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U.S. Nuclear Regulatory Commission
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10 CFR 50.54(f)

SUSQUEHANNA STEAM ELECTRIC STATION
FLOODING MITIGATING STRATEGIES ASSESSMENT (MSA) REPORT
PLA-7559

Docket Nos. 50-387 and 50-388

References:

1. *NRC Letter, "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.*
2. *PPL Letter (PLA-7287), "Susquehanna Steam Electric Station Flood Hazards Reevaluation Report," dated March 3, 2015.*
3. *Talen Letter (PLA-7389), "Susquehanna Steam Electric Station Flood Hazards Reevaluation Report Information to Support Audit," dated September 24, 2015.*
4. *NRC Staff Requirements Memoranda to COMSECY-14-0037, "Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards," dated March 30, 2015.*
5. *Nuclear Energy Institute (NEI), Report NEI 12-06 [Rev 2], "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated December 2015.*
6. *U.S. Nuclear Regulatory Commission, JLD-ISG-2012-01, Revision 1, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events," dated January 22, 2016.*
7. *NRC Letter, "Susquehanna Steam Electric Station – Units 1 and 2- Correction to Interim Staff Response to Reevaluated Flood Hazards Submitted in Response to 10 CFR 50.54(f) Information Request – Flood- Causing Mechanism Reevaluation (TAC NO. MF6037 and MF6038)," dated November 12, 2015 (ML15314A747).*
8. *NRC Letter, "Supplemental Information Related to Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) regarding Flooding Hazard Reevaluations for Recommendation 2.1 of the Near Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 1, 2013 (ML13044A561).*

On March 12, 2012, the NRC issued Reference 1 to request information associated with Near- Term Task Force (NTTF) Recommendation 2.1 for Flooding. One of the Required Responses in Reference 1 directed licensees to submit a Flood Hazard

Reevaluation Report (FHRR). For Susquehanna Steam Electric Station, the FHRR was submitted on March 3, 2015 (Reference 2). The reevaluated flood hazard was augmented in response to the NRC Audit of Reference 2 in Reference 3. Per Reference 8, the NRC considers the reevaluated flood hazard to be "beyond the current design/licensing basis of operating plants."

Concurrent to the flood hazard reevaluation, Susquehanna Steam Electric Station developed and implemented mitigating strategies in accordance with NRC Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." In Reference 6, the Commission affirmed that licensees need to address the reevaluated flooding hazards within their mitigating strategies for BDB external events, including the reevaluated flood hazards. Guidance for performing mitigating strategies assessments (MSAs) for flooding considerations is contained in Appendix G of Reference 5, endorsed by the NRC (with conditions) in Reference 6. For the purpose of the MSAs, the NRC has termed the reevaluated flood hazard, summarized in Reference 7, as the "Mitigating Strategies Flood Hazard Information" (MSFHI). Reference 5, Appendix G, describes the MSA for flooding as containing the following elements:

- Section G.2 – Characterization of the MSFHI
- Section G.3 – Comparison of the MSFHI and FLEX DB Flood
- Section G.4.1 – Assessment of Current FLEX Strategies (if necessary)
- Section G.4.2 – Assessment for Modifying FLEX Strategies (if necessary)
- Section G.4.3 – Assessment of Alternative Mitigating Strategies (if necessary)
- Section G.4.4 – Assessment of Targeted Hazard Mitigating Strategies (if necessary).

The following provides the MSA results for the Susquehanna Steam Electric Station.

Reference 6, Section G.2 – Characterization of the MSFHI

Characterization of the Mitigating Strategies Flood Hazard Information (MSFHI) is summarized in Table 1 of Reference 7, the NRC's interim response to the flood hazard reevaluation submittal (Reference 2) and information submitted in Reference 3. A more detailed description of the MSFHI, along with the basis for inputs, assumptions, methodologies, and models, is provided in the following references:

- Local Intense Precipitation (LIP): See Section 3.3.1 of Reference 2, Enclosure.
- Flooding in Streams and Rivers: See Section 3.3.2 of Reference 2, Enclosure.
- Dam Breaches and Failures: See Section 3.3.3 of Reference 2, Enclosure.
- Storm Surge: See Section 3.3.4 of Reference 2, Enclosure.
- Seiche: See Section 3.3.4 of Reference 2, Enclosure.
- Tsunami: See Section 3.3.4 of Reference 2, Enclosure.

- Ice-Induced Flooding: See Section 3.3.5 of Reference 2, Enclosure.
- Channel Migration or Diversion: See Section 3.3.6 of Reference 2, Enclosure.
- Combined Effects (including wind-waves and run-up effects): See Section 3.3.7 of Reference 2, Enclosure.
- Cooling tower basin rupture: See Section 3.3.8 of Reference 2, Enclosure

At Susquehanna Steam Electric Station, the potentially impacting flood-causing mechanisms include the cooling tower basin rupture and LIP (including co-incident wind wave activity). All other potential flooding mechanisms are screened out as credible sources of flooding. The sources of flooding that screened out include river flooding, dam breaches and failures, storm surge, seiche, tsunami, channel migration or diversion, ice-induced flooding, and combined effects flooding.

In Reference 7, the NRC concluded that the "reevaluated flood hazards information [i.e. MSFHI], as summarized in the Enclosure [Summary Table of the Reevaluated Flood Hazard Levels], is suitable for the assessment of mitigating strategies developed in response to Order EA-12-049" for Susquehanna Steam Electric Station.

Reference 6, Section G.3 – Basis for Mitigating Strategies Assessment (FLEX Design Basis (Comparison)

For Susquehanna Steam Electric Station, the FLEX design basis (FLEX DB) flood, described in Reference 7, is equivalent to the plant's current design basis (CDB) flood. A complete comparison of the CDB and reevaluated flood hazards is provided in Section 4 of Reference 2, Enclosure 1. As described in References 2 and 3 and summarized below, the CDB and, by relationship, FLEX DB floods bound the reevaluated flood (i.e. MSFHI) for all applicable flood-causing mechanisms. Flood duration is not a significant factor for SSES potentially impacting events (i.e. LIP and cooling tower basin rupture). The reevaluated LIP analysis determined that the maximum localized ponding depths adjacent to safety-related SSCs vary between 1.61 ft at the Unit 1 and Unit 2 Reactor Buildings, and 0.31 ft at the south side of the Engineered Safeguards Service Water (ESSW) Pumphouse. These maximum depths occurred at two-thirds of the way through the one-hour event and did not result in internal flooding of any safety-related SSCs due to the presence of credited flood barriers with a minimum height of 2 ft. Other associated effects, such as hydrostatic and hydrodynamic forces are small due to shallow depths near safety- related SSCs, resulting in no detailed structural analysis of safety-related SSCs being required (Reference 2 enclosure).

Under various evaluated Cooling Tower Basin rupture scenarios, the maximum localized external flood depth at the south side of the ESSW Pumphouse was 1.45 ft. This is approximately 8.4 ft below the height of the credited flood barrier, resulting in no internal flooding of safety-related SSCs. The evaluated maximum hydrostatic and hydrodynamic forces on the ESSW Pumphouse, were 66 pounds/ft and 84 pounds/ft respectively (Reference 2 enclosure).

The NRC further affirms in Reference 7 that "the reevaluated flood hazard mechanisms at Susquehanna are bounded by the CDB" and "it is unnecessary for the licensee to perform an integrated assessment or focused evaluation."

Therefore, since the MSFHI is bounded by the FLEX DB (equivalent to the CDB), as affirmed by the NRC, Susquehanna Steam Electric Station considers the requirement to address the reevaluated flooding hazards within its BDB mitigating strategies as being satisfied with no further action required.

This letter contains no new regulatory commitments.

Should you have any questions regarding this submittal, please contact Mr. Jason Jennings, Manager – Nuclear Regulatory Affairs at (570) 542-3155.

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

Executed on: 12/19/2016

T. S. Rausch

cc: Director, Office of Nuclear Reactor Regulation
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