Exelon Generation®

Order No. EA-12-049

RS-18-011

February 28, 2018

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: Tenth 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 1, dated January 22, 2016
3. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 2, dated December 2015
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. Exelon Generation Company, LLC 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), dated February 27, 2015 (RS-15-024)
10. Exelon Generation Company, LLC Fifth 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, 2015 (RS-15-215)
11. Exelon Generation Company, LLC Sixth 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 26, 2016 (RS-16-027)
12. Exelon Generation Company, LLC Seventh 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 26, 2016 (RS-16-150)
13. Exelon Generation Company, LLC Eighth 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, 2017 (RS-17-022)
14. Exelon Generation Company, LLC Ninth 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, 2017 (RS-17-097)
15. 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
16. NRC letter to Exelon Generation Company, LLC, Quad Cities Nuclear Power Station, Units 1 and 2 – Report for the Onsite Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF1048, MF1049, MF1052, and MF1053), dated June 25, 2015
17. Exelon Generation Company, LLC Request for Extension to Comply with NRC Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions" and NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated November 16, 2016 (RS-16-210)
18. Exelon Generation Company, LLC Request for Extension to Comply with NRC Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions" and NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated January 12, 2017 (RS-17-006)

19. NRC letter to Exelon Generation Company, LLC, Quad Cities Nuclear Power Station, Units 1 and 2 – Relaxation of Schedule Requirements for Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" and Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," dated March 21, 2017

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 and an overall integrated plan pursuant to Section IV, Condition C. Reference 2 endorses industry guidance document NEI 12-06, Revision 2 (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, 8, 9, 10, 11, 12, 13, and 14 provided the first, second, third, fourth, fifth, sixth, seventh, eighth, and ninth 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 tenth 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 15, and any NRC Audit Report open items contained in Reference 16.

In Reference 17, EGC requested an extension to comply with NRC Order EA-12-049 based on the earlier decision to permanently cease power operations at Quad Cities Nuclear Power Station, Units 1 and 2 by June 1, 2018, and engineering design and plant modification activities supporting Order implementation were discontinued. In Reference 18, as a result of the reversed cessation of operation decision, EGC withdrew this request for extension to comply and provided a revised request for extension to comply with NRC Order EA-12-049 based on the continued operation of both units. In Reference 19, the NRC approved this extension request. EGC has resumed work to complete full implementation of NRC Order EA-12-049 at Quad Cities Nuclear Power Station, Units 1 and 2.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact David J. Distel at 610-765-5517.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 28th day of February 2018.

Respectfully,

Patrick R. Simpson
Licensing Manager
Exelon Generation Company, LLC

Enclosure: Quad Cities Nuclear Power Station, Units 1 and 2 Tenth 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: NRC Regional Administrator - Region III
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station
NRC Project Manager, NRR – Quad Cities Nuclear Power Station
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

Tenth 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

(16 pages)

Enclosure

Quad Cities Nuclear Power Station, Units 1 and 2 Tenth 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 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.

2 Milestone Accomplishments

Unit 1 and Unit 2 FLEX tie-ins to the severe accident capable containment vents remain to be completed as described in Section 5 of this Enclosure.

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	
Update 4	Feb 2015	Complete	
Update 5	Aug 2015	Complete	
Update 6	Feb 2016	Complete	
Update 7	Aug 2016	Complete	

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Update 8	Feb 2017	Complete	
Update 9	Aug 2017	Complete	
Update 10	Feb 2018	Complete with this submittal	
Modifications Development & Implementation:			
Unit 1 Modification Development (All FLEX Phases)	Feb 2014	Completed	April 2014
Unit 1 Modification Implementation (All FLEX Phases)	Apr 2015	Completed	Mar 2015
Unit 2 Modification Development (All FLEX Phases)	Mar 2015	Completed	
Unit 2 Modification Implementation (All FLEX Phases)	Apr 2016	Completed	
Common Unit Modification Development (Interim Storage Pads and Deep Well)	Mar 2015	Completed	Dec 2015
Common Unit Modification Implementation (Interim Storage Pads and Deep Well)	Mar 2015	Completed	Dec 2015
Robust Storage Building	Oct 2015	Completed	
ASCE 7-10 FLEX +1 Storage Building	Apr 2016	Completed	
Procedures:			
Create Site-Specific Procedures	Apr 2015	Completed	Mar 2015
Validate Procedures (NEI 12-06, Sect. 11.4.3)	Apr 2015	Completed	Mar 2015
Create Maintenance Procedures	Apr 2015	Completed	Mar 2015
Perform Staffing Analysis	Nov 2014	Completed	
Storage Plan and Construction	Apr 2015	Completed	April 2016
FLEX Equipment Acquisition	Apr 2015	Completed	Mar 2015
Training Completion	Apr 2015	Completed	Mar 2015
National Safer Response Center Operational	Dec 2014	Completed	

Milestone	Target Completion Date	Activity Status	Revised Target Completion Date
Unit 1 FLEX Implementation	Apr 2015	Started	June 2018
Unit 2 FLEX Implementation	Apr 2016	Started	June 2018
Submit Unit One Compliance Report	June 2015	Not Started	Aug 2018
Submit Unit Two Compliance Report	June 2016	Not Started	Aug 2018

4 Changes to Compliance Method

Change 1- Interim FLEX Equipment Storage Alternative Approach:
Quad Cities Station has completed construction of the FLEX equipment storage buildings for the N and N+1 equipment. Therefore, Alternative Approach Change 1 - Interim FLEX Equipment Storage Alternative Approach is no longer applicable.

Change 2 - Storage, Maintenance and Testing Alternative Approach:

NEI 12-06, Revision 2 incorporated this change in compliance method, therefore, this change in no longer necessary.

Change 3 - N+1 Hoses and Cables Alternative Approach:
NEI 12-06, Revision 2 incorporated this change in compliance method, therefore, this change in no longer necessary.

Change 4 - Seismic Water Source Alternative Approach (no changes from previously submitted)

Issue

The station installed a single Deep Well as a seismically qualified source of water for the FLEX mitigation strategy. This single Deep Well is fully capable of supplying both Units 1 and 2 FLEX requirements simultaneously. Schedule relief for this well has been approved under References 13, 14 and 15. This configuration does not utilize a redundant seismic deep well. As such, Quad Cities will implement an Alternative Approach to meet the Order for allowed unavailability time on the single seismic deep well.

Background

Since only one deep well was installed, this alternative approach provides the actions that will occur upon unavailability of this deep well during maintenance and testing, or its unavailability during a FLEX event response. The plant circulating water discharge bay will be utilized as a source of backup water during deep well unavailablilty periods. The discharge bay has not been seismically evaluated but there is reasonable assurance that this water supply will remain available as a source of water following a seismic event due to the size of the two diffuser pipes which connect to the main channel of the Mississippi River.

To the extent to which the guidance of JLD-ISG-2012-01 and NEI 12-06 is being followed, deviations should be identified. The allowed unavailability time requirements are stated in NEI 12-06, Section 11.5.3 and are 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." As such, this alternative approach is an acceptable deviation from the guidance of JLD-ISG-2012-01 and NEI 12-06 as described below.

Alternative

Unavailability Alternative Approach (Consistent with NEI 12-06, Section 11.5.3)

1. The unavailability of the seismic deep well 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 installed plant equipment is controlled by existing plant processes such as the Technical Specifications (TS). When installed 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 seismic deep well equipment may be unavailable for 90 days provided that the site seismic water supply capability is met. If the site seismic water supply capability is met but not fully protected for the site's applicable hazards, then the allowed unavailability is reduced to 45 days.
    c. If seismic deep well equipment or connections becomes unavailable such that the site seismic water supply capability is not maintained, initiate actions within 24 hours to restore the site seismic water supply capability and implement compensatory measures (ensure equipment for use of the discharge bay water supply is ready for deployment) within 72 hours, and then initiate a concurrent 45 day period to repair the seismic well to full availability.
    d. If seismic deep well permanently installed equipment required for FLEX strategies are expected to be unavailable for greater than 45 days, initiate actions to restore the seismic deep well capability and implement compensatory measures (e.g., use of alternate suitable equipment) prior to exceeding the 45 days.

<u>Actions During a Seismic FLEX Event</u>

For an ELAP event with a seismic initiator the station will perform the following actions:

1. Phase 1 Actions:
    - Initiate RCIC for FLEX RPV water injection. RCIC will operate under these conditions for > 72 hours. This will allow time for station staff to deploy Phase 2 FLEX strategies.
2. Phase 2:
    - Deploy FLEX generator to power the deep well for primary source of water for FLEX requirements for Suppression Chamber level control, Spent Fuel Pool level and Reactor Pressure Vessel water level control. The deep well pump is powered by one FLEX generator and the well is sufficient to provide water to both Units. Two additional FLEX generators are deployed, one per unit, to restore voltage to the 480V buses.

3. ERO Response Actions:
   - Following the initial stabilization actions for Phase 2, establish a backup water supply using a FLEX pump taking suction from the discharge bay.
   - Monitor the condition of Lock and Dam 14 for a potential failure and/or the discharge bay for level change that may be indicating a degradation of this source.
   - Upon indication or prediction of degradation of the discharge bay level, deploy a submersible pump with the suction placed in low point of the discharge bay with the discharge of the submersible pump connected to the FLEX pump suction to provide additional NPSH should the discharge bay level drop.
4. Continue to operate well pump or the submersible and FLEX pumps as required to supply the FLEX water needs.

Actions 1 – 4, above can be performed within the minimum time requirements needed for FLEX injection.

The discharge bay used in this strategy provides access for use of NSRC Phase 3 equipment as a backup to Phase 2 equipment and addresses indefinite coping time.

Actions During Maintenance or Testing Should the Deep Well Become Unavailable

1. Initiate actions to restore well pump within 24 hours.
2. Verify FLEX and submersible pumps and necessary support components are ready for deployment and are protected from the seismic hazard. This contingency action is required to be completed within 72 hours.
3. Restore well pump to operation within 45 days.

Basis for An Alternative Approach

During times when the single seismic deep well is unavailable, Quad Cities will compensate by use of an Alternative Approach which consists of a FLEX pump and portable submersible pump that will take suction from Quad Cities Station discharge bay. The discharge bay will supply the necessary backup water supply. Access to the river as a water source remains available during this event. This method provides a compensatory separate and diverse FLEX water supply, should the single seismic deep well become unavailable.

As a result, if the single seismic deep well becomes unavailable for a FLEX event (specifically a seismic event), the Alternative Approach described herein, will be utilized. This Approach applies a reduced Unavailability Time to the single seismic deep well which when coupled with the associated compensatory measures, will be used to compensate when the seismic deep well is not available. If the equipment is not protected from the applicable hazards, instead of the NEI recommended 90 day unavailability period, an allowed unavailability period of 45 days will apply. This is based on the 6-week short cycle work scheduling. This will allow the station to continue to manage work associated with equipment important to safety. Placing the seismic deep well 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.

Supporting Plant Conditions

- Discharge Bay Water Level:
  - Normal discharge bay and Mississippi River level is 572 feet controlled by downstream Lock and Dam 14.
  - Per UFSAR 2.4.4, the minimum elevation of the discharge bay is 561 feet, should Lock and Dam 14 fail, which is the normal elevation downstream of Lock and Dam 14.
  - Bottom elevation of discharge bay is 557 feet.
  - Godwin FLEX pumps will provide the necessary water to a suction level of 565 feet which will be reached 90 hours after the Lock and Dam 14 failure per UFSAR 2.4.4.
  - At 565 feet or lower, the station plans to use a submersible booster pump to provide additional required NPSH for the FLEX Godwin pump.
- Torus and Reactor:
  - Per EC 395980 and calc QDC-1300-M-2074 analysis, the RCIC system pump will have sufficient NPSH and is capable of operation greater than 72 hours.
- Spent Fuel Pool:
  - From Calculation QDC-1900-M-2079 for a Full Core Offload time to 12 ft. above fuel is 31.5 hours and the time to 10 ft. is 38.6 hours. The more restrictive time of 31.5 hours will be utilized for this alternative approach.
- Therefore, the shortest time that Phase 2 FLEX water injection is required is 31.5 hours based on Spent Fuel Pool water needs.
- Discharge bay remains open to the river following the event. The diffuser piping (Two-16 ft. pipes) remains open to allow sufficient backflow flow from the Mississippi river main channel to the discharge bay and remains open to the river following the event.
- The discharge bay bottom elevation is 557 feet. The minimum water level is 561 feet which is consistent with the normal water level downstream of Lock and Dam 14, should it fail. Therefore, a depth of 4 feet of usable water will remain available in the discharge bay and will be maintained by open path to the Mississippi River main channel via the diffuser piping.
- The discharge bay is expected to remain accessible following the event due to its construction that utilizes a sheet pile enclosure reinforced with rip-rap slope stabilization.
- The discharge bay pump pad was designed and installed to be seismically robust.
- The travel path to the discharge bay was evaluated for liquefaction.
- The station stores one FLEX pump in the FLEX storage building
- The NSRC will provide a diesel driven hydraulic submersible booster pump to provide the additional NPSH for the FLEX pump if the discharge bay level continues to drop below or is expected to degrade below 565 feet. Changes to the SAFER Response plan for Quad Cities Station have been completed to provide this pump as part of the Quad Cities Power Station equipment package within 24 hours of notification. (Reference 18)

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).

In Reference 22, EGC requested an extension to comply with NRC Order EA-12-049 based on the earlier decision to permanently cease power operations at Quad Cities Nuclear Power Station, Units 1 and 2 by June 1, 2018, and engineering design and plant modification activities supporting Order implementation were discontinued. In Reference 23, as a result of the reversed cessation of operation decision, EGC withdrew this request for extension to comply and provided a revised request for extension to comply with NRC Order EA-12-049 based on the continued operation of both units. EGC has resumed work to complete full implementation of NRC Order EA-12-049 at Quad Cities Nuclear Power Station, Units 1 and 2.

This request for extension to comply with NRC Order EA-12-049 for Quad Cities Nuclear Power Station, Units 1 and 2 is in addition to the previous schedule relaxation granted by the NRC in Reference 9, and provides an additional schedule relaxation to June 30, 2018 for Quad Cities Nuclear Power Station, Units 1 and 2.

By letter dated March 4, 2015 (Ref. 13) and supplemented by a letter dated March 6, 2015 (Ref. 14) Quad Cities Station requested schedule relaxation of the requirements of Order EA-12-049 (Ref. 2) related to the completion of installation of the mitigating strategies equipment and modifications to implement the strategies. The NRC granted the schedule relief via letter dated March 11, 2015 (Ref. 15). The seismic deep well installation and associated modifications to implement the strategies were completed and made fully functional prior to the requested schedule relaxation date of December 11, 2015. As such, compliance with the requested schedule relaxation concerning the seismic deep well has been achieved.

No additional need for relief/relaxation relative to Order EA-12-049 (Ref 2), other than as described above, 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.

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 6-month update.	Completed. See August 2015 Six-month Update.
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.	Completed. See August 2013 Six-Month Update.
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.	Completed. See August 2014 Six-Month Update.
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 6-month update.	Completed. See August 2014 Six-Month Update.

Section Reference	Overall Integrated Plan Open Item	Status
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	Completed. See August 2015 Six-month Update.
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.	Completed. See August 2015 Six-month Update.
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 6-month update. This update will include any changes to the initial designs as submitted in this Integrated Plan.	Completed. See February 2017 Six-month Update.
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.	Completed. See August 2015 Six-month Update.
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 6-month update.	Completed. See August 2015 Six-month Update.
Safety Function Support (p. 42)	10. Habitability conditions will be evaluated and a strategy will be developed to maintain RCIC habitability.	Completed. See August 2015 Six-month Update.

Section Reference	Overall Integrated Plan Open Item	Status
Safety Function Support (p. 42)	11. Habitability conditions will be evaluated and a strategy will be developed to maintain Main Control Room habitability.	Completed. 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.	Completed. See August 2015 Six-month Update.
Safety Function Support (p. 43)	13. Fuel Oil Supply to Portable Equipment: A detailed fuel oil supply plan will be developed.	Completed. See August 2015 Six-month Update
Attachment 1A, Item 20 (p.59)	14. Provide alternate cooling to the RCIC rooms. Procedure to be developed.	Completed. See August 2015 Six-month Update.

Section Reference	Interim Safety Evaluation Open/Confirmatory Items	Status
3.2.3.A	SIGNIFICANT OPEN Item. 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.	Completed. See February 2014 Six-Month Update.
3.2.4.6.A	OPEN Item 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.	Completed. See August 2015 Six-month Update.
3.3.2.A	OPEN Item Control of equipment and connections for unavailability needs to be addressed.	Completed. See August 2015 Six-month Update.
3.4.B	OPEN Item Details not provided to demonstrate the minimum capabilities for offsite resources will be met per NEI 12-06, Section 12.2.	Completed. See February 2014 Six-Month Update.
3.1.1.2.A	Confirmatory Item Studies for liquefaction and the effects on haul paths and storage location(s) are not complete.	Completed. See August 2015 Six-month Update.
3.1.1.2.B	Confirmatory Item A postulated downstream dam failure from a seismic event is still being evaluated.	Completed. See August 2015 Six-month Update.

3.1.1.2.C	Confirmatory Item Need to confirm implementation of strategy for power to move or deploy FLEX equipment and opening of doors.	Completed. See August 2015 Six-month Update.
3.1.1.3.A	Confirmatory Item 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 instrumentation location and power source.	Completed. See August 2015 Six-month Update.
3.1.1.3.B	Confirmatory Item Need identification of instrumentation used to monitor FLEX electrical power equipment including measurement tolerance/accuracy.	Completed. See August 2014 Six-Month Update.
3.1.2.2.A	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.1.3.2.A	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.1.3.2.B	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.2.1.1.A	Confirmatory Item Need benchmarks to demonstrate Modular Accident Analysis Program (MAAP)4 is the appropriate code for simulation of ELAP.	Completed. See August 2014 Six-month Update.
3.2.1.1.B.	Confirmatory Item 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.	Completed. See August 2014 Six-Month Update.
3.2.1.1.C.	Confirmatory Item 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.	Completed. See August 2014 Six-Month Update.
3.2.1.1.D.	Confirmatory Item 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).	Completed. See August 2014 Six-Month Update.
3.2.1.1.E.	Confirmatory Item 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 thee-Portal for NRC staff to view. Alternately, a comparable level of information may be included in the supplemental response.	Completed. See August 2014 Six-Month Update.

3.2.1.2.A.	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.2.1.3.A.	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.2.1.3.B.	Confirmatory Item Licensee plans further review and analysis to ensure suppression pool temperature will support RCIC operation.	Completed. See August 2015 Six-month Update.
3.2.1.3.C.	Confirmatory Item Need identification of the minimum voltage required for the dc buses and the basis of that determination.	Completed. See February 2014 Six-Month Update.
3.2.1.4.A.	Confirmatory Item Water quality issue and guidance on priority of water source usage need to be addressed.	Completed. See August 2015 Six-month Update.
3.2.1.4.B.	Confirmatory Item Need completion of current evaluation of FLEX generator sizing calculation.	Completed. See August 2015 Six-month Update.
3.2.1.4.C.	Confirmatory Item Need design and working pressure of hoses and fittings.	Completed. See August 2015 Six-month Update.
3.2.1.6.A.	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.2.2.A.	Confirmatory Item The licensee identified modifications and procedures for SFP cooling are in development.	Completed. See August 2015 Six-month Update.
3.2.4.2.A.	Confirmatory Item Modifications to restore RCIC room cooling are being developed by the licensee.	Completed. See August 2014 Six-Month Update.
3.2.4.2.B.	Confirmatory Item 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.	Completed. See August 2014 Six-Month Update.
3.2.4.4.A.	Confirmatory Item Procedures for emergency lighting are to be developed for deployment of hands free flashlights.	Completed. See August 2015 Six-month Update.
3.2.4.4.B.	Confirmatory Item Confirm upgrades to communication system that resulted from the licensee communications assessment. (ADAMS Accession Nos. ML 12306A 199 and ML13056A 135.)	Completed. See August 2015 Six-month Update.

3.2.4.5.A.	Confirmatory Item Verify completion of drafted procedures for protected and internal locked area access.	Completed. See August 2015 Six-month Update.
3.2.4.6.B.	Confirmatory Item Site industrial procedures and identification of protective clothing, ice vests/packs, bottled water, etc. is needed.	Completed. See February 2014 Six-Month update.
3.2.4.6.C.	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.2.4.8.A.	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.2.4.9.A.	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.2.4.10.A.	Confirmatory Item 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.	Completed. See August 2015 Six-month Update.
3.4.A.	Confirmatory Item Procedures for interface with the NSRC need to be developed.	Completed. See August 2015 Six-month Update.

NRC FLEX Audit Report Open Items

3.1.1.2.B	Confirmatory Item A postulated downstream dam failure from a seismic event is still being evaluated.	Completed. See August 2015 Six-month Update.
AQ 28-B	The licensee stated that it can mitigate the effects of an ELAP indefinitely using phase two portable equipment and utilizing the Phase 3 NSRC equipment as back-up for reliability if needed. However, for a seismic event the licensee only has one seismically qualified well pump, and there is no NSRC equipment that can substitute for the well pump. Although there will be a spare well pump at the site, the replacement time of 72 hours.	Completed. See August 2015 Six-month Update.

AQ 49-B, SE 3-E	Provide details of the maintenance and testing plan for portable/FLEX electrical equipment that is credited for events that require mitigating strategies. Please describe how Regulatory Guidance documents, IEEE Standards, manufacturer recommendations, etc. will be used to establish the maintenance and testing programs for the portable/FLEX electrical equipment, especially for batteries and diesel generators.	Completed. See August 2015 Six-month Update.
SE 9-E	For a design basis Mississippi River flood, most of the site will have several feet of water. The license's plan is to remove the drywell heads, and the RPV heads, and flood the refueling cavity, connecting both RPVs and both SFPs. There will be a loss of all AC power due to the flood. Gasoline powered pumps will be used to refill the refueling cavity. Please provide an assessment of the reliability of this action, including the timeline for getting to cold shutdown and removing the heads and flooding the refueling cavity, the reliability of offsite power to perform these actions, the availability of backup power supplies, and the availability of critical equipment such as the crane for head removal and stud detensioners.	Completed. See August 2015 Six-month Update.
SE 10-E	Final robust FLEX building configuration - Current plan using one robust building with N equipment and one commercial building with the +1 equipment is an Alternate Strategy approach to NEI Guidelines NEI 12-06.	Completed. See August 2015 Six-month Update.

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 Cites 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 Cites 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.
8. Quad Cities Nuclear Power Station, Units 1 and 2 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," dated February 28, 2014.
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.
12. 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," dated February 27, 2015.
13. Quad Cites 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 March 4, 2015 (ADAMS Accession No. ML 15064A090).
14. Quad Cites 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 March 6, 2015 (ADAMS Accession No. ML 15068A064).
15. NRC Approval of Exelon/Quad Cities Unit 1 Request for Relaxation from NRC Order EA-12-049, dated March 11, 2015 (ADAMS Accession No. ML 15068A206).

16. NRC Report for the Onsite Audit regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation related to Orders EA-12-049 and EA-12-51, dated June 25, 2015 (ADAMS Accession No. ML15156B134).

17. Quad Cities Nuclear Power Station, Units 1 and 2 Fifth 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, 2015.

18. SAFER Response Plan for Quad Cities Generating Station, Rev. 003, dated 11/18/15, Quad Cities Station procedure CC-QC-118-1001 Rev. 001.

19. Quad Cities Nuclear Power Station, Units 1 and 2 Sixth 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 February 26, 2016.

20. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 2, dated December 2015.

21. 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 1, dated January 22, 2016.

22. Exelon Generation Company, LLC Request for Extension to Comply with NRC Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions" and NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated November 16, 2016 (RS-16-210).

23. Exelon Generation Company, LLC Request for Extension to Comply with NRC Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions" and NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated January 12, 2017 (RS-17-006).

24. Quad Cities Nuclear Power Station, Units 1 and 2 Seventh 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 26, 2016 (RS-16-150).

25. Quad Cities Nuclear Power Station, Units 1 and 2 Eighth 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 February 28, 2017 (RS-17-022).

26. Quad Cities Nuclear Power Station, Units 1 and 2 Ninth 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 February 28, 2017 (RS-17-097).

9 Attachments:

None