitted with August 2013 Six Month Update.	Completed. See Aug 2013 Update
Sequence of Events (page 8)	Initial evaluations 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.	Not Started
Deployment Strategy (pages 8-9)	<p>Transportation routes will be developed from the equipment storage area to the FLEX staging areas. An administrative program will be developed to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation.</p> <p>Identification of storage areas and creation of the administrative program are open items.</p>	See Interim Staff Evaluation Confirmatory Item 3.1.2.2.A response.
Programmatic Controls (pages 9-10)	An administrative program for FLEX to establish responsibilities, and testing & maintenance requirements will be implemented.	Not Started
Spent Fuel Pool Cooling Phase 2 Discussion (page 46)	Complete an evaluation of the spent fuel pool area for steam and condensation.	See Interim Staff Evaluation Confirmatory Item 3.2.2.A response.
Safety Functions Support Phase 2 Discussion (page 57)	Evaluate the habitability conditions for the Main Control Room and develop a strategy to maintain habitability.	See Interim Staff Evaluation Confirmatory Item 3.2.4.6.C response.
Safety Functions Support Phase 2 Discussion (page 57)	Evaluate the habitability conditions for the Auxiliary Electric Equipment Room (AEER) and develop a strategy to maintain habitability.	See Interim Staff Evaluation Confirmatory Item 3.2.4.2.C response.

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Item number	Interim Staff Evaluation OPEN Item	Status
3.1.1.1.A	Each section of the Integrated Plan describing storage protection from hazards makes reference to Section 11 rather than to the specific protection requirements described in NEI 12-06 for the applicable hazard; that is Section 6.2.3.1 for floods, Section 7.3.1 for wind, etc. As a result, the specific guidelines for each hazard are not addressed.	Proposed Complete. By reference in NEI 12-06, Section 11.3 Items 11.3.1, 11.3.2 and 11.3.3, the structures will conform to the guidance of NEI 12-06, Sections 5 through 9. Therefore, each applicable hazard will be evaluated and storage requirements will be established per NEI 12-06.
3.1.2.2. B	The Plan is silent regarding loss of normal access to the Ultimate Heat Sink (UHS) due to flood hazard conditions, the need to provide electrical power for sump pumps, and whether or not flood barriers will be utilized.	Proposed Complete The Ultimate Heat Sink is a section of the intake canal (Dresden UFSAR Section 9.5). The intake canal is connected to the Kankakee River. During a flood event the river will overflow its banks. Water for FLEX requirements will come from the flood waters. As a result, access specifically to the UHS is not required. During the actual flood the water in the UHS and the flood water will essentially be the same. The FLEX Flood strategy is described in Section 4, Changes to Compliance Method, of this update. The FLEX flood strategy acknowledges that installed sump pumps and temporary flood barriers will be in place. With the primary FLEX Flood pump being staged on a floating platform the strategy will function regardless of the status of the sump pumps or temporary flood barriers.
3.2.4.8.A	Updated information provided by the licensee as part of the 6-month update states that they are proposing to install a prestaged generator to supply all FLEX related loads for both units simultaneously for Phase 2 mitigating strategies. This appears to be an alternative approach for satisfying the Mitigating Strategies order. Insufficient information has been provided by the licensee in order to determine whether this provides an equivalent level of protection as would be provided through conformance with NEI 12-06.	Not started.

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Item number	Interim Staff Evaluation CONFIRMATORY Item	Status
3.1.1.2.A	A postulated downstream dam failure from a seismic event is still being evaluated.	Proposed Complete The downstream dam failure during a seismic event has been evaluated against the criteria in Section 5 of NEI 12-06 Rev 0 and this failure is applicable to Dresden for FLEX response. As a result the Dresden FLEX strategy conceptual design has been revised as described in Section 4, Changes to Compliance Method, of this update to address this event. Detailed design will incorporate the results of the review. No further action required.
3.1.1.2.B	Plans for strategies did not address whether electrical power would be required to move or deploy FLEX equipment (e.g. to open a door from a storage location.)	Not started
3.1.1.3.A	Development of a reference source for obtaining necessary instrument readings in the event of seismic damage to electrical equipment as described in NEI 12-06, Section 5.3.3, consideration 1.	Started
3.1.1.3.B	Use of, or need for ac power to mitigate ground water intrusion was not addressed.	Proposed Complete. The Dresden FLEX Flood strategy assumes the flood waters will eventually enter the Reactor Building. Control of ground water intrusion is desirable but is not required. Ground water intrusion will not prevent implementation of the FLEX strategy. Therefore, AC power is not required to mitigate ground water intrusion. See Interim Safety Evaluation <u>OPEN</u> Item 3.1.2.2. B response (above) for additional explanation.
3.1.1.4.A	Regarding off site resources, detailed plans for local staging areas and transport of FLEX equipment to overcome hazards are to be provided in 6-month update.	Started
3.1.2.A	Impact of persistence of flooding to staging of FLEX equipment not fully addressed.	Started
3.1.2.2.A	Administrative program and procedures for on-site FLEX equipment storage locations and transport routes not yet established.	Started
3.1.2.3.A	Administrative program and procedures related to implementation of mitigation strategies not yet developed.	Started

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Item number	Interim Staff Evaluation CONFIRMATORY Item	Status
3.1.4.2.A	Equipment to clear ice and snow from haul pathways is not identified in plan.	Proposed Complete. Dresden has purchased an F750 Truck with a snow plow for snow/ice clearing of haul paths. The plow on the F-750 is of a composite design with a steel reinforced frame. The truck will be used for snow/ice clearing to support initial FLEX equipment deployment.
3.1.5.2.A	Procedures to assure equipment can be deployed in a high temperature context have not been developed. Specifically, address high temperature effects on storage locations (e.g. expansion of sheet metal, swollen seals, etc.)	Not started
3.1.5.3.A	Procedures to address high temperature impacts on FLEX equipment not yet developed.	Started
3.2.1.1.A	Need benchmarks to demonstrate Modular Accident Analysis Program (MAAP) 4 is the appropriate code for simulation of ELAP.	Started
3.2.1.1.B	For MAAP4, collapsed level must remain above Top of Active Fuel and cool down rate must meet technical specifications.	Started
3.2.1.1.C	MAAP4 use must be consistent with June 2013 position paper.	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).	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.	Started

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Item number	Interim Staff Evaluation CONFIRMATORY Item	Status
3.2.1.3.A	Outstanding Confirmatory Items regarding the use of the MAAP4 analysis may impact the sequence of events timeline. Any changes to the MAAP4 analysis results will need to be reviewed for impact on the sequence of events timeline. The licensee stated that 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
3.2.1.3.B	Sequence of Events timing for compensatory actions to control temperature rise in the Main Control Room not resolved.	Started
3.2.1.4.A	Detailed engineering analyses to confirm the ability of FLEX pumps to provide required flow and head capacities are not complete.	Started
3.2.1.4.B	Analysis needs to be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. To be provided in a future six (6) month update.	Started
3.2.1.6.A	Whether or not backup compressed air for valve actuation is required, is contingent on the MAAP4 analyses conclusions. The MAAP4 conclusions will determine if containment venting is necessary.	Started
3.2.2.A	Final analysis of fuel pool area for steam and condensation impacts regarding access is not complete.	Started
3.2.3.A	There are outstanding issues regarding the acceptability of the MAAP4 analysis. The potential for impact of MAAP4 results on the containment heat removal strategy needs to be reviewed.	Started

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Item number	Interim Staff Evaluation CONFIRMATORY Item	Status
3.2.4.2.A	A discussion is needed on the effects of extreme low temperatures (i.e., temperatures below those assumed in the sizing calculation for each battery) on each battery's capability to perform its function for the duration of the ELAP event.	Not started
3.2.4.2.B	Procedure will be developed to address controlling battery room hydrogen concentration.	Not started
3.2.4.2.C	Evaluations to address loss of ventilation in the auxiliary equipment electric room and Battery Rooms are not complete.	Not started
3.2.4.2.D	Insufficient information to address impact on elevated temperatures in areas critical to mitigation strategies. For example, initial temperatures assumed in the analyses is not clear, critical components in pump rooms are not identified, etc. Detailed design information is needed.	Not started
3.2.4.4.A	Provisions for portable lighting for area access not clear. More information required.	Not started
3.2.4.4.B	Confirm upgrades to communication system that resulted from the licensee communications assessment. ADAMS Accession Nos. ML 12306A199 and ML 13056A135.	Started
3.2.4.6.A	Surface pyrometer temperature readings are required in the torus area. The licensee needs to address habitability and access to the torus area.	Started
3.2.4.6.B	Final GOTHIC analysis for the HPCI room temperature rise is not complete.	Started
3.2.4.6.C	Habitability of the control room should consider temperature limits of NUMARC 87-00 and MIL-STD-1472C.	Started
3.2.4.8.B	Detailed designs will identify comprehensive load lists to confirm conceptual load assumptions.	Not started

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Item number	Interim Staff Evaluation CONFIRMATORY Item	Status
3.2.4.8.C	Insufficient information provided regarding FLEX diesel generators and the plant Class 1 E diesel generators isolation to prevent simultaneously supplying power to the same Class 1 E bus and regarding minimum bus voltages during the use of FLEX generators.	Started
3.2.4.9.A	The licensee stated in its 6-month update that a modification has been proposed to allow transfer of fuel oil from the 2/3 Emergency Diesel Generator main fuel oil storage tank to the area of the proposed FLEX diesel generators. Need to confirm that the modification is installed and supplies sufficient fuel.	Started
3.2.4.9.B	Assessing and maintaining fuel oil quality for FLEX equipment use was not addressed.	Not started
3.2.4.10.A	Final analysis for battery operation with load shed not complete. Need detailed load profile for all mitigating strategies and a detailed discussion of loads that will be shed, how they will be shed, and what are the effects of the shed.	Started
3.4.A	Details not provided to demonstrate the minimum capabilities for offsite resources will be met per NEI 12-06 Section 12.2.	Started

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. Dresden Nuclear 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 (subsequently revised Aug 28, 2013).

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

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. Dresden Nuclear Power Station Updated Final Safety Analysis Report, Revision 9
4. Diverse and Flexible Coping Strategies (FLEX) Implementation Guide", NEI 12-06, Revision 0, August 2012
5. Attachment 1 Revised Estimated Sequence of Events Timeline.
6. Attachment 2, Simplified FLEX Makeup Conceptual Design
7. Attachment 3, Simplified FLEX Electrical Conceptual Design

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Attachment 1
Revised Estimated Sequence of Events Timeline

Action item	Elapsed Time	Action	Time Constraint Y/N ¹	Remarks / Applicability
	0	Event Starts	NA	Plant @100% power
	0	Reactor scram	NA	Loss of power to Reactor Protection System results in a reactor scram.
1	1 min	Personnel enter DGP 02-03 and DGA 12	N	These actions will provide direction for reactor control and options for loss of AC power.
2	1 min	Isolation Condenser initiated for pressure control (or verified operating if auto initiation occurs)	N	DEOP 100 will direct action based on reactor pressure.
3	2 mins	Attempt to start EDGs upon identification of failure to auto start.	N	Per FLEX event initial conditions the EDGs are not available.
4	3 mins	Attempt to Start IC Makeup Pump for IC Shell side makeup	N	There are no fully qualified makeup sources for shell-side makeup.
5	5 mins	Personnel dispatched to investigate EDG failure to start.	N	Per FLEX event initial conditions the EDGs are not available.
6	5 mins	HPCI initiated for inventory control and reactor pressure control (or verified operating if auto initiation occurs).	N	DEOP 100 will direct this action. HPCI suction will auto swap to the Torus due to CSTs being assumed lost with the FLEX event (not missile protected).
7	10 mins	Attempt to start SBO DG for either Unit	N	Per FLEX event initial conditions the SBO DGs are not available.

¹ Instructions: Provide justification if No or NA is selected in the remark column. If yes, include technical basis discussion as requires by NEI 12-06 section 3.2.1.7

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Attachment 1
Revised Estimated Sequence of Events Timeline

Action item	Elapsed Time	Action	Time Constraint Y/N ¹	Remarks / Applicability
8	15 mins	Personnel dispatched to investigate SBO DG failure to start.	N	Per FLEX event initial conditions the SBO DGs are not available.
9	15 mins	Perform 125 VDC load shedding per DGA 13	N	This is an immediate action of DGA 13 to prolong battery availability. Must be completed by 30 minutes after event initiation.
10	20 mins	Isolation Condenser secured due to lack of shell-side makeup.	Y	Per UFSAR, the IC will operate for approximately 20 minutes without shell-side makeup. It is secured to prevent possible damage.
11	30 mins	125 and 250 VDC Load Shed Completed (actions identified in DGA 03, DGA 12 and DGA 13)	Y	DGA 12 Step D.13 identifies that load shedding to maintain battery availability must be completed if DC chargers are unavailable.
12	1 hour	Control Room crew has assessed SBO and plant conditions and declares an Extended Loss of AC Power (ELAP) event. <ul style="list-style-type: none"> • Personnel dispatched to FLEX strategy for supplying make-up water to the Isolation Condenser shell-side. • Personnel dispatched to FLEX strategy for supplying power to the FLEX Makeup Pump and station battery chargers 	N	Time is reasonable approximation based on operating crew assessment of plant conditions.

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Attachment 1
Revised Estimated Sequence of Events Timeline

Action item	Elapsed Time	Action	Time Constraint Y/N ¹	Remarks / Applicability
13	2 hours	Complete actions for Loss of AEER Ventilation	N	Perform DOA 5750-1 Attachment C Step 6. Actions can be coordinated with personnel obtaining and staging portable generators, fans, etc.
14	2 hours	Establish natural air flow to HPCI room by opening doors.	Y	Preliminary GOTHIC analysis indicates opening doors at 2 hours will result in acceptable room temperature values to support operation of HPCI for at least 6 hours. HPCI room temperature remains below the isolation point during this time. HPCI operation is assumed for approximately 2.5 hours in Phase 1.
15	2 hours	Complete actions for loss of Main Control Room Ventilation.	N	DOA 5750-01 actions.
16	2 hours	Defeat HPCI high temperature and flow isolations	N	Ensure HPCI remains available during the event.
17	2.5 hours	FLEX strategy for supplying power to a FLEX Makeup Pump completed.	Y	Involves running temporary cables and connecting to the selected FLEX Makeup pump.
18	2.5 hours	FLEX pump connected and supplying Isolation Condenser shell-side makeup.	Y	Due to pre-staging of major components, it is reasonable to expect the FLEX pump can be available within this time period.

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Attachment 1
Revised Estimated Sequence of Events Timeline

Action item	Elapsed Time	Action	Time Constraint Y/N ¹	Remarks / Applicability
19	2.5 hours	Isolation Condenser initiated for RPV pressure control	Y	Complete prior to loss of HPCI to ensure RPV heat removal mechanism operating prior to MAAP analysis assumed HPCI loss.
20	2.5 hours	HPCI assumed to fail due to suppression pool temperature of $\geq 140^{\circ}\text{F}$	N	HPCI may continue to operate above 140°F but it is not relied upon past this point. Restoration of the Isolation Condenser will replace the need for HPCI in terms of RPV pressure control.
21	6 hours	FLEX strategy for supplying power to 480 VAC busses and associated Motor Control Centers (MCCs) completed.	Y	When the busses are energized, power will be available to supply power to battery chargers and other desired loads such as SBLC and SBT. Preliminary review indicates the batteries will remain available for at least 6 hours without chargers.
22	6 hours	Isolate both Reactor Recirculation Loops by closing suction and discharge valves	N	Recirc loops are isolated to reduce RPV leakage. The sooner this is accomplished the more reactor inventory is conserved.

Dresden Nuclear Power Station's Second Six Month Status Report for the Implementation of FLEX
February 28, 2014

Attachment 1
Revised Estimated Sequence of Events Timeline

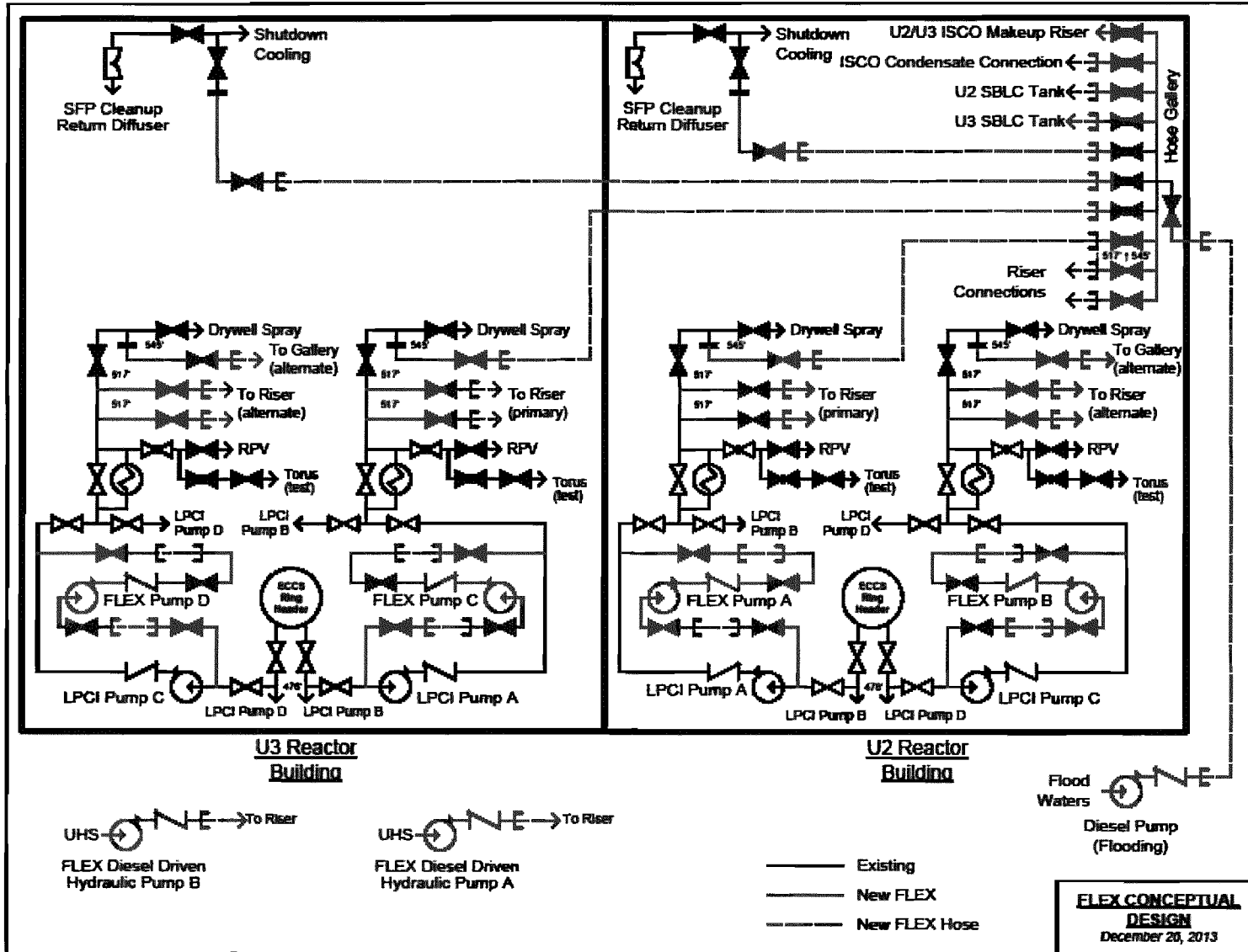
Action item	Elapsed Time	Action	Time Constraint Y/N ¹	Remarks / Applicability
23	6 hours	Initiate SBLC as necessary for RPV level control.	N	Per MAAP analysis after Recirc Loops are isolated and the Isolation Condenser is controlling reactor pressure, RPV leakage will be reduced to approximately 15 gpm at time = 6.0 hours. Makeup from SBLC can be utilized to maintain RPV level above Top of Active Fuel (TAF).
24	10 hours	Personnel dispatched to establish temporary ventilation to the MCR and AEER (portable fans and associated generators).	N	Further analysis is required to determine if supplemental ventilation is needed.
25	12 hours	Makeup to the Spent Fuel Pools using FLEX pump strategy is available.	Y	EC 371913, Revision 2, Time-to-Boil Curves, identifies a time to boil of 9.54 hours, and 110.07 hours to the top of active fuel. Therefore completing the equipment line-up for initiating SFP make-up at 12 hours into the event ensures adequate cooling of the spent fuel is maintained.
26	12 hours	Personnel dispatched to deploy portable pump and line-up water supply from the Ultimate Heat Sink (UHS).	N	Additional site resources will be available 6 hours after event initiation to aid in this effort. The resources include personnel to operate equipment such as mobile lifting device to deploy submersible pump in the UHS.

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Action item	Elapsed Time	Action	Time Constraint Y/N¹	Remarks / Applicability
27	17 hours	Makeup available from UHS using portable equipment	N	Long term makeup water source will be available before the water contained in the Suppression Pools for both Units is exhausted. Makeup from the UHS will not be required before this time.
28	24 hours	Initial equipment from Regional Response Center becomes available.	N	NEI 12-06 assumption.
29	24-72 hours	Continue to maintain critical functions of core cooling (via IC and FLEX Pump injection), containment (via hardened vent opening) and SFP cooling (FLEX pump injection to SFP). Utilize initial RRC equipment in spare capacity.	N	None

Attachment 2
Simplified FLEX Makeup Conceptual Design



Attachment 3

