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U.S. Nuclear Regulatory Commission
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Washington, DC 20555-0001

SUSQUEHANNA STEAM ELECTRIC STATION (SSES)
NEI 12-06, APPENDIX H, REVISION 2, H.4.3 PATH 3:
GMRS > SSE BUT < IHS, MITIGATING STRATEGIES ASSESSMENT (MSA) REPORT FOR THE NEW SEISMIC HAZARD INFORMATION
PLA-7551

Docket No. 50-387
and No. 50-388

References:

1. *NEI 12-06, Revision 2, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, December 2015, ADAMS Accession Number ML16005A625*
2. *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, January 2016, ADAMS Accession Number ML15357A163*
3. *SSES Letter PLA-7145, Seismic Hazard and Screening Report (CEUS Sites) Response to NRC Request for Information Pursuant to 10 CFR50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 26, 2014, ADAMS Accession Number ML14085A398*
4. *NRC Letter, SSES Units 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 (CAC Nos. MF3707 and MF3708), dated Jan 20, 2016, ADAMS Accession Number ML15356A247*
5. *U.S. NRC, "NUREG-1407: Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," ADAMS Accession Number ML063550238, Washington, D.C., June, 1991*
6. *NEI, "NEI 12-01 Revision 0: Guideline for Assessing Beyond-Design-Basis Accident Response Staffing and Communications Capabilities," Washington, D.C., May, 2012*
7. *EPRI, "Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details [SPID] for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic, EPRI 1025287, Palo Alto, CA, February 2013*
8. *SSES Letter PLA-7491, 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 Dai-Ichi Accident, dated June 30, 2016, ADAMS Accession Number ML16182A263*
9. *EPRI, "High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation," Report Number 3002004396, Palo Alto, CA, July 2015.*

10. *SSES Letter PLA-7513, Seventh Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events (NRC Order EA-12-049), dated August 19 2016, ADAMS Accession Number ML16239A011*
11. *SSES Letter PLA-7416, 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, dated December 23, 2015, ADAMS Accession Number ML15362A529*
12. *SSES Letter PLA-4162, Submittal of the IPEEE Report, dated June 27, 1994*
13. *NRC Letter to Licensees, Final Determination of Licensee Seismic Probabilistic Risk Assessments Under the Request For Information Pursuant To Title 10 Of The Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1 "Seismic" of The Near-Term Task Force Review Of Insights From The Fukushima Dal-Ichi Accident, dated October 27, 2015, ADAMS Accession Number ML15194A015*

The purpose of this letter is to provide the results of the assessment performed for Susquehanna Nuclear, LLC's Susquehanna Steam Electric Station (SSES) Units 1 and 2 to demonstrate that an Individual Plant Examination of External Events (IPEEE) based Alternate Mitigating Strategy (AMS) can be implemented considering the impacts of the reevaluated seismic hazard. The assessment was performed in accordance with the guidance provided in Appendix H of NEI 12-06 Revision 2 (Reference 1) which was endorsed by the NRC (Reference 2). This is considered an AMS because the IPEEE evaluations and results are being used to justify the two IPEEE safe shutdown paths surviving the new Ground Motion Response Spectrum (GMRS) seismic event. The FLEX equipment and strategies provide defense-in-depth. The Spent Fuel Pool (SFP) is addressed separately in the Attachment to this letter.

The Mitigating Strategies Seismic Hazard Information (MSSHI) is the licensee's reevaluated seismic hazard information for SSES, developed using Probabilistic Seismic Hazard Analysis (PSHA). The MSSHI for Path 3, as defined in NEI 12-06 (Reference 1), includes the performance-based GMRS at various frequencies developed at the SSES Units 1 and 2 control point elevation. In response to the NRC's Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 12, 2012, Susquehanna Nuclear, LLC submitted the reevaluated seismic hazard information including the Uniform Hazard Response Spectrum (UHRS), GMRS and the hazard curves to the NRC on March 26, 2014 (Reference 3). The NRC staff concluded that the MSSHI that was submitted adequately characterizes the reevaluated seismic hazard for the site (Reference 4).

Consistent with Section H.4.3 of Reference 1, the SSES Units 1 and 2 GMRS is bounded by the high-confidence-of-low-probability-of-failure (HCLPF) spectrum developed from evaluations for the IPEEE between 1-10 Hz – referred to as the IPEEE HCLPF spectrum or IHS. Section 6.1.2 of Reference 2 identified that the method described in Section H.4.3 of Reference 1 is applicable to SSES Units 1 and 2. The SSES Units 1 and 2 GMRS is not bounded by the IHS at all frequencies greater than 10 Hz.

Based upon the Seismic Mitigating Strategies Assessment in the Attachment to this letter, the mitigating strategies for SSES Units 1 and 2, considering the impacts of the reevaluated seismic hazard, can be implemented as designed.

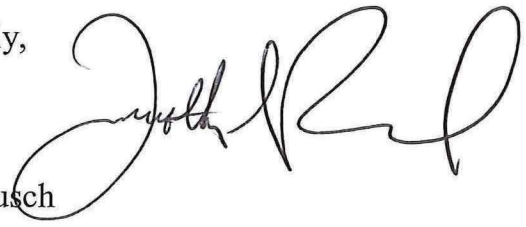
This letter contains no new Regulatory Commitments and no revision to existing Regulatory Commitments.

Should you have any questions regarding this submittal, please contact Mr. Jason Jennings at 570-542-3155.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: 12/19/2016

Sincerely,



T.S. Rausch

Attachment: Seismic Mitigating Strategies Assessment for Susquehanna Steam Electric Station

Copy: Director, Office of Nuclear Reactor Regulation
NRC Region I
Mr. Rajender Auluck, NRR/JLD/PSB, NRC
Mr. Brian Lee, NRR/JLD/JOMB, NRC
Mr. J. E. Greives, NRC Sr. Resident Inspector
Ms. T. E. Hood, NRC Project Manager
Mr. W. D. Reckley, NRR/JLD/PSB, NRC
Mr. M. Shields, PA DEP/BRP

ATTACHMENT FOR PLA-7551

Seismic Mitigating Strategies Assessment for

Susquehanna Nuclear, LLC

Susquehanna Steam Electric Station Units 1 and 2

Docket Numbers 50-387 and 50-388

Renewed License Numbers NPF-14 and NPF-22

INTRODUCTION

The purpose of this seismic mitigating strategies assessment is to evaluate and demonstrate that Susquehanna Nuclear, LLC's Susquehanna Steam Electric Station (SSES) Units 1 and 2 can mitigate the effects of the reevaluated seismic hazard information developed pursuant to the NRC's 10CFR 50.54(f) letter dated March 12, 2012. The assessment was performed in accordance with the guidance provided in Reference 1. Reference 1 discusses a method to develop an Alternate Mitigating Strategy (AMS) to address the Mitigating Strategies Seismic Hazard Information (MSSHI). This includes a modification of the general criteria and baseline assumptions included in Section 3.2.1 of Reference 1 to exclude consideration of losses such as an Extended Loss of AC Power (ELAP), Loss Of Offsite Power (LOOP) or Loss of Ultimate Heat Sink (LUHS) unless caused by the seismic hazard. Reference 2 provides an NRC staff position that the method described in Section H.4.3 of Reference 1 for an AMS is acceptable for mitigating a beyond design basis external event.

An Individual Plant Examination for External Events (IPEEE) based AMS relies on the seismic evaluation of plant equipment to demonstrate robustness of structures, systems and components (SSCs) to the Ground Motion Response Spectrum (GMRS). The IPEEE for SSES Units 1 and 2 (Reference 12) relied on the results of an EPRI Seismic Margins Assessment (SMA) methodology to demonstrate the capability to bring the plant to a safe shutdown condition following a Review Level Earthquake (RLE) as described in NUREG-1407 (Reference 5). The EPRI SMA methodology approach evaluated two safe shutdown success paths. The safe shutdown success paths provide independent means of achieving a safe shutdown condition following a severe seismic event.

The IPEEE HCLPF Spectrum (IHS) for SSES Units 1 and 2 demonstrates (Reference 4) plant seismic capacity to levels higher than GMRS in the 1-10 Hertz range. Seismic evaluations performed for the IPEEE included SSCs in the two safe shutdown success paths. Therefore, based on the results of the IPEEE, safe shutdown of the plant following a seismic event can be accomplished, and consequences can be mitigated, for a seismic event up to the plant capacity level (i.e., the IHS) for which the SSCs in the IPEEE were evaluated.

Indefinite Coping

A plant-specific review (Reference 3) of the SSES Units 1 and 2 IPEEE (Reference 12) was performed and concluded that there are no SSCs in either safe shutdown path that limit the SMA-based IPEEE coping duration to 72 hours. It is expected that all SSCs in either safe shutdown path will be available for an indefinite period following a Beyond Design-Basis (BDB) seismic event at the reevaluated seismic hazard level to support continued maintenance of the safe shutdown condition.

The SSES Units 1 and 2 IPEEE used the EPRI SMA method. This approach defined the Seismic Equipment List (SEL) for evaluation of safe shutdown success paths to be comprised of those SSCs required to bring the plant to a stable condition (either hot or cold shutdown) and maintain that condition for at least 72 hours. Therefore, the IPEEE results have been reviewed for limitations that are based on the 72 hour coping duration. Generally, the conclusions of the SMA are not sensitive to coping duration. However, certain consumable items, such as water and

diesel fuel oil inventories, have been evaluated based on a limited onsite supply. The ability to continue coping would potentially require re-supply of consumables.

Adequate on-site cooling water is available from the seismically rated Unit 1 and 2 Suppression Pools and the 25 million gallon Ultimate Heat Sink (Spray Pond). Adequate on-site diesel fuel oil is available from the five (5) seismically rated diesel fuel oil storage tanks. The plant-specific review that was performed to identify consumables and/or SSCs that are limiting for the 72 hour coping duration assumed in the development of the IPEEE concluded that there are no consumables or SSCs in either safe shutdown path that limit the SMA-based IPEEE coping duration to 72 hours. Therefore, there was no need to identify methods of addressing any shortfalls, since there were none.

Site access is assumed to be restored to a near-normal status and/or augmented transportation resources are available within a few days as determined by NEI 12-01 (Reference 6), to allow for additional supplies to be brought in and allow for continuation of coping strategies and maintain the plant in a stable condition.

In addition to the Spray Pond, several alternative water supplies that are not fully seismically rated may be available to SSES Units 1 and 2 to support coping for an extended period following the BDB seismic event to support continued maintenance of the safe shutdown condition. Additional water sources include the two Condensate Storage Tanks, the Refueling Water Storage Tank, and both Units' Condenser Hotwells. Portable pumps are available from the National SAFER Response Centers (NSRC) to support water transfer to or from the Spray Pond and alternate supplies.

Although not determined to be limiting, diesel fuel oil supplies supporting operation of the Diesel Generators were also evaluated for extended coping. SSES Units 1 and 2 have established standing contracts with diesel fuel oil providers to replenish diesel fuel oil supplies. The on-site diesel fuel oil supplies have been evaluated to last at least 72 hours to continue the strategies evaluated under the IPEEE and/or on-site FLEX strategies. Additionally, the NSRCs have the ability to air lift diesel fuel oil bladders for use in the limited cases prior to roadways being made available for site access.

IPEEE Upgrade to Full Scope

The SSES Units 1 and 2 IPEEE was included in the Focused Scope bin, and an upgrade to a full scope assessment as described in EPRI 1025287 (Reference 7) was addressed in the IPEEE Seismic Adequacy review submitted with the SSES Units 1 and 2 reevaluated Seismic Hazard and Screening Report (Reference 3).

SSES Units 1 and 2 were binned as a 0.3g Focused Scope plant in NUREG-1407 (Reference 5). As stated in Section 3.3.1 of EPRI 1025287 (Reference 7), Focused-Scope IPEEE submittals may be used for screening against the GMRS provided they are enhanced to bring them in line with full scope assessments. The enhancements include (1) a full scope detailed review of relay chatter and (2) a full evaluation of soil failures.

Full Scope Relay Chatter Review

SSES Units 1 and 2 performed an assessment of relay chatter effects in accordance with the scope and procedures described in NUREG-1407 (Reference 5) as documented in the SSES Units 1 and 2 IPEEE Report (Reference 12). In addition, SSES concluded that the relay chatter evaluations performed in the IPEEE exceeded the requirements for a full scope IPEEE (Reference 3).

The NRC accepted the evaluation in Reference 3 and did not require SSES Units 1 and 2 to perform additional Relay Chatter evaluations as documented in their October 27, 2015 letter to Licensees regarding the Final Determination of Licensee Seismic Probabilistic Risk Assessments, Table 1a (Reference 13).

Therefore, no modifications to Susquehanna are required (Reference 12).

SSES Units 1 and 2 also performed a High Frequency Evaluation to supplement the Seismic Hazard Screening Report (Reference 11), which is discussed later in this Attachment.

Soil Failure Analysis

SSES Units 1 and 2 have completed a soil failure analysis in accordance with the procedures described in NUREG-1407, which defers to the guidance provided in EPRI NP-6041-SL. Soil failure modes include soil liquefaction, foundation settlement, and slope instability (failure). The soil failure evaluation was conducted in accordance with Section 7 of EPRI NP-6041-SL. These results are documented in Section 3.11.4 of the IPEEE Report (Reference 12) and the reevaluation (Reference 3). No adverse effects are expected from soil failure and no modifications are required for SSES Units 1 and 2.

Spent Fuel Pool Cooling Evaluation

The evaluation of Spent Fuel Pool (SFP) Cooling for SSES Units 1 and 2 was performed based on the initial conditions established in NEI 12-06 (Reference 1) for SFP Cooling coping in the event of an ELAP/LUHS. The evaluation also used the results of SFP heatup analyses from the ELAP evaluation as input.

Spent Fuel Pool Cooling

The FLEX strategy for SFP cooling utilizes SFP level monitoring and make-up capability as described in the SSES Units 1 and 2 Overall Integrated Plan (OIP) (Reference 10). The SFP level is monitored using installed level monitoring instrumentation with remote monitoring capability installed in compliance with NRC Order EA-12-051. The primary method to provide water to the SFP utilizes the pumper truck (FLEX pump) discharging through portable flexible hose connected to the RHRSW piping in the ESSW Pump House structure to supply water to the FLEX hose connection on the RHRSW piping in SSES Unit 2. The cooling water is routed from the RHRSW piping through portable flexible hose connected to the Refueling Floor through a standpipe in the stairway of the northeast corner of the SSES Unit 2 Reactor Building. The top of the standpipe is connected to a portable flexible hose that will reach the SFP or the hose can

be connected to spray nozzles that discharge into the SFP. The source of make-up water is the plant's Ultimate Heat Sink (Spray Pond).

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 Safe Shutdown Earthquake (SSE) loading conditions. 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 reviewed considering the GMRS-consistent loading conditions. SSES Units 1 and 2's FLEX Equipment Storage Building and equipment storage spacing were designed to two (2) times the SSES Units 1 and 2 SSE. Therefore, considering the SSES Units 1 and 2 seismic design basis, the IPEEE seismic evaluation results, and the review of the FLEX equipment storage and deployment bases SSES concludes the permanently installed plant equipment and the portable equipment will be able to perform the designed function after a seismic event within the appropriate criteria.

The Spent Fuel Pool structure seismic adequacy was documented in Reference 8. Therefore, the design of the Spent Fuel Pool Cooling strategy has been evaluated to be acceptable from a seismic adequacy perspective in accordance with NEI 12-06, Appendix H.

High Frequency Evaluation

SSES Units 1 and 2 have conducted an evaluation (Reference 11) of High Frequency motion sensitive components (relays) in accordance with the guidance in EPRI 3002004396 (Reference 9) and found no adverse impact from the GMRS level seismic demands.

Exceedance exists over a limited frequency range but is bounded by the exceedance area criteria in Section 3.1.2 of EPRI 3002004396 (Reference 9) and thus the exceedance does not represent a concern nor warrant additional evaluations to confirm the functionality of control devices in the high frequency range.

This conclusion is also supported by information in References 3 and 12.

Availability of FLEX Equipment

With the exception of SFP Cooling, the AMS described in H.4.3 does not rely upon availability of FLEX equipment.

On-site FLEX equipment may be available for deployment to support the maintenance of core cooling, Containment, and SFP Cooling functions. In order to provide additional potential mitigating capability, portable FLEX equipment not being used for the AMS is stored and reasonably protected in accordance with Section 5.3.1 of NEI 12-06 (Reference 1).

Additionally, SSES Units 1 and 2 maintain the capability to obtain additional portable FLEX equipment from offsite sources. No strategies are preplanned for the use of the offsite equipment since this offsite equipment would augment onsite equipment and plans. The use of offsite equipment for SSES Units 1 and 2 is documented in Reference 10.

Portable equipment is also available from offsite. The industry has established two (2) National SAFER Response Centers (NSRCs) to support utilities during beyond design basis events. Susquehanna Nuclear, LLC has established contracts with the Pooled Equipment Inventory Company (PEICo) to participate in the process for support of the NSRCs as required. Each NSRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. In the event of a BDB seismic event, equipment can be moved from an NSRC to a local assembly area established by the Strategic Alliance for FLEX Emergency Response (SAFER) team. From there, equipment can be taken to the site and staged at the SAFER onsite Staging Area by helicopter, if ground transportation is unavailable. Communications will be established between the site and the SAFER team (via satellite phones if required) and required equipment moved to the site as needed. First arriving equipment will be delivered to the site within 24 hours from the initial request. The order in which equipment is delivered is identified in the Susquehanna Steam Electric Station SAFER Response Plan and no modifications to the sequence are necessary following a seismic event.

Summary of Modifications

No modifications or procedure changes were identified as a result of this MSA.