



Order No. EA-12-049

RS-15-024

February 27, 2015

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

Quad Cities Nuclear Power Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Subject: Fourth 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-13-025)
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-13-129)
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-14-015)

8. Exelon Generation Company, LLC 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), dated August 28, 2014 (RS-14-213)
9. NRC letter to Exelon Generation Company, LLC, Quad Cities Nuclear Power Station, Units 1 and 2 – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC Nos. MF1048 and MF1049), 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.

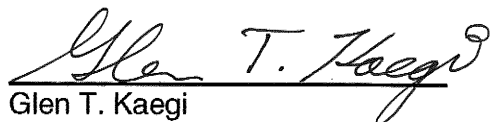
Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an overall integrated plan pursuant to Section IV, Condition C. Reference 2 endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial status report regarding mitigation strategies. Reference 5 provided the Quad Cities Nuclear Power Station, Units 1 and 2 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, 7, and 8 provided the first, second, and third six-month status reports, respectively, pursuant to Section IV, Condition C.2, of Reference 1 for Quad Cities Station. The purpose of this letter is to provide the fourth 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 9.

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 27th day of February 2015.

Respectfully submitted,



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

Enclosure:

1. Quad Cities Nuclear Power Station, Units 1 and 2 Fourth 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 – Quad Cities Nuclear Power Station, Units 1 and 2
NRC Project Manager, NRR – Quad Cities Nuclear Power Station, Units 1 and 2
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Mr. Jack R. Davis, NRR/DPR/MSD, NRC
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Mr. Jeremy S. Bowen, NRR/DPR/MSD/MSPB, NRC
Mr. Robert L. Dennig, NRR/DSS/SCVB, NRC
Mr. John P. Boska, NRR/JLD/JOMB, NRC
Illinois Emergency Management Agency - Division of Nuclear Safety

Enclosure

Quad Cities Nuclear Power Station, Units 1 and 2

**Fourth 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**

(24 pages)

Enclosure

Quad Cities Nuclear Power Station, Units 1 and 2 Fourth 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

Quad Cities Nuclear Power Station, Units 1 and 2, developed an Overall Integrated Plan (Reference 1 in Section 8) documenting the diverse and flexible strategies (FLEX) in response to NRC Order EA-12-049 (Reference 2). This enclosure provides an update of milestone accomplishments since submittal of the last status report, including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

NOTE: The "Status" indicated in this document is as of January 23, 2015. This date was chosen to support the development, review, approval and submittal of this report by the required February 27, 2015 due date.

2 Milestone Accomplishments

The Staffing analysis has been completed since the last update and was submitted in letter RS-14-280 dated November 3, 2014. Also, the National SAFER Response Center (NSRC) is operational.

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.

The revised target completion dates impact the order implementation date. An explanation of the impact of these changes is provided in Section 5 of this enclosure.

Milestone Schedule

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Submit 60 Day Status Report	Oct 2012	Complete	
Submit Overall Integrated Plan	Feb 2013	Complete	
Contract with RRC		Complete	
Submit 6 Month Updates:			
Update 1	Aug 2013	Complete	
Update 2	Feb 2014	Complete	
Update 3	Aug 2014	Complete	

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Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Update 4	Feb 2015	Complete with this submittal	
Update 5	Aug 2015	Not Started	
Update 6	Feb 2016	Not Started	
Update 7	Aug 2016	Not Started	
Submit Completion Report		Not Started	June 2018 See Section 5 of this enclosure.
Modifications Development & Implementation:			
Unit 1 Modification Development (All FLEX Phases)	Feb 2014	Completed	April 2014
Unit 1 Modification Implementation (All FLEX Phases)	Apr 2015	Started	Mar 2015
Unit 2 Modification Development (All FLEX Phases)	Mar 2015	Completed	
Unit 2 Modification Implementation (All FLEX Phases)	Apr 2016	Started	
Common Unit Modification Development (Interim Storage Pads and Deep Wells)		Started	Mar 2015
Common Unit Modification Implementation (Interim Storage Pads and Deep Wells)		Started	Mar 2015
Robust Storage Building	October 2015	Started	
ASCE 7-10 FLEX +1 Storage Building	April 2016	Started	
Procedures:			
Create Site-Specific Procedures	Apr 2015	Started	Mar 2015
Validate Procedures (NEI 12-06, Sect. 11.4.3)	Apr 2015	Started	Mar 2015
Create Maintenance Procedures	Apr 2015	Started	Mar 2015
Perform Staffing Analysis	Nov 2014	Completed	
Storage Plan and Construction	Apr 2015	Started	Mar 2015

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Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
FLEX Equipment Acquisition	Apr 2015	Started	Mar 2015
Training Completion	Apr 2015	Started	Mar 2015
National Safer Response Center Operational	Dec 2014	Completed	
Unit 1 FLEX Implementation	Apr 2015	Started	Apr 2017 See Section 5 of this enclosure.
Unit 2 FLEX Implementation	Apr 2016	Started	Apr 2018 See Section 5 of this enclosure.
Full Site FLEX Implementation	Apr 2016	Started	Apr 2018 See Section 5 of this enclosure.

4 Changes to Compliance Method

The equipment listings for Phase 2 and Phase 3 (National SAFER Response Center (NSRC) equipment) are updated in Attachments 1 and 2, respectively. The timeline submitted with the OIP has been updated based on additional MAAP analysis (Reference 11) and the timeline is enclosed in Attachment 3.

Change 1

General Integrated Plan Elements BWR Requirement:

Extent to which the guidance, JLD-ISG-2012-01 and NEI 12-06, are being followed. Identify any deviations to JLD-ISG-2012-01 and NEI 12-06. The allowed unavailability time requirements are stated in NEI 12-06 section 11.5.3 and described as: "The unavailability of equipment and applicable connections that directly performs a FLEX mitigation strategy for core, containment, and SFP should be managed such that risk to mitigating strategy capability is minimized."

Reason for Change:

Due to delays in completing the Robust FLEX Building, Quad Cities will be utilizing an outdoor two-pad equipment storage configuration on an interim basis. This configuration will only be utilized until construction of the Robust FLEX Building is complete, which is expected by October 2015. This temporary two-pad storage configuration is an interim approach to the standard FLEX building strategy that meets the requirements of NEI 12-06 and satisfies the intent of NRC Order EA-12-049. During the period Quad Cities is in this configuration for storage, Quad Cities will implement an Alternate Approach to meet the Order for allowed unavailability time.

Change to Compliance Method:

Unavailability Alternate Approach

1. The unavailability of equipment and applicable connections that directly performs a FLEX mitigation strategy for core, containment, and SFP should be managed such that risk to mitigating strategy capability is minimized.
 - a. The unavailability of plant equipment is controlled by existing plant processes such as the Technical Specifications. When plant equipment which supports FLEX strategies becomes unavailable, then the FLEX strategy affected by this unavailability does not need to be maintained during the unavailability.
 - b. The required FLEX equipment may be unavailable for 90 days provided that the site FLEX capability (N) is met. If the site FLEX (N) capability is met but not fully protected for the site's applicable hazards, then the allowed unavailability is reduced to 45 days.
 - c. Connections to plant equipment required for FLEX strategies can be unavailable for 90 days provided the remaining connection remains available such that the site FLEX strategy is available.
 - d. If FLEX equipment is likely to be unavailable during forecast site specific external events (e.g., flooding), appropriate compensatory measures should be taken to restore equivalent capability in advance of the event.
 - e. The duration of FLEX equipment unavailability, discussed above, does not constitute a loss of reasonable protection from a diverse storage location protection strategy perspective.
 - f. If FLEX equipment or connections becomes unavailable such that the site FLEX capability (N) is not maintained, initiate actions within 24 hours to restore the site FLEX capability (N) and implement compensatory measures (e.g., use of alternate suitable equipment or supplemental personnel) within 72 hours.
 - g. If FLEX equipment or connections to permanent plant equipment required for FLEX strategies are unavailable for greater than 45/90 days, initiate actions to restore the FLEX capability and implement compensatory measures (e.g., use of alternate suitable equipment or supplemental personnel) prior to exceeding the 45/90 days.

Basis for an Alternate Approach:

The interim storage pad design requires use of two separate storage pads separated by a large distance. The lower pad and its haul path are qualified to withstand the seismic event, while the upper pad is designed for the seismic event, however, its haul path is not analyzed for seismic capabilities. As a result, the upper pad may become unavailable for accessing FLEX equipment during a seismic event, therefore the Alternate Approach described herein for a reduced Unavailability Time applied to the interim storage pad equipment will be used to compensate for the upper pad haul path not being analyzed for seismic capabilities. If the remaining N equipment is not protected from the applicable hazards, instead of the 90-day allowed out of service time, an allowed out of service time of 45 days will apply. This is based on 6-week short cycle work scheduling. This will allow the station to continue to manage work associated with equipment important to safety. Placing the FLEX equipment into the site work schedule at the 6-week period still allows proper planning and resource loading while maintaining schedule compliance and stability. This action will not cause the station to be distracted from other scheduled work.

The probability of an event causing an ELAP and loss of the UHS is low, and reducing the allowed unavailability time will further reduce the probability of an event during this period. Therefore, it is reasonable to expect equipment availability during periods when it is required.

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

By letter dated February 27, 2014 (Ref. 5), Quad Cities Station requested relaxation from certain schedule requirements of Order EA-12-049 (Ref. 2) related to installation of the severe accident capable containment vent required by Order EA-13-109 (Ref. 3). The NRC granted that schedule relief via letter dated April 15, 2014 (Ref. 9).

No additional need for relief/relaxation relative to Order EA-12-049 has been identified 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 (Reference 1) or the Draft Safety Evaluation (SE) (Reference 7), and the status of each item.

OIP Section Reference	Overall Integrated Plan Open Item	Status
Sequence of Events (p. 4)	1. 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 are developed, and the results will be provided in a future six-month update.	Started
Sequence of Events (p. 4,5)	2. Issuance of BWROG document NEDC-33771P, "GEH Evaluation of FLEX Implementation Guidelines," on 01/31/2013 did not allow sufficient time to perform the analysis of the deviations between Exelon's engineering analyses and the analyses contained in the BWROG document prior to submittal of this Integrated Plan. This analysis is expected to be completed, documented on Attachment 1B, and provided to the NRC in the August 2013 six-month status update.	Complete - See August 2013 Six-Month update (Reference 4).

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OIP Section Reference	Overall Integrated Plan Open Item	Status
Sequence of Events (p. 6)	3. Additional work will be performed during detailed design development to ensure Suppression Pool temperature will support RCIC operation, in accordance with approved BWROG analysis, throughout the event.	Complete - Quad Cities MAAP analysis results for the case used for the strategy development indicated that the peak Suppression Pool temperature was 232°F at 10 hours from the start of the event. This temperature provides significant margin to the limits provided in the BWROG Fukushima Response Committee- Beyond Design Basis RCIC Elevated Temperature Functionality Assessment, “ BWROG-TP-14-018 Rev. 0”.
Sequence of Events (p. 7)	4. 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 designs, and will be provided in a future six-month update.	Complete - See August 2014 Six-Month update (Reference 10).
Multiple Sections	5. 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 Quad Cities.	Started
Programmatic controls (p. 8)	6. Quad Cities Nuclear Power Station will implement an administrative program for FLEX to establish responsibilities, and testing and maintenance requirements.	Started

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OIP Section Reference	Overall Integrated Plan Open Item	Status
Multiple Sections	7. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the integrated plan for Quad Cities Nuclear Power Station during a scheduled six-month update. This update will include any changes to the initial designs as submitted in this Integrated Plan.	Started
Maintain Core Cooling Phase 1 (p.13)	8. Guidance will be provided to ensure that sufficient area is available for deployment and that haul paths remain accessible without interference from outage equipment during refueling outages.	Started
Maintain Spent Fuel Pool Cooling Phase 1 (p.32)	9. Evaluation of the spent fuel pool area for steam and condensation has not yet been performed. The results of this evaluation and the vent path strategy, if needed, will be provided in a future six-month update.	Started
Safety Function Support (p. 42)	10. Habitability conditions will be evaluated and a strategy will be developed to maintain RCIC habitability.	Started
Safety Function Support (p. 42)	11. Habitability conditions will be evaluated and a strategy will be developed to maintain Main Control Room habitability.	Complete Duplicate of 3.2.4.6.A
Safety Function Support (p. 43)	12. Battery Room Ventilation: Alternate ventilation will be provided to address Hydrogen generation and cold weather, as required.	Started

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OIP Section Reference	Overall Integrated Plan Open Item	Status
Safety Function Support (p. 43)	13. Fuel Oil Supply to Portable Equipment: A detailed fuel oil supply plan will be developed.	Started
Attachment 1A, Item 20 (p.59)	14. Provide alternate cooling to the RCIC rooms. Procedure to be developed.	Started

Section Reference	Interim Safety Evaluation Open/Confirmatory Items	Status
3.2.3.A	<u>SIGNIFICANT OPEN Item</u> . Generic concern related to adoption of Revision 3 to the BWROG EPG/SAG [Emergency Procedure Guidelines/Severe Accident Guidelines] relating to potential detrimental effects on containment response.	Complete - See February 2014 Six-Month update (Reference 8).
3.2.4.6.A	<u>OPEN Item</u> Licensee asserts 120 °F used for habitability in SBO is adequate for FLEX. Habitability of the control room should consider 110 degree F temperature limits of NUMARC 87-00 and MIL-STD-1472C.	See NOTE below
3.3.2.A	<u>OPEN Item</u> Control of equipment and connections for unavailability needs to be addressed.	See NOTE below
3.4.B	<u>OPEN Item</u> Details not provided to demonstrate the minimum capabilities for offsite resources will be met per NEI 12-06 Section 12.2.	Complete - See February 2014 Six-Month update (Reference 8).
3.1.1.2.A	<u>Confirmatory Item</u> Studies for liquefaction and the effects on haul paths and storage location(s) are not complete.	See NOTE below
3.1.1.2.B	<u>Confirmatory Item</u> A postulated downstream dam failure from a seismic event is still being evaluated.	See NOTE below
3.1.1.2.C	<u>Confirmatory Item</u> Need to confirm implementation of strategy for power to move or deploy FLEX equipment and opening of doors.	See NOTE below
3.1.1.3.A	<u>Confirmatory Item</u> Plans for strategies have insufficient information to demonstrate alternate sources of instrument readings and adequate tolerances/accuracies if there is seismic impact to primary sources. Also, need identification of installed	See NOTE below

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	instrumentation location and power source.	
3.1.1.3.B	<u>Confirmatory Item</u> Need identification of instrumentation used to monitor FLEX electrical power equipment including measurement tolerance/accuracy.	Complete - See August 2014 Six-month update (Reference 10).
3.1.2.2.A	<u>Confirmatory Item</u> A detailed fuel supply plan is to be provided in a future 6-month status update including what is needed, what is available, and how it will be transported.	See NOTE below
3.1.3.2.A	<u>Confirmatory Item</u> Completion of development of an administrative program to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation. Procedures and programs are to be developed.	See NOTE below
3.1.3.2.B	<u>Confirmatory Item</u> Completion of assessment on the adequacy of the debris removal equipment and the effect on the timeline to assure the critical times are capable of being met. This will be tracked as an open item in the 6 month update.	See NOTE below
3.2.1.1.A	<u>Confirmatory Item</u> Need benchmarks to demonstrate Modular Accident Analysis Program (MAAP)4 is the appropriate code for simulation of ELAP.	Complete - See August 2014 Six-month update (Reference 10).
3.2.1.1.B.	<u>Confirmatory Item</u> The collapsed level must remain above Top of Active Fuel (TAF) and the cool down rate must be within technical specification limits in the MAAP4 analysis.	Complete - See August 2014 Six-month update (Reference 10).
3.2.1.1.C.	<u>Confirmatory Item</u> 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.	Complete - See August 2014 Six-month update (Reference 10).
3.2.1.1.D.	<u>Confirmatory Item</u> 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 1 020236).	Complete - See August 2014 Six-month update (Reference 10).
3.2.1.1.E.	<u>Confirmatory Item</u> The specific MAAP4 analysis case that was used to validate the timing of mitigating strategies in the integrated plan must be identified and available on the e-Portal for NRC staff to view. Alternately, a comparable level of information may be included in the	Complete - See August 2014 Six-month update (Reference 10).

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	supplemental response.	
3.2.1.2.A.	<u>Confirmatory Item</u> Questions remain unanswered regarding recirculation pump seal leakage rates. Aspects such as pressure dependence, leakage phase assumptions (single phase liquid, steam, mixed) are not discussed.	See NOTE below
3.2.1.3.A.	<u>Confirmatory Item</u> Need gap analysis between results of the licensee's analysis results and those of BWROG document NEDC-33771 P. Results are presented in 6 month update; however there is no analysis of the relevance of differences.	See NOTE below
3.2.1.3.B.	<u>Confirmatory Item</u> Licensee plans further review and analysis to ensure suppression pool temperature will support RCIC operation.	See NOTE below
3.2.1.3.C.	<u>Confirmatory Item</u> Need identification of the minimum voltage required for the dc buses and the basis of that determination.	Complete - See February 2014 Six-Month update (Reference 8).
3.2.1.4.A.	<u>Confirmatory Item</u> Water quality issue and guidance on priority of water source usage need to be addressed.	See NOTE below
3.2.1.4.B.	<u>Confirmatory Item</u> Need completion of current evaluation of FLEX generator sizing calculation.	See NOTE below
3.2.1.4.C.	<u>Confirmatory Item</u> Need design and working pressure of hoses and fittings.	See NOTE below
3.2.1.6.A.	<u>Confirmatory Item</u> Licensee identified protection of equipment for Hardened Vent is to Order EA-13-109 (Reference 22). Explain if this is equivalent to Order EA-12-049, as Order EA-13-109 does not require protection from external events.	See NOTE below
3.2.2.A.	<u>Confirmatory Item</u> The licensee identified modifications and procedures for SFP cooling are in development.	See NOTE below
3.2.4.2.A.	<u>Confirmatory Item</u> Modifications to restore RCIC room cooling are being developed by the licensee.	Complete - See August 2014 Six-Month update (Reference 10).
3.2.4.2.B.	<u>Confirmatory Item</u> Modifications to restore ventilation to the battery rooms via use of the portable FLEX generators to address hydrogen and cold weather are being developed by the licensee.	Complete - See August 2014 Six-Month update (Reference 10).
3.2.4.4.A.	<u>Confirmatory Item</u> Procedures for emergency lighting are to be developed for deployment of hands free flashlights.	See NOTE below

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3.2.4.4.B.	<u>Confirmatory Item</u> Confirm upgrades to communication system that resulted from the licensee communications assessment. (ADAMS Accession Nos. ML 12306A 199 and ML13056A 135.)	See NOTE below
3.2.4.5.A.	<u>Confirmatory Item</u> Verify completion of drafted procedures for protected and internal locked area access.	See NOTE below
3.2.4.6.B.	<u>Confirmatory Item</u> Site industrial procedures and identification of protective clothing, ice vests/packs, bottled water, etc. is needed.	Complete - See February 2014 Six-Month update (Reference 8).
3.2.4.6.C.	<u>Confirmatory Item</u> Need to address the use of appropriate human performance aids (e.g., component marking, connection schematics, installation sketches, photographs, etc.) which shall be included in the FLEX guidance implementing the FLEX strategies.	See NOTE below
3.2.4.8.A.	<u>Confirmatory Item</u> The licensee did not provide any information regarding loading/sizing calculations of portable diesel generators(s) and strategy for electrical isolation for FLEX electrical generators from installed plant equipment.	See NOTE below
3.2.4.9.A.	<u>Confirmatory Item</u> Need detailed fuel plan including fuel storage tank, truck, and day tank volumes and how fuel quality is maintained in the day tanks and in portable FLEX equipment.	See NOTE below
3.2.4.10.A.	<u>Confirmatory Item</u> Need detailed battery 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 load shed.	See NOTE below
3.4.A.	<u>Confirmatory Item</u> Procedures for interface with the NSRC need to be developed.	See NOTE below

NOTE: The information with respect to these ISE Open and Confirmatory items was presented to the NRC FLEX Audit Team during their onsite visit the week of January 26, 2015. Work is either pending closure (designated “See NOTE below”) or completed for each of the items. The upcoming “status” of the items (OPEN or CLOSED) will be determined by the NRC in the pending Audit Report. Preliminary classification from the Audit Team, pending review and approval through the NRC audit report generation and approval process, is that all of these items are to be stuated as closed with two exceptions as related to ISE Confirmatory Items 3.1.1.2.A, and 3.1.1.2.B. These particular items are being resolved via ongoing discussions between the NRC and Exelon. The status of all of these ISE Open and Confirmatory items will be updated in a future 6-Month Update pending receipt of the NRC FLEX Audit Report.

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. Quad Cities 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. NRC Order EA-13-109, “Issuance of Order to Modify Licenses with Regard to reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions,” dated June 6, 2013.
4. Quad Cities Nuclear Power Station, Units 1 and 2 First 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,” dated August 28, 2013.
5. Quad Cities Nuclear Power Station’s Request for Relaxation from NRC Order EA-12-049, "Order Modifying Licenses With Regard To Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" dated February 27, 2014.
6. RCIC Pump and Turbine Durability Evaluation – Pinch Point Study, February 2013, 0000-0155-1545-RO, DRF 0000-0155-1541, Revision 0
7. Quad Cities Nuclear Power Station, Units 1 and 2 – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC NOS.MF 1048 and MF 1049), dated November 22, 2013.
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9. NRC Approval of Exelon/Quad Cities Request for Relaxation from NRC Order EA-12-049, dated April 15, 2014 (ADAMS Accession No. ML14071A531).
10. Quad Cities Nuclear Power Station, Units 1 and 2 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,” dated August 28, 2014.
11. Quad Cities MAAP Analysis to Support FLEX Initial Strategy, QC-MISC-013 Rev. 2, dated February 14, 2014.

9 Attachments

1. Quad Cities Portable Equipment Phase 2
2. BWR Portable Equipment Phase 3 (Generic Equipment)
3. Quad Cities Station Sequence of Events Timeline

Attachment 1

Quad Cities Portable Equipment Phase 2							
<i>Use and (potential / flexibility) diverse uses</i>						<i>Performance Criteria</i>	<i>Maintenance</i>
<i>List portable equipment</i>	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Two (2) low pressure high capacity self prime pump	X	X	X			1343 gpm, 270 psia	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.
Five (5) 480 VAC Portable Diesel Driven Generators	X	X	X	X	X	500kW	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.
Three (3) sets cable reels (8) prestaged 2 of 3 required for power restoration to both units	X	X	X	X	X	(8) 250 ft cable spool RB 647 @ M-16. (8) 250 ft cable spool RB 647 @ H-15. (8) 250 ft cable spool TB 639 @ F-1.	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.

Quad Cities Portable Equipment Phase 2							
<i>Use and (potential / flexibility) diverse uses</i>						<i>Performance Criteria</i>	<i>Maintenance</i>
<i>List portable equipment</i>	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Two (2) Tandem Axle Hose Trailer	X	X	X			Haul portable water manifold, 5" and 3" hoses, and Well pump motor starter.	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.
One (1) Massey Ferguson 4610L Tractor with bucket, pintel hitch	X	X	X		X	Tow vehicle and debris removal	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11
Ford F750 Truck w/snow plow and two (2) 118 gal diesel fuel tanks with transfer pump	X	X	X		X	Tow vehicle, portable equipment refueling vehicle, and debris removal vehicle	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.
Six (6) 5.5 kW portable diesel generators					X		Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.

Quad Cities Portable Equipment Phase 2							
<i>Use and (potential / flexibility) diverse uses</i>						<i>Performance Criteria</i>	<i>Maintenance</i>
<i>List portable equipment</i>	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Ten (10) portable fans with ducting	X			X	X	AC, 6250 SCFM	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.
6 large area fans					X	AC. 13,300 cfm.	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.
(2) Portable diesel fuel transfer pumps and hoses	X	X	X	X	X		Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11.

Attachment 2

BWR Portable Equipment Phase 3 (Generic Equipment)							
Note: The equipment listed is the generic equipment list provided by the National SAFER Response Center and even though Quad Cities does not require this equipment in our FLEX strategies, this equipment will be available from the NSRC and could be utilized in the Phase 3 time period. {Based on AREVA “National SAFER Response Center Equipment Technical Requirements” document 51-9199717-013.}							
<i>Use and (potential / flexibility) diverse uses</i>						<i>Performance Criteria</i>	<i>Notes</i>
<i>List portable equipment</i>	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	X			150 psi shutoff head, 5000 gpm max flow	
Cable /	X	X	X			Various as determined	

BWR Portable Equipment Phase 3 (Generic Equipment)							
Note: The equipment listed is the generic equipment list provided by the National SAFER Response Center and even though Quad Cities does not require this equipment in our FLEX strategies, this equipment will be available from the NSRC and could be utilized in the Phase 3 time period. {Based on AREVA “National SAFER Response Center Equipment Technical Requirements” document 51-9199717-013.}							
<i>Use and (potential / flexibility) diverse uses</i>						<i>Performance Criteria</i>	<i>Notes</i>
<i>List portable equipment</i>	<i>Core</i>	<i>Containment</i>	<i>SFP</i>	<i>Instrumentation</i>	<i>Accessibility</i>		
Electrical						by AREVA document # 51 - 9199717 - 013	
Hose / Mechanical Connections	X	X	X			Various as determined by AREVA document # 51 - 9199717 - 013	
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	
<p>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 of AREVA document).</p>							

BWR Portable Equipment Phase 3 (Generic Equipment)							
Note: The equipment listed is the generic equipment list provided by the National SAFER Response Center and even though Quad Cities does not require this equipment in our FLEX strategies, this equipment will be available from the NSRC and could be utilized in the Phase 3 time period. {Based on AREVA “National SAFER Response Center Equipment Technical Requirements” document 51-9199717-013.}							
<i>Use and (potential / flexibility) diverse uses</i>						<i>Performance Criteria</i>	<i>Notes</i>
<i>List portable equipment</i>	Core	Containment	SFP	Instrumentation	Accessibility		
Note 2: The 1100 kW unit is derated to 1000 kW.							
Phase 3 Response Equipment/Commodities							
Item				Notes			
Radiation Protection Equipment <ul style="list-style-type: none"> • Survey instruments • Dosimetry • Off-site monitoring/sampling 				The NSRC 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 <ul style="list-style-type: none"> • Food • Potable water 				The NSRC will not stock these commodities but they will be requested from site-to-site and utility-to-utility on an as required basis.			

Attachment 3
Quad Cities Station
Sequence of Events Timeline

Quad Cities Nuclear Power Station, Units 1 and 2- Fourth Six Month Status Report for the Implementation of FLEX
February 27, 2015

Action item	Elapsed Time	Action	Time Constraint Y/N ¹	Remarks / Applicability
1	0	Event Starts	NA	Plant at 100% power
2	0	Reactor Scram and SBO.	NA	Event Initiation
3	0 min	Group I isolation due to loss of power to instrumentation.	N	Loss of AC power causes Group 1 isolation due to loss of power to trip system [UFSAR 7.3.2.2]
4	~2 min	Operating crew enters applicable EOPs and abnormal procedures for LOOP. EOP entry conditions; Low Reactor water level and High Reactor pressure	N	QGA 100 RPV Control QCOA 6100-03 Loss of Offsite Power
5	~2 min	RCIC Manually started and injects to restore level to normal operating band.	N	Reactor operator initiates or verifies initiation of reactor water level restoration with steam driven high pressure injection. [UFSAR Section 1.2.2.5] QGA 100 RPV Control QCOP 1300-02 RCIC System Manual Startup This is not time critical because if not completed automatic initiation will occur at the Low-Low level setpoint.
6	~2 min	ERV valves operation is monitored and manual operation initiated to control RPV pressure.	N	QGA 100 RPV Control QCOP 0203-01 Reactor Pressure Control Using Manual Relief Valve Actuation. Not time critical as automatic cycling of ERVs is controlling RPV pressure and manual control stabilizes system operation but does not impact key function control.

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

Action item	Elapsed Time	Action	Time Constraint Y/N ¹	Remarks / Applicability
7	~5 mins	Attempt to manually start emergency diesel generators (U1, U2 and 1/2), and enter SBO procedure.	N	QCOA 6100-03 Loss of Offsite Power. No success will occur from this action. QCOA 6100-04, Station Blackout
8	~5 mins	DC load shedding initiated per QCOA 6100-03	N	QOA 6900-07 Loss of AC Power to the 125 VDC Battery Charger with Simultaneous Loss of Auxiliary Electric Power. Initiation of load shedding is not time critical – completion of load shedding is time critical.
9	~5 mins	Reactor Operator control RPV level with RCIC	N	QGA 100, RPV Control QCOP 1300-02 This action controls the system operation to maintain parameters within the EOP specified band and is not time critical as system operation will continue without this action.
10	10 mins	Commence RPV depressurization using ERVs at less than or equal to 80 deg F per hour.	N	QCOP 0203-01 Not time critical as initiation of depressurization controls the RPV pressure prior to EOP directed operation due to HCTL of suppression chamber temperature requiring an emergency depressurization.
11	30 mins	DC load shedding completed	Y	QOA 6900-07
12	30 mins	Defeat RCIC Low Pressure Isolation Logic	N	Not time critical since RPV depressurization will be stopped prior to the RCIC Low Pressure Isolation setpoint per QGA 100 (in accordance with EPG, Rev 3). QCOP 1300-10
13	~60 mins	Control Room crew has assessed SBO and plant conditions and declares an Extended Loss of AC Power (ELAP) event.	Y	Time sensitive in that decision drives timeline for setup of FLEX equipment and early venting. QCOA 6100-04

Action item	Elapsed Time	Action	Time Constraint Y/N ¹	Remarks / Applicability
14	~60 mins	Equipment Operators dispatched to begin setup/connection of FLEX equipment (480VAC generators to power battery chargers and FLEX pump), and commence FLEX DC load shed.	Y	QCOP 0050-01, 02 QCOP 0050-05, 07 DC coping analysis shows the following DC battery capabilities: 125 VDC / 10 hrs 250 VDC / 9 hrs
15	90 mins	FLEX DC load shed complete.	Y	DC coping analysis assumes FLEX load shed is complete by 90 minutes. Therefore, this action is time critical.
16	2 hours	Defeat RCIC High area temperature isolations	Y	QCOP 1300-10. This action is critical at 8.7 hours when RCIC room temperature reaches 150°F, per Gothic analysis. The RCIC room temperature does not reach 180F in the first 72 hours.
17	4 hrs	480VAC FLEX generators connected to the Safety Related Busses. This supplies battery chargers for 125VDC (Div. 1 and 2) and 250VDC buses.	Y	Restore AC power to battery chargers prior to loss of each battery at: 125 VDC / 10 hrs 250 VDC / 9 hrs
18	4 hrs	FLEX pumps connected and alignment for suppression pool injection established.	N	QCOP 0050-06 This action becomes time critical when early containment venting is initiated.
19	~5.3 hrs	Initiate early containment venting strategy at a Containment pressure of 10 psig. Open the Reliable Hardened Containment Vent from the wetwell to maintain suppression pool temperatures less than ~230 deg F to support long term RCIC operation.	Y	QGA 200, Primary Containment Control (EPG Rev 3) ~5.3 hrs is projected via MAAP analysis as when Containment pressure reaches 10 psig.

Action item	Elapsed Time	Action	Time Constraint Y/N ¹	Remarks / Applicability
20	~5.5 hrs	Heat Capacity Temperature Limit (HCTL) curve projected to be exceeded via MAAP analysis, RPV blowdown to ~200 psig required. RPV pressure now maintained 150-250 psig range to support RCIC operation.	Y	QGA 200 (EPG Rev 3) RPV blowdown stops at ~200 psig in RPV to preserve RCIC operation.
21	~5.5 hrs	FLEX pumps connected and alignment for RPV injection established.	N	QCOP 0050-06 RPV blowdown is completed and RCIC is shut down.
22	12 hrs	Begin makeup to SFP with the FLEX pump to maintain level above top of fuel.	Y	QCOP 0050-06 QGA 300, Secondary Containment Control (EPG Rev 3) The worst case SFP heat load scenario shows a time-to-boil of 13.5 hours. The time to reach top of fuel is 147 hours.
23	24 hrs	Initial equipment from National SAFER Response Center becomes available.	N	Per NEI 12-06, Section 12 (NSRC).
24	24 -72 hrs	Continue to maintain critical functions of core cooling (via FLEX pump injection), containment control, and SFP cooling (FLEX pump injection to SFP). Utilize initial NSRC equipment in spare capacity.	N	Not time critical/sensitive since Phase 2 actions result in indefinite coping times for all safety functions.