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August 22, 2017

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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LaSalle County Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

Subject: Seismic Mitigating Strategies Assessment (MSA) Report for the Reevaluated Seismic Hazard Information – NEI 12-06, Appendix H, Revision 4, H.4.4 Path 4: GMRS < 2xSSE

References:

1. NEI 12-06, Revision 4, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, December 2016, ADAMS Accession Number ML16354B421
2. JLD-ISG-2012-01, Revision 2, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, February 2017, ADAMS Accession Number ML17005A188

The purpose of this letter is to provide the results of the assessment for LaSalle County Station, Units 1 and 2 to demonstrate that the FLEX strategies developed, implemented and maintained in accordance with NRC Order EA-12-049 can be implemented considering the impacts of the reevaluated seismic hazard. The assessment was performed in accordance with the guidance provided in Appendix H Section H.4.4 of NEI 12-06 Revision 4 [Reference 1] which was endorsed by the NRC [Reference 2].

Based upon the mitigating strategies assessment results provided in the Enclosure, the mitigating strategies for LaSalle County Station, Units 1 and 2, as described in the procedure CC-LA-118-1001 [Reference 17 of the enclosed report], are acceptable considering the impacts of the reevaluated seismic hazard.


This letter contains no new regulatory commitments and no revision to existing regulatory commitments.

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If you have any questions regarding this submittal, 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 22nd day of August 2017.

Respectfully submitted,



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Enclosure: Seismic Mitigating Strategies Assessment for LaSalle County Station, Units 1 and 2

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ENCLOSURE

**Seismic Mitigating Strategies Assessment for LaSalle County
Station, Units 1 & 2**

NEI 12-06 Appendix H – Seismic “Path 4”

(8 Pages)

1. BACKGROUND

LaSalle County Station, Units 1 and 2 has completed a mitigating strategies assessment (MSA) for the impacts of the reevaluated seismic hazard to determine if the mitigating (FLEX) strategies developed, implemented and maintained in accordance with NRC Order EA-12-049 remain acceptable at the reevaluated seismic hazard levels. The MSA was performed in accordance with the guidance provided in Appendix H of NEI 12-06 Revision 4 [Reference 1] which was endorsed by the NRC [Reference 2].

The Mitigating Strategies Seismic Hazard Information (MSSHI) is the reevaluated seismic hazard information at LaSalle County Station, Units 1 and 2, developed using the Probabilistic Seismic Hazard Analysis (PSHA). The MSSHI includes a performance-based Ground Motion Response Spectrum (GMRS), Uniform Hazard Response Spectra (UHRS) at various annual probabilities of exceedance, and a family of seismic hazard curves at various frequencies and fractiles developed at the LaSalle County Station, Units 1 and 2 control point elevation. LaSalle County Station, Units 1 and 2 submitted the reevaluated seismic hazard information including the UHRS, GMRS and the hazard curves to the NRC on March 31 2014 [Reference 3]. The NRC staff concluded that the GMRS that was submitted adequately characterizes the reevaluated seismic hazard for the LaSalle County Station, Units 1 and 2 site [Reference 4]. Section 6.1.1 of Reference 2 identifies the method described in Section H.4.4 of Reference 1 as applicable to LaSalle County Station, Units 1 and 2.

2. ASSESSMENT TO MSSHI

Consistent with Section H.4.4 (Path 4) of Reference 1, the LaSalle County Station, Units 1 and 2 GMRS has spectral accelerations greater than the safe shutdown earthquake (SSE) but no more than 2 times the Safe Shutdown Earthquake (SSE) anywhere in the 1 to 10 Hz frequency range. As described in the procedure CC-LA-118-1001, "Site Implementation of Diverse and Flexible Coping Strategies (FLEX) and Spent Fuel Pool Instrumentation Program" [Reference 17], the plant equipment relied on for FLEX strategies have previously been evaluated as seismically robust to the SSE levels. The basic elements within the MSA of Path 4 SSCs are described in Reference 1. Implementation of each of these basic Path 4 elements for the LaSalle County Station, Units 1 and 2 site is summarized below.

2.1 Step 1 – Scope of MSA Plant Equipment

The scope of SSCs considered for the Path 4 MSA was determined following the guidance used for the expedited seismic evaluation process (ESEP) defined in EPR1 3002000704 [Reference 9]. FLEX SSCs excluded from consideration in the ESEP were added to the MSA equipment scope. In addition, SSC failure modes not addressed in the ESEP that could potentially affect the FLEX strategies were added and evaluated.

SSCs associated with the FLEX strategy that are inherently rugged or sufficiently rugged are discussed in Section 2.3 below and identified in Section H.4.4 (Path 4) of Reference 1. These SSCs were not explicitly added to the scope of MSA plant equipment.

2.2 Step 2 – ESEP Review

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. This includes the expedited seismic evaluation process (ESEP) evaluations [Reference 10] for the FLEX strategies which were performed in accordance with EPRI 3002000704 [Reference 9]. The ESEP evaluations remain applicable for this MSA since these evaluations directly addressed the most critical 1 Hz to 10 Hz part of the new seismic hazard using seismic responses from the scaling of the design basis analyses. In addition, separate evaluations are performed to address high frequency exceedances under the high frequency (HF) sensitive equipment assessment process, as required, and are documented in Section 4 of this report.

2.3 Step 3 – Inherently/Sufficiently Rugged Equipment

The qualitative assessment of certain SSCs not included in the ESEP was accomplished using (1) a qualitative screening of “inherently rugged” SSCs, and (2) evaluation of SSCs to determine if they are “sufficiently rugged.” Reference 1 documents the process and the justification for this ruggedness assessment. SSCs that are either inherently rugged or sufficiently rugged are described in Reference 1 and no further evaluations for these rugged SSCs are required under the MSA.

2.4 Step 4 – Evaluations Using Section H.5 of Reference 1

Step four for Path 4 plants includes the evaluations of:

1. FLEX equipment storage buildings and Non-Seismic Category 1 Structures that could impact FLEX implementation
2. Operator Pathways
3. Tie down of FLEX portable equipment
4. Seismic Interactions not included in ESEP that could affect FLEX strategies
5. Haul Paths

FLEX SSCs not included in the ESEP were evaluated and qualified for the MSSHI in LaSalle County Station, Units 1 and 2 Report No. EXLS014-REPT-001 [Reference 20]. It is concluded that these SSCs have adequate $C_{10\%}$ capacities corresponding to the GMRS.

The results of the reviews of each of these five areas are described in the sections below.

2.4.1 FLEX Equipment Storage Buildings

The Robust FLEX Equipment Storage Building # 22 (60' x 90') consists of 1'-9" thick reinforced concrete walls on a 5'-0" thick strip footing with 1'-9" thick reinforced concrete floor slab. The roof slab is a 1'-9" thick reinforced concrete slab on a 3" metal decking supported by W14 x 48 composite beams and W36 x 256 composite girders.

The Robust FLEX Equipment Storage Building #23 (30' x 40') consists of 1'-9" thick reinforced concrete walls on a 5'-0" thick strip footing with 1'-9" thick reinforced concrete

floor slab. The roof slab is a 1'-9" thick reinforced concrete slab on a 3" metal decking supported by W14 x 48 composite beams and W40 x 167 composite girders.

Minimum required design horizontal seismic acceleration of 0.16g for Robust FLEX Equipment Storage Buildings was calculated per the seismic design criteria provided in ASCE 7-10 using the LaSalle County Station peak SSE ground acceleration of 0.54g. However, the Robust FLEX Equipment Storage Building #22 and Building #23 are designed for a horizontal seismic acceleration of 0.26g. The ratio of peak GMRS/peak SSE ground spectral ordinates (increase in seismic demand) is $0.695g/0.54g = 1.29$. Since the ratio of minimum design seismic acceleration to actual design seismic acceleration (seismic margin) for the Robust FLEX Storage Buildings is $0.26g/0.16g = 1.62$ and realistic lower bound ratio C10%/C1% is 1.36 per NEI 12-06, Appendix H, Section H5, Table H-1 are larger than the increase in seismic demand 1.29, it is reasonable to conclude that the Robust FLEX Equipment Storage Building #22 and Building #23 have adequate C10% capacity corresponding to the GMRS.

Non-Seismic Category 1 Structures

Since non-safety related FLEX reinforced concrete Hardened Hose Station (HHS) #1 and #2 are designed based on a linear comparison between the reevaluated seismic hazard (GMRS) and the existing SSE using a seismic scaling factor of 1.83, it is reasonable to conclude that the HHS #1 and #2 have adequate seismic capacity to withstand the GMRS.

2.4.2 Operator Pathways

Procedure CC-LA-118-1001 [Reference 17] provides the different FLEX operator pathways as well as FLEX hose and cable routes. The major pathways are located in the Diesel Generator Buildings at EL. 710', Auxiliary Buildings at ELs. 710', 731', and 768' and Reactor Buildings at ELs. 710', 761' and 843'. The operator pathways are required to route FLEX hoses and cables and also allow operators to reach equipment required for FLEX strategies. LaSalle County Station has reviewed the operator pathways in Reference 20 and verified that the operator pathways are not impacted by the MSSHI. Considerations for this review included:

- At least a single operator pathway is available for successful implementation of FLEX strategies.
- FLEX Pathway and components in seismic Category 1 structures with previous reviews for seismic ruggedness.
- Proximity and anchorage of other plant SSCs with respect to FLEX SSCs, including overhead items.
- Debris removal capabilities for moderate to smaller seismic interactions.
- Available time for operator actions: The only action with time restraints less than 4.5 hours is DC bus load shedding. Operators have clear pathways to perform this action and, due to location, can easily be completed within the required time frame.
- Operator pathways were reviewed during a walkdown to assess seismic interactions associated with a GMRS-level seismic event.

Examples of more specific considerations associated with the above bulleted items are:

- Width of the pathways and FLEX equipment deployment areas.
- Type, size, general condition, and proximity and anchorage of other plant SSCs with respect to FLEX SSCs along the pathways, including overhead items such as lighting, piping, cable trays, conduits, etc.
- Equipment that could block the entrance to rooms that house FLEX equipment.
- Equipment that could cause seismic-induced flooding.
- Block walls seismic interaction excluded from the ESEP.

Per MSA walkdown observations provided in Reference 20, operator pathways within the buildings are interconnected by stairs and hallways that have enough space for operators to walk through. Equipment within these pathways is adequately supported such that FLEX equipment will not be adversely impacted during a GMRS-level event.

Therefore, additional plant modifications or procedure changes are not required for successful use of the FLEX operator pathways during a GMRS-level seismic event.

2.4.3 Tie Down of FLEX Portable Equipment

Large FLEX portable equipment used for the LaSalle County Station FLEX strategies include FORD F-750 truck, KUBOTA Tractors, Diesel Generators, Hale Pumps, Fuel Trailer, hose and cable trailers and tuggers as described in LOS-FSG-A1 [Reference 18] are stored and tied down as required in the Robust FLEX Equipment Storage Buildings # 22 and # 23. FLEX implementation procedures CC-LA-118-1001 [Reference 17] and LOA-FSG-012 [Reference 19] provide additional equipment description and characteristics. Stored components were evaluated (for stability and restraint as required/necessary) and protected from seismic interactions to the SSE level as part of the FLEX design process to ensure that unsecured and/or non-seismic components do not damage the FLEX equipment. In addition, large FLEX equipment such as pumps and power supplies are secured as necessary to protect them during a SSE seismic event. This type of equipment has a low aspect ratio and will not overturn when subjected to the GMRS seismic loadings. Evaluation has been performed in Reference 20 for overturning of this type of equipment and found stable. Also, the large FLEX portable equipment is tied down with ratchet straps to prevent any rocking during a GMRS-level seismic event.

FLEX equipment storage boxes house smaller FLEX portable equipment (e.g., hoses, cables, pipe fittings, tools, spider boxes etc.) and are stored at various locations inside the plant. The FLEX equipment storage box has a low aspect ratio and will not overturn when subjected to the GMRS seismic loadings. Evaluation has been performed in Reference 20 for overturning of the FLEX equipment storage box and found stable.

LaSalle County Station has reviewed and documented the storage requirements (including any tie-down or restraint devices) in effect for FLEX portable equipment in Report No. EXLS014-REPT-001 [Reference 20], and verified that the equipment has no adverse interactions or significant damage that could impair the ability of the equipment to perform its mitigating strategy function during or following the GMRS-level seismic event using the methods described in Section H.5 of NEI 12-06.

2.4.4 Additional Seismic Interactions

Seismic interactions that could potentially affect the FLEX strategies and were not previously reviewed as part of the ESEP program were reviewed for LaSalle County Station Units 1 and 2. The review is documented in Report No. EXLS014-REPT-001 [Reference 20] and included the following considerations:

1. Seismically induced spatial interaction between FLEX equipment and other plant equipment:
 - a. Plant equipment included piping, cable trays, conduits, gas cylinders, fire extinguishers, overhead lighting, block walls excluded from the ESEP, and others.
 - b. Observations of interest included the clear distance between the FLEX equipment in question and adjacent equipment, and anchorage of the equipment. Also, attention was given to the potential of having a piece of equipment turn over or slide in a way that could block the entrance to a room needed for FLEX implementation, which could not be removed by debris removal equipment.
2. Equipment that could completely block a pathway, haul path, or FLEX cable/hose route, which could not be removed by debris removal equipment.

LaSalle County Station has reviewed and documented the additional seismic interactions in Report No. EXLS014-REPT-001 [Reference 20] and verified that the Mitigation Strategy is not adversely impacted by the MSSHI.

2.4.5 Haul Path

Haul paths described in the FLEX site implementation procedures CC-LA-118-1001 [Reference 17] and LOA-FSG-012 [Reference 19] are used to transport FLEX portable equipment from the Robust FLEX Storage Buildings to the deployment zones at east of Units 1 and 2 Reactor Building and at north shore of the intake canal. The FLEX equipment haul paths from the Robust FLEX Storage Buildings to the deployment zones were reviewed during a walkdown to assess seismic interactions associated with a GMRS level seismic event, no potential seismic interaction noted. Soil slope stability and liquefaction evaluation for the FLEX staging area and equipment deployment path have been performed and are not a concern. Per Reference 19, LaSalle County Station has capabilities for debris removal to reestablish a haul path following a beyond design basis earthquake.

LaSalle County Station has reviewed the haul paths in Report No. EXLS014-REPT-001 [Reference 20], and verified that the haul paths are not adversely impacted by the MSSHI.

3. SPENT FUEL POOL COOLING REVIEW

The FLEX strategy for spent fuel pool (SFP) cooling utilizes SFP level monitoring and make-up capability as described in LaSalle County Station, Units 1 and 2 FLEX implementation procedure CC-LA-118-1001 [Reference 17]. SFP make-up capability is provided using the portable FLEX Diesel-driven pump taking suction through a portable flexible hose and discharging through a permanently installed FLEX makeup connection tie-in to the SFP emergency make-up piping. The source of make-up water is the plant ultimate heat sink LaSalle cooling lake. The SFP level monitoring is provided by a newly installed spent fuel pool level panel, which remotely displays the water level in the SFP.

The permanently installed plant equipment relied on for the implementation of the SFP Cooling FLEX strategy has been designed and installed, or evaluated to remain functional, in accordance with the plant design basis to the SSE loading conditions. The spent fuel pool integrity evaluations demonstrated inherent margins of the spent fuel pool structure and interfacing plant equipment above the required peak ground acceleration (PGA) as per EPRI 3002007148 [Reference 14]. The portable FLEX equipment availability, including its storage and deployment pathways, and the permanently installed plant equipment needed to accomplish SFP cooling have subsequently been evaluated considering the MSSHI loading conditions.

The evaluation of spent fuel pool cooling for LaSalle County Station, Units 1 and 2 was performed based on the initial conditions established in NEI 12-06 [Reference 1] for spent fuel cooling coping in the event of an ELAP/LUHS. The evaluation also used the results of pool heat-up analyses from the ELAP evaluation as input.

LaSalle County Station has reviewed the spent fuel pool cooling strategy and verified that the spent fuel pool cooling mitigation strategy is not adversely impacted by the MSSHI.

4 HIGH FREQUENCY REVIEW

The high frequency review was submitted under separate cover to the NRC [Reference 5]. As shown in Reference 5, LaSalle County Station has completed the high frequency evaluation of potentially sensitive contact devices in accordance with NEI 12-06 [Reference 1], Appendix H Section H.4.2 and EPRI 3002004396 [References 7 and 8] and the devices have adequate seismic capacity. The results of the evaluation confirm that the FLEX strategies for LaSalle County Station, Units 1 and 2 can be implemented as designed and no further seismic evaluations are necessary.

5 CONCLUSION

Therefore, the FLEX strategies for LaSalle County Station, Units 1 and 2 as described in the FLEX implementation procedure CC-LA-118-1001 [Reference 17] are acceptable as specified and no further seismic evaluations are necessary.

6 REFERENCES

1. NEI 12-06, Revision 4, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, December 2016, ADAMS Accession Number ML16354B421
2. JLD-ISG-2012-01, Revision 2, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, February 2017, ADAMS Accession Number ML17005A188
3. LaSalle County Station, Unit 1 and 2, Exelon Generation Company, LLC, Seismic Hazard and Screening Report (Central and Eastern United States (CEUS) Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, [March 31, 2014], ADAMS Accession Number ML14091A013
4. NRC Letter, LaSalle County Station, Unit 1 and 2- Staff Assessment of Information provided Pursuant to Title 10 of the Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima DAI-ICHI Accident (TAC Nos. MF3881 and MF3882), [April 21, 2015], ADAMS Accession Number ML15013A132
5. LaSalle County Station, Unit 1 and 2, High Frequency Supplement to Seismic Hazard Screening Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, [December 1, 2016], ADAMS Accession Number ML16336A810
6. NRC Letter, LaSalle County Station, Units 1 And 2 - Staff Review of High Frequency Confirmation Associated with Reevaluated Seismic Hazard Implementing Near-Term Task Force Recommendation 2.1, [February 6, 2017], ADAMS Accession Number ML17031A425
7. EPRI 3002004396, Final Report, July 2015, High Frequency Program Application Guidance for Functional Confirmation and Fragility Evaluation, ADAMS Accession Number ML15223A102
8. NRC Letter, Endorsement of Electric Power Research Institute Final Draft Report 3002004396, "High Frequency Program: Application Guidance for Functional Confirmation and Fragility", dated September 17, 2015, ADAMS Accession Number ML15218A569
9. EPRI, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic", Report Number 3002000704, Palo Alto, CA, April, 2013
10. LaSalle County Station, Unit 1 and 2, Exelon Generation Company, LLC Expedited Seismic Evaluation Process Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dia-ichi Accident, [December 19, 2014], ADAMS Accession Number ML14353A085

11. EPRI, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic", Report Number 1025287, Palo Alto, CA, November, 2012
12. EPRI, "EPRI NP-6041-SL Revision 1: A Methodology for Assessment of Nuclear Plant Seismic Margin, Revision 1", Palo Alto, CA, August, 1991
13. NRC Letter, LaSalle County Station, Unit 1 and 2 – Staff Review of Interim Evaluation Associated with Reevaluated Seismic Hazard Implementing Near-Term Task Force Recommendation 2.1 (TAC Nos. MF5247 and MF 5248), [June 16, 2015], ADAMS Accession Number ML15160A168
14. LaSalle County Station, Units 1 and 2, Exelon Generation Co., LLC - Spent Fuel Pool Evaluation Supplemental Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, [August 31, 2016], ADAMS Accession Number ML16244A802
15. NRC Letter, LaSalle County Station, Unit 1 and 2- Staff Review of Spent Fuel Pool Evaluation Associated with Reevaluated Seismic Hazard Implementing Near-Term Task Force Recommendation 2.1 (CAC Nos. MF3881 and MF3882), [September 13, 2016], ADAMS Accession Number ML16252A314
16. LaSalle County Station, Units 1 and 2, Report of Full Compliance with March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), [April 27, 2015], ADAMS Accession Number ML15117A635
17. CC-LA-118-1001, Rev. 1, Site Implementation of Diverse and Flexible Coping Strategies (FLEX) and Spent Fuel Pool Instrumentation Program (Compliant with OIP and six month updates)
18. LOS-FSG-A1, Rev. 2, FLEX Equipment Annual Inventory
19. LOA-FSG-012, Rev. 1, FLEX Deployment Path Debris Removal
20. EXLS014-REPT-001, Rev.0, MSA Seismic Path 4 Evaluation For LaSalle County Station Units 1 & 2 (EC 619279)
21. CC-LA-118-1004, Rev. 1, LaSalle FLEX (BDBEE) Validation Process