



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

January 22, 2018

Mr. Bryan Hanson  
Senior Vice President  
Exelon Generation Company, LLC  
President and Chief Nuclear Officer  
Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 605551

SUBJECT: BYRON STATION, UNITS 1 AND 2 – STAFF REVIEW OF MITIGATING STRATEGIES ASSESSMENT REPORT OF THE IMPACT OF THE REEVALUATED SEISMIC HAZARD DEVELOPED IN RESPONSE TO THE MARCH 12, 2012, 50.54(f) LETTER (CAC NOS. MF7809 AND MF7810; EPID L-2016-JLD-0006)

Dear Mr. Hanson:

The purpose of this letter is to provide the U.S. Nuclear Regulatory Commission's (NRC) assessment of the seismic hazard mitigating strategies assessment (MSA) and Expedited Seismic Evaluation Process (ESEP), as described in the August 22, 2017, letter (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17234A478), submitted by Exelon Generation Company, LLC (Exelon, the licensee) for Byron Station, Units 1 and 2 (Byron). The NRC staff evaluated the Byron strategies developed under Order EA-12-049 and described in Byron's Final Integrated Plans (FIPs) for Units 1 and 2 (ADAMS Accession No. ML16197A390). The staff's review of Byron's mitigating strategies was documented in a safety evaluation dated December 19, 2016 (ADAMS Accession No. ML16334A504). The purpose of the staff's review is to ensure that the licensee has developed guidance and proposed strategies which, if implemented appropriately, should adequately address the requirements of Order EA-12-049. An inspection confirmed compliance with the order and is documented and addressed in accordance with the Reactor Oversight Process in a report dated September 20, 2017 (ADAMS Accession No. ML17263B152). The following NRC staff review confirms that the licensee has adequately addressed the reevaluated seismic hazard within Byron's mitigation strategies for beyond-design-basis external events.

#### BACKGROUND

By letter dated March 12, 2012 (ADAMS Accession No. ML12053A340), the NRC issued a request for information pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f) (hereafter referred to as the 50.54(f) letter). The 50.54(f) letter was issued as part of implementing lessons-learned from the accident at the Fukushima Dai-ichi nuclear power plant. Enclosure 1 to the 50.54(f) letter requested that licensees reevaluate the seismic hazard using present-day methodologies and guidance.

Concurrent with the reevaluation of seismic hazards, the NRC issued Order EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for

Beyond-Design-Basis External Events” (ADAMS Accession No. ML12054A736). The order requires holders of operating power reactor licenses and construction permits issued under 10 CFR Part 50 to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling following a beyond-design-basis external event. In order to proceed with the implementation of Order EA-12-049, licensees used the current design basis flood and seismic hazard or the most recent flood and seismic hazard information, which may have not been based on present-day methodologies and guidance, in developing their mitigation strategies.

By letter dated April 12, 2013 (ADAMS Accession No. ML13102A142), the Electric Power Research Institute (EPRI) staff submitted EPRI Technical Report 3002000704 “Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force (NTTF) Recommendation 2.1: Seismic.” The augmented approach proposed that licensees would use an expedited seismic evaluation process (ESEP) to address the interim actions as requested by Information Item (6) in the 50.54(f) letter. The ESEP is a simplified seismic capacity evaluation with a focused scope of certain key installed mitigating strategies equipment that is used for core cooling and containment functions to cope with scenarios that involve a loss of all alternating current power and loss of access to the ultimate heat sink to withstand the Review Level Ground Motion, which is up to two times the safe shutdown earthquake. Due to the expedited and interim nature of the ESEP, certain considerations were deferred to the longer term risk assessments. These deferred items, include but are not limited to, structures, piping, non-seismic failures, and operator actions, as well scenarios such as addressing loss of coolant accidents. By letter dated May 7, 2013 (ADAMS Accession No. ML13106A331), the NRC staff endorsed the EPRI guidance. Most Central and Eastern United States licensees with a reevaluated seismic hazard exceeding the SSE submitted an ESEP interim evaluation in December 2014. Byron elected to submit an ESEP with the MSA to complete the scope of the MSA.

On December 10, 2015 (ADAMS Accession No. ML16005A621), the Nuclear Energy Institute (NEI) submitted Revision 2 to NEI 12-06, including guidance for conducting MSAs using the reevaluated hazard information. The NRC subsequently endorsed NEI 12-06, Revision 2, with exceptions, clarifications, and additions, in Japan Lessons-Learned Division (JLD) interim staff guidance (ISG) JLD-ISG-2012-01, Revision 1, “Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events” (ADAMS Accession No. ML15357A163).

#### MITIGATION STRATEGIES ASSESSMENT

By letter dated February 17, 2016 (ADAMS Accession No. ML16027A045), and supplement dated March 15, 2016 (ADAMS Accession No. ML16070A116), the NRC staff documented its review of the licensee’s reevaluated seismic hazard, also referred to as the mitigation strategies seismic hazard information (MSSHI). The staff found that the Byron Ground Motion Response Spectrum (GMRS) exceeds the SSE in the 7 to 100 Hertz (Hz) range. However, based on the NRC staff’s comparison of the GMRS to the SSE and the review of additional hazard and risk information as documented in NRC staff letter dated October 27, 2015 (ADAMS Accession No. ML15194A015), the NRC staff concluded that a seismic risk evaluation was not merited for Byron. However, because the GMRS exceeded the SSE above 10 Hz, a high frequency (HF) confirmation was merited. In addition, the staff concluded that the GMRS determined by the licensee adequately characterized the reevaluated seismic hazard for the Byron site.

By letter dated November 2, 2016 (ADAMS Accession No. ML16307A447), Exelon submitted an HF confirmation report for Byron. By letter dated January 30, 2017 (ADAMS Accession No. ML17023A137), the NRC staff concluded, based on its review, that the licensee correctly implemented the guidance in conducting the HF confirmation for Byron. All evaluated components demonstrated adequate seismic capacity and no component modifications were required.

By letter dated August 22, 2017 (ADAMS Accession No. ML17234A478), Exelon submitted an MSA report for Byron. The licensee stated that the Byron MSA was performed consistent with Appendix H of NEI 12-06, Revision 4, which describes acceptable methods for demonstrating that the reevaluated seismic hazard is addressed within the Byron mitigation strategies for beyond-design-basis external events. Guidance document NEI 12-06, Revision 4 has not been officially endorsed at the time of this review. However, the NRC staff confirmed that the licensee's seismic hazard MSA is consistent with the guidance in Section H.4.4 of NEI 12-06, Revision 2, as endorsed by JLD-ISG-2012-01, Revision 1. Therefore, the methodology used by the licensee is acceptable to perform an assessment of the mitigation strategies that addresses the reevaluated seismic hazard.

In its letter, dated August 22, 2017, the licensee also included an ESEP report as an enclosure. The ESEP report was provided to complete the scope and support the conclusions in the MSA. The licensee stated that the ESEP was completed using the methodologies in EPRI 3002000704. Consistent with the nature of this activity, the NRC staff performed the review of the licensee's submittal to assess whether the intent of the EPRI guidance was implemented.

The NRC staff performed checklist reviews of the ESEP and the seismic hazard MSA for Byron. The checklists are provided as attachments to this letter. The NRC staff identified one deviation from the guidance, but found that Byron met the intent of the guidance. No deficiencies were identified in the assessment. All evaluated components demonstrated adequate seismic capacity and no component modifications are required.

The NRC staff completed its review of the ESEP and seismic hazard MSA for Byron and concluded that sufficient information has been provided to demonstrate that the licensee's plans for the development and implementation of guidance and strategies under Order EA-12-049 appropriately address the reevaluated seismic hazard information stemming from the 50.54(f) letter.

B. Hanson

- 4 -

If you have any questions, please contact me at (301) 415-2864 or via e-mail at Milton.Valentin@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'M Valentin', with a long horizontal flourish extending to the right.

Milton Valentin, Project Manager  
Beyond-Design-Basis Management Branch  
Division of Licensing Projects  
Office of Nuclear Reactor Regulation

Docket Nos. 50-454 and 50-455

Enclosures:

1. MSA Technical Review Checklist
2. ESEP Technical Review Checklist

cc w/encls: Distribution via Listserv

MSA TECHNICAL REVIEW CHECKLIST  
BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO PATH FOUR MITIGATING STRATEGY ASSESSMENT  
BYRON STATION, UNITS 1 AND 2  
DOCKET NOS. 50-454 AND 50-455

The U.S. Nuclear Regulatory Commission (NRC) staff performed the following checklist review based on the Enclosure of the August 22, 2017, letter (Agencywide Documents Access and Management System (ADAMS Accession No. ML17234A478) for Byron Station, Units 1 and 2 (Byron). Deviations, deficiencies, and conclusions are noted at the end of each section and an overall conclusion is provided at the end of the checklist.

I. Background and Assessment to Mitigation Strategies Seismic Hazard Assessment (MSSHI)

<p>This section establishes basic background and assessment to MSSHI criteria in Nuclear Energy Institute (NEI) 12-06, Appendix H.</p>	
<p>Licensee approach to mitigating strategies assessment (MSA):</p>	
<p>Was the MSA conducted in accordance with NEI 12-06, Revision 2 as endorsed by the staff?</p>	<p>No</p>
<p>Was the MSA conducted using an alternate method?</p>	<p>Yes</p>
<p>Status of Order EA-12-049 Flexible Mitigation Strategy at the time of this review:</p>	
<p>Has the licensee submitted a Final Integrated Plan?</p>	<p>Yes</p>
<p>Has the NRC staff completed a safety evaluation for the mitigation strategy?</p>	<p>Yes</p>
<p>Has the NRC staff confirmed compliance with Order EA-12-049 by successfully completing the temporary instruction (TI)-191 inspection?</p>	<p>Yes</p>
<p>Status of MSSHI</p>	
<p>Did the licensee use the Ground Motion Response Spectra (GMRS) and Uniform Hazard Response Spectra (UHRS) as submitted in response to the 50.54(f) request for information and reviewed by the NRC staff?</p>	<p>Yes</p>

<p>Has the plant equipment relied on for FLEX strategies previously been evaluated as seismically robust to the plant safe shutdown earthquake (SSE) levels?</p> <p>Is the maximum ratio of GMRS/SSE in the range of 1-10 Hertz (Hz) less than 2?</p> <p>Did the licensee meet the seismic evaluation criteria described in NEI 12-06, Section H.5?</p>	<p>Yes</p> <p>Yes</p> <p>Yes</p>
<p>Notes from staff reviewer: The GMRS/SSE ratio is about 1.18. This meets the seismic evaluation criteria of NEI 12-06, H.5. The NRC staff reviewed via ePortal the licensee's MSA detailed report (EXBY039-RPT-001, Rev. 0, "Byron MSA Seismic Path 4 Evaluation"). The NRC staff found that the report followed the guidance in NEI 12-06.</p> <p>Deviation(s) or deficiency(ies) and Resolution: The licensee performed this MSA using NEI 12-06, Revision 4, but as of the date of performance of the MSA, only Revision 2 has been endorsed by the NRC staff. The NRC staff has determined that working to Revision 4 is acceptable because there are no substantive differences between the two revisions in the portions that are used for this MSA.</p> <p>Consequence(s): None</p>	
<p>The NRC staff concludes:</p> <ul style="list-style-type: none"> <li>The licensee meets the background and assessment to MSSHI criteria in NEI 12-06, Appendix H.</li> </ul>	<p>Yes</p>

II. Expedited Seismic Evaluation Process (ESEP) Equipment

<p>Equipment used in support of the FLEX strategies has been evaluated to demonstrate seismic adequacy following the guidance in Section 5 of NEI 12-06. As stated in Appendix H of NEI 12-06, previous seismic evaluations should be credited to the extent that they apply for the assessment of the MSSHI, including the ESEP evaluations performed in accordance with Electric Power Research Institute 3002000704.</p>	
<p>Licensees may reference a previous ESEP submittal, submit a new or updated ESEP report, or provide other adequate justification or evaluation.</p>	
<p>Did the licensee previously perform an ESEP?</p>	<p>No</p>
<p>Did the licensee provide a new or updated ESEP report with the MSA?</p>	<p>Yes</p>

<p>If the licensee did not perform ESEP, did they provide adequate justification that the expedited seismic equipment list structures, systems, and components (SSCs) are acceptable in accordance with the original guidance and in accordance with NEI 12-06 Section H.5 C<sub>10%</sub> capacity criteria?</p> <p>If the licensee did not perform the ESEP, did they perform an evaluation consistent with the guidance in NEI 12-06, Section H.4.4, Steps 2 and 3, including the evaluation of FLEX components that were not previously evaluated to GMRS or 2 times the SSE?</p>	<p>N/A</p> <p>N/A</p>
<p>Notes from staff reviewer: The licensee submitted the ESEP report to demonstrate inclusion of FLEX SSCs and failure modes that could affect FLEX. Enclosure 2 in this letter includes the NRC staff evaluation of the Byron ESEP report. The licensee stated that FLEX items were evaluated and qualified for the Byron MSSHI. Since the MSSHI GMRS/SSE ratio is less than 1.36 at all frequencies below 10 Hz, the licensee concluded that these items have adequate C<sub>10%</sub> capacities.</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p> <p>Consequence(s): None</p>	
<p>The NRC staff concludes:</p> <ul style="list-style-type: none"> <li>The licensee has evaluated seismic adequacy of equipment used in support of FLEX strategy consistent with the NEI 12-06, Appendix H guidance.</li> </ul>	<p>Yes</p>

III. Inherently / Sufficiently Rugged Equipment

<p>Appendix H, Section 4.4 of NEI 12-06, Revision 2 documents the process and justification for inherently and sufficiently rugged SSCs.</p> <p>The licensee:</p> <p>Documented the inherently and sufficiently rugged SSCs consistent with the NEI 12-06 Appendix H guidance.</p>	<p>Yes</p>
<p>Notes from staff reviewer: The process to identify inherently rugged items is documented in Section 2.3 of the Byron MSA report.</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p> <p>Consequence(s): None</p>	

<p>The NRC staff concludes:</p> <ul style="list-style-type: none"> <li>• The licensee's assessment of inherently and sufficiently rugged SSCs met the intent of the NEI 12-06, Appendix H guidance.</li> </ul>	<p>Yes</p>
--	------------

IV. Evaluation of Components Not Covered by ESEP

<p>The ESEP specifically excluded the evaluation of certain components of the FLEX strategy in an effort to provide stakeholders with near-term confidence in a plant's seismic capacity. However, licensees will be required to complete those evaluations as part of the Path 4 MSA to demonstrate compliance with the impending rule. Were the following components, not evaluated in the ESEP, evaluated as part of the MSA? :</p> <ul style="list-style-type: none"> <li>• FLEX Storage Building</li> <li>• Non-seismic CAT I structures</li> <li>• Operator Pathways credited in FLEX strategy</li> <li>• Tie down of FLEX portable equipment</li> <li>• Seismic interactions             <ul style="list-style-type: none"> <li>○ Masonry block wall</li> <li>○ Piping attached to tanks</li> <li>○ Flooding from non-seismically robust tanks</li> <li>○ Distributed systems (Piping/conduit/raceways/cable trays)</li> <li>○ Other potential areas of interaction</li> </ul> </li> <li>• FLEX equipment haul paths</li> <li>• Other equipment (list in Staff Reviewer Notes)</li> </ul> <p>Did the licensee provide adequate description/documentation of the evaluation?</p>	<p>Yes</p> <p>No</p> <p>Yes</p>
--	--

Notes from staff reviewer: The licensee submitted the ESEP report to demonstrate that SSCs important for FLEX were evaluated to the GMRS. The NRC staff evaluation of the Byron ESEP is provided in Enclosure 2 of this letter.

Deviation(s) or deficiency(ies) and Resolution: None

Consequence(s): None

<p>The NRC staff concludes:</p> <ul style="list-style-type: none"> <li>• The licensee followed the NEI 12-06, Appendix H guidance in evaluating SSCs not deemed inherently rugged.</li> </ul>	<p>Yes</p>
---	------------

V. Spent Fuel Pool (SFP) Cooling

<p>Per NEI 12-06, Appendix H, Section 4.4, licensees need to evaluate the adequacy of SFP cooling equipment to the GMRS. Most plants include the Order EA-12-051 SFP Level Instrument as part of the strategy.</p> <p>The licensee:</p> <ul style="list-style-type: none"> <li>• Clearly identified the SSCs and locations of the equipment that is part of the final FLEX SFP cooling strategy.</li> <li>• Clearly stated the seismic design-basis (e.g. SSE) of the equipment used in the strategy.</li> <li>• Provided adequate description or documentation of the SFP cooling equipment's evaluation to the GMRS. Portable equipment and flexible hoses do not need to be evaluated.</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p>
<p>Notes from staff reviewer: As documented in its ESEP, Exelon evaluated all equipment needed to accomplish SFP cooling against the GMRS.</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p> <p>Consequence(s): None</p>	
<p>The NRC staff concludes:</p> <ul style="list-style-type: none"> <li>• The licensee followed the NEI 12-06, Appendix H guidance in evaluating SFP cooling.</li> </ul>	<p>Yes</p>

VI. High Frequency (HF)

<p>Per NEI 12-06, Appendix H, Section 4.4, licensees with GMRS exceedance above the SSE above 10 Hz need to evaluate bi-stable components such as relays using the methodology described in NEI 12-06, Section H.4.2. The HF evaluation may have been submitted under separate letter or may be sent as an attachment to the MSA Report.</p> <p>The licensee:</p> <ul style="list-style-type: none"> <li>• GMRS exceeds the SSE above 10 Hz.</li> <li>• Provided a HF evaluation as described in NEI 12-06, Section H.4.2.</li> <li>• Appeared to follow the guidance for the HF evaluation.</li> <li>• Provided results of demand vs. capacity with identification of resolutions as needed.</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
--	---

Notes from staff reviewer: The Byron 2.1 Seismic HF evaluation included in the submittal dated November 3, 2016 (ADAMS Accession No. ML16308A267), encompassed the MSA HF scope. A table with HF evaluation results was provided in the November 3, 2016, submittal. About 16 components were evaluated to have adequate capacities and no modifications were required.

Deviation(s) or deficiency(ies) and Resolution: None

Consequence(s): None

The NRC staff concludes:

- The licensee's component capacity evaluation met the intent of the HF guidance.

Yes

#### VII. Conclusions:

The NRC staff assessed the licensee's implementation of the MSA guidance for Byron. Based on its review, the NRC staff concludes that the licensee's implementation of the MSA meets the intent of the guidance. The staff concludes that through the implementation of the MSA guidance, the licensee identified and evaluated the seismic capacity of the mitigating strategies equipment to ensure functionality will be maintained following a seismic event up to the GMRS. As noted in the review checklist, the staff identified one deviation (for which the licensee still meets the intent of the guidance) and no exceptions taken from the guidance. The licensee did not identify any necessary equipment modifications or changes to the strategy.

In summary, the NRC staff has reviewed the seismic hazard MSA for Byron. The NRC staff concludes that sufficient information has been provided to demonstrate that the licensee's plans for the development and implementation of guidance and strategies under Order EA-12-049 appropriately address the reevaluated seismic hazard information stemming from the 50.54(f) letter.

ESEP TECHNICAL REVIEW CHECKLIST  
BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO PATH FOUR MITIGATING STRATEGY ASSESSMENT  
BYRON STATION, UNITs 1 AND 2  
DOCKET NOS. 50-454 and 50-455

By letter dated August 22, 2017 (Agencywide Documents Access and Management System (ADAMS Accession No. ML17234A478), Exelon Generation Company, LLC (Exelon, the licensee) provided an Expedited Seismic Evaluation Process (ESEP) report in a response to Enclosure 1, Requested Information Item (6) of the 50.54(f) letter for the Byron Station, Units 1 and 2 (Byron). Deviations, deficiencies, and conclusions are noted at the end of each section and an overall conclusion is provided at the end of the checklist.

I. Review Level Ground Motion

<p>The licensee:</p> <ul style="list-style-type: none"> <li>• described the determination of the review level ground motion (RLGM) using one of the means acceptable by the guidance;</li> <li>• identified location of the control point and is consistent with March 2014 Seismic Hazard and Screening Report submittal;</li> <li>• compared the site ground motion response spectra used to select the ESEP RLGM to the SSE.</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p>
<p>Byron used a scaled SSE at a ratio of 1.18.</p>	
<p>Notes from staff reviewer: None</p>	
<p>Deviation(s) or deficiency(ies) and Resolution: None</p>	
<p>The NRC staff concludes:</p> <ul style="list-style-type: none"> <li>• the licensee's RLGM meets the intent of the guidance</li> <li>• the RLGM is reasonable for use in the interim evaluation</li> </ul>	<p>Yes</p> <p>Yes</p>

II. Selection of the Success Path

<p>The licensee:</p> <ul style="list-style-type: none"> <li>• described the success path</li> <li>• described normal and desired state of the equipment for the success path</li> <li>• ensured that the success path is consistent with the plant's overall mitigating strategies approach or provided a justification for an alternate path</li> <li>• stated that the selection process was in accordance with the guidance or meets the intent of the guidance</li> <li>• used installed FLEX Phase 1 equipment as part of the success path</li> <li>• included FLEX Phase 2 and/or 3 connections</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
--	---

<ul style="list-style-type: none"> <li>considered installed FLEX Phase 2 and/or 3 equipment</li> </ul>	Yes
<p>Notes from staff reviewer: Success path described to be the same as those in Byron's overall implementation plan for mitigating strategies. Detailed report supporting the ESEP described in Exelon Document 14Q4240-RPT-005, Revision 1, "Byron ESEP Screening Evaluation Work Sheets."</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p>	
<p>The NRC staff concludes:</p> <ul style="list-style-type: none"> <li>the selected success path is reasonable for use in the interim evaluation;</li> <li>the licensee considered installed Phase 2 and 3 connections or equipment in the interim evaluation.</li> </ul>	<p>Yes</p> <p>Yes</p>

III. Selection of the Equipment List

<p>The licensee:</p> <ul style="list-style-type: none"> <li>developed and provided the Expedited Seismic Equipment List (ESEL) by applying the ESEP</li> <li>identified equipment considering the following functions: <ul style="list-style-type: none"> <li>Core cooling (with focus on Mode 1) function</li> <li>Available, sustainable water source</li> <li>Containment function and integrity</li> </ul> </li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
<p>Notes from staff reviewer: None</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p>	
<p style="text-align: center;">For PWR Plants ONLY</p> <p>The licensee included indicators / instrumentation for the following functions: level, pressure, temperature, that would be indicative of (but not explicitly identified to specific instruments): water level of the steam generator (SG), pressure of SG, containment, and reactor coolant system (RCS); and temperature of the RCS.</p>	Yes
<p style="text-align: center;">For BWR Plants ONLY</p> <p>The licensee considered indicators for the following functions: level, pressure, temperature that would be indicative of (but not explicitly identified to specific instruments): Temperature of suppression pool, RCS, containment); Pressure of suppression pool, RCS, and drywell; water level of the suppression pool.</p>	N/A
<p>Notes from staff reviewer: Detailed report supporting the ESEP ESEL in Exelon Document 14Q4240-RPT-003, Revision 3, "Validation of Expedited Seismic Equipment List."</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p>	
<p>Through a sampling of the ESEP key components, the NRC staff concludes that:</p> <ul style="list-style-type: none"> <li>the licensee's process to develop the ESEL meets the intent of the guidance for the interim evaluation</li> </ul>	Yes

<ul style="list-style-type: none"> <li>• the desired equipment state for the success path were identified</li> <li>• the licensee considered the support equipment for the ESEL</li> <li>• both front-line and support systems appeared to be included in the ESEL as evidenced by inclusion of SSCs on the success path and of support systems (e.g., batteries, motor control centers, inverters).</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p>
---	----------------------------------

IV. Walkdown Approach

<p>The licensee:</p> <ul style="list-style-type: none"> <li>• described the walkdown screening approach, including walk-bys and walkdowns performed exclusively for the ESEP, in accordance with the guidance</li> <li>• credited previous walkdown results, including a description of current action(s) to verify the present equipment condition and/or configuration (e.g., walk-bys), in accordance with the guidance</li> <li>• stated that the walkdown was performed by seismically trained personnel</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p>
<p>Notes from staff reviewer: None</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p>	
<p>The licensee:</p> <ul style="list-style-type: none"> <li>• described, as needed, adverse material condition of the equipment (e.g., material degradation)</li> <li>• credited previous walkdown results, included a description of current action(s) to verify the present equipment condition (e.g., walk-bys), meeting the intent of the guidance</li> </ul>	<p>Yes</p> <p>Yes</p>
<p>The licensee:</p> <ul style="list-style-type: none"> <li>• described the conditions of structural items considered for the interim evaluation, including: <ul style="list-style-type: none"> <li>○ spatial interactions (i.e., interaction between block walls and other items/components)</li> <li>○ anchorage</li> <li>○ piping connected to tanks (i.e., differential movement between pipes and tanks at connections)</li> </ul> </li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p>
<p>Notes from staff reviewer: None</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p>	
<p>The licensee reported deviations for Byron:</p> <p>If deviations were identified, there is a discussion of how the deficiencies were or will be addressed in the ESEP submittal report.</p>	<p>No</p> <p>N/A</p>

<p>The NRC staff concludes that:</p> <ul style="list-style-type: none"> <li>• the licensee described the performed walkdown approach, including any credited previous efforts (e.g., Individual Plant Examination of External Events (IPEEE)) consistent with the guidance</li> <li>• the licensee addressed identified deviations consistent with the guidance, if any</li> </ul>	<p>Yes</p> <p>N/A</p>
--	--------------------------

V. Capacity Screening Approach and HCLPF Calculation Results

<p>The licensee:</p> <ul style="list-style-type: none"> <li>• described the capacity screening process for the ESEL items, consistent with the guidance (e.g., use of EPRI NP-6041 screening table)</li> <li>• presented the results of the screened-out ESEL items in the ESEP report</li> <li>• described the development of in-structure response spectra (ISRS) based on scaling</li> <li>• described the development of ISRS based on new analysis consistent with the guidance</li> <li>• described the method for estimating high confidence low probability of failure (HCLPF) capacity of screened-in ESEL items, including both structural and functional failure modes consistent with the guidance: <ul style="list-style-type: none"> <li>○ use of Conservative Deterministic Failure Margin (CDFM)</li> <li>○ use of fragility analysis (FA)</li> <li>○ use of experience data or generic information</li> </ul> </li> <li>• credited IPEEE spectral shape for HCLPF capacity estimates is similar to or envelopes the RLGM, and anchored at the same control point</li> <li>• presented the results of HCLPF capacities including associated failure modes for screened-in ESEL items</li> <li>• reviewed the ESEL items with the lowest HCLPF values to ensure that their capacities are equal or greater than the RLGM</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>N/A</p> <p>N/A</p> <p>No</p> <p>Yes</p> <p>Yes</p>
<p>Notes from staff reviewer: Detailed HCLPF calculations supporting the ESEP in Exelon Documents 14Q4240-CAL-002, Revision 1, "HCLPF Evaluations of Equipment and Anchorage for Byron ESEP," 14Q4240-CAL-003, Revision 1, "HCLPF Evaluations of Masonry Block Walls for Byron ESEP," 14Q4240-CAL-004, Revision 1, "HCLPF Evaluation of the Diesel Oil Storage Tanks for Byron ESEP," 14Q4240-CAL-005, Revision 1, "HCLPF Evaluations of Relays for Byron ESEP," and 14Q4240-CAL-001, Revision 1, "Generation of In-Structure Response Spectra for Byron ESEP."</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p>	

<p>The NRC staff concludes that:</p> <ul style="list-style-type: none"> <li>the licensee described the implementation of the capacity screening process consistent with the intent of the guidance</li> <li>the licensee presented capacity screening and calculation results, as appropriate, in the ESEP report</li> <li>the method used to develop the ISRS is consistent with guidance for use in the ESEP</li> <li>for HCLPF calculations, the licensee used HCLPF calculation methods as endorsed in the guidance</li> <li>no anomalies were noted in the reported HCLPF</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
---	--

VI. Inaccessible Items

<p>The licensee:</p> <ul style="list-style-type: none"> <li>provided a list of inaccessible items</li> <li>provided a schedule of the planned walkdown and evaluation for all inaccessible items</li> <li>provided Regulatory Commitment to complete walkdowns.</li> </ul>	<p>Yes</p> <p>No</p> <p>No</p>
<p>Notes from staff reviewer: Walkdowns were completed. The licensee stated that all inaccessible items were covered.</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p>	
<p>The NRC staff concludes that the licensee:</p> <ul style="list-style-type: none"> <li>listed inaccessible items</li> <li>committed to provide the results (e.g., walkdowns, walk-bys, etc.) of the remaining inaccessible items consistent with the guidance</li> <li>substitutions, if needed, were appropriately justified</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p>

VII. Modifications to Plant Equipment

<p>The licensee:</p> <ul style="list-style-type: none"> <li>identified modifications for ESEL items necessary to achieve HCLPF values that bound the RLGM (excluding mitigative strategies equipment (FLEX)), as specified in the guidance</li> <li>provided a schedule to implement such modifications (if any), consistent with the intent of the guidance</li> <li>provided Regulatory Commitment to complete modifications</li> <li>provided Regulatory Commitment to report completion of modifications.</li> </ul>	<p>No</p> <p>N/A</p> <p>N/A</p> <p>N/A</p>
<p>Byron will:</p> <ul style="list-style-type: none"> <li>complete modifications by: N/A</li> <li>report completion of modifications by: N/A</li> </ul>	<p>N/A</p>
<p>Notes from staff reviewer: None</p> <p>Deviation(s) or deficiency(ies) and Resolution: None</p>	

The NRC staff concludes that the licensee: <ul style="list-style-type: none"><li>• identified plant modifications necessary to achieve the target seismic capacity</li><li>• provided a schedule to implement the modifications (if any) consistent with the guidance</li></ul>	No  N/A
---	---------------

VIII. Conclusions:

The NRC staff assessed the licensee's implementation of the ESEP guidance. Due to the interim applicability of the ESEP evaluations, use of the information for another application would require a separate NRC review and approval. Based on its review, the NRC staff concludes that the licensee's implementation of the interim evaluation meets the intent of the guidance. The staff concludes that, through the implementation of the ESEP guidance, the licensee identified and evaluated the seismic capacity of certain key installed mitigating strategies equipment that is used for core cooling and containment functions to cope with scenarios that involve a loss of all alternating current power and loss of access to the ultimate heat sink to withstand a seismic event up to the RLGM and thus, provides additional assurance while the plant seismic risk evaluation is being conducted. In the case of Byron, the RLGM was set at the maximum ratio of two times the SSE in accordance with the guidance because the GMRS is above two times the SSE. The application of this staff review is limited to the ESEP interim evaluation as part of NTTF Recommendation 2.1: Seismic activities. As noted in the review checklist, the staff did not identify that deviations or exceptions were taken from the guidance. The licensee did not identify any modifications of equipment based on the ESEP.

In summary, the licensee, by implementing the ESEP interim evaluation, has demonstrated additional assurance, which supports continued plant safety while the longer-term seismic evaluation is completed to support regulatory decisionmaking. The NRC staff concludes that the licensee responded appropriately to Enclosure 1, Item (6) of the 50.54(f) letter, dated March 12, 2012, for Byron.

SUBJECT: BYRON STATION, UNITS 1 AND 2 – STAFF REVIEW OF MITIGATING STRATEGIES ASSESSMENT REPORT OF THE IMPACT OF THE REEVALUATED SEISMIC HAZARD DEVELOPED IN RESPONSE TO THE MARCH 12, 2012, 50.54(f) LETTER (CAC NOS. MF7809 AND MF7810; EPID L-2016-JLD-0006) DATED January 22, 2018

DISTRIBUTION:

PUBLIC  
PBMB R/F  
RidsNrrDorlLPL3 Resource  
RidsNrrPMBByron Resource  
RidsNrrLASLent Resource  
RidsACRS\_MailCTR Resource

MValentin, NRR  
BTitus, NRR  
EBowman, NRR  
MShams, NRR  
TBrown, NRR  
CWolf, OCA

ADAMS Accession No. ML17313A881

\* via e-mail

OFFICE	NRR/DLP/PBMB/PM	NRR/DLP/PBMB/LA	NRR/DLP/PBE B/BC	NRR/DLP/PBMB/BC	NRR/DLP/PBMB/PM
NAME	MValentin	SLent	TBrown	MShams	MValentin
DATE	12/15/17	1/12/18	1/17/18	1/21/18	1/22/18

OFFICIAL RECORD COPY