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10 CFR 50.54(f)

RS-16-180

September 30, 2016

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Byron Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and 50-455

Subject: Mitigating Strategies Flood Hazard Assessment (MSFHA) Submittal

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. Exelon Generation Company, LLC Letter to USNRC, Response to March 12, 2012 Request for Information Enclosure 2, Recommendation 2.1, Flooding, Required Response 2, Flooding Hazard Reevaluation Report, dated March 12, 2014 (RS-14-053)

3. Exelon Generation Company, LLC Letter to USNRC, Response to Request for Additional Information Regarding Fukushima Lessons Learned – Flood Hazard Reevaluation Report, dated July 14, 2014 (RS-14-194)

4. Exelon Generation Company, LLC Letter to USNRC, Response to Request for Additional Information Regarding Fukushima Lessons Learned – Flood Hazard Reevaluation Report, dated May 26, 2015 (RS-15-111)

5. 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

6. 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

7. NRC Letter, Coordination of Requests for Information Regarding Flooding Hazard Reevaluations and Mitigating Strategies for Beyond-Design-Basis External Events, dated September 1, 2015

8. Nuclear Energy Institute (NEI), Report NEI 12-06 [Rev 2], Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, dated December 2015

9. 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

10. NRC Letter, Byron Station, Units 1 and 2 – Interim Staff Response to Reevaluated Flood Hazards Submitted in Response to 10 CFR 50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (TAC NOS. MF3893 and MF3894), dated September 3, 2015

11. Byron Station, Units 1 and 2, Report of Full Compliance with 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 July 15, 2016 (RS-16-088)

12. NRC Letter, Byron Station, Units 1 and 2 – Staff Assessment of Response to 10 CFR 50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (CAC NOS. MF3893 and MF3894), dated August 16, 2016

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 Byron Station, Units 1 and 2, the FHRR was submitted on March 12, 2014 (Reference 2). Additional information was provided with References 3 and 4. Per Reference 5, the NRC considers the reevaluated flood hazard to be "beyond the current design/licensing basis of operating plants".

Concurrent to the flood hazard reevaluation, Byron Station developed and implemented mitigating strategies in accordance with NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events". In Reference 6, the NRC affirmed that licensees need to address the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis (BDB) external events, including the reevaluated flood hazards. This requirement was confirmed by the NRC in Reference 7. Guidance for performing mitigating strategies flood hazard assessments (MSFHAs) is contained in Appendix G of Reference 8, endorsed by the NRC in Reference 9. For the purpose of the MSFHAs and in Reference 7, the NRC termed the reevaluated flood hazard, summarized in References 10, as the "Mitigating Strategies Flood Hazard Information" (MSFHI). Reference 8, Appendix G, describes the MSFHA for flooding as containing the following elements:

- Section G.2 – Characterization of the MSFHI
- Section G.3 – Basis for Mitigating Strategy Assessment
- 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)

If a Section G.3 assessment shows that the FLEX design basis (DB) flood completely bounds the reevaluated flood (i.e. MSFHI), only documentation for Sections G.2 and G.3 are required; assessments and documentation for the remaining sections (G.4.1 through G.4.4) are not necessary.

The following provides the MSFHA results for Byron Station.

Reference 8, Section G.2 – Characterization of the MSFHI

Characterization of the Mitigating Strategies Flood Hazard Information (MSFHI) is summarized in Reference 10; the NRC's interim response to the flood hazard reevaluation submittal provided in Reference 2 and additional information submittals in References 3 and 4. A more detailed description of the reevaluated flood hazard (i.e., MSFHI), along with the basis for inputs, assumptions, methodologies, and models, is provided in the following references:

- Local Intense Precipitation (LIP): See Section 3.1 of Reference 2, Enclosure 1.
- Flooding in Streams and Rivers: See Section 3.2 of Reference 2, Enclosure 1.
- Dam Breaches and Failures: See Section 3.4 of Reference 2, Enclosure 1.
- Storm Surge: See Section 3.3 of Reference 2, Enclosure 1.
- Seiche: See Section 3.3 of Reference 2, Enclosure 1.
- Tsunami: See Section 3.3 of Reference 2, Enclosure 1.
- Ice-Induced Flooding: See Section 3.6 of Reference 2, Enclosure 1.
- Channel Migration or Diversion: See Section 3.7 of Reference 2, Enclosure 1.
- Combined Effects (including wind-waves and runup effects): See Section 3.5 of Reference 2, Enclosure 1.
- Other Associated Effects (i.e. hydrodynamic loading, including debris; effects caused by sediment deposition and erosion; concurrent site conditions; and groundwater ingress): See Sections 3.9 and 4 of Reference 2, Enclosure 1.
- Flood Event Duration Parameters (i.e. warning time, period of site preparation, period of inundation, and period of recession): See Sections 3.9 and 4 of Reference 2, Enclosure 1.

At Byron Station, the storm surge, seiche, tsunami, ice-induced flooding, channel migration or diversion, Rock River seismically-induced dam failure, and on-site impoundment failure flood-causing mechanisms were either determined to be implausible or completely bounded by other mechanisms. Some individual flood-causing mechanisms (i.e., flooding in streams and rivers and dam breaches and failures) are addressed in one or more of the combined-effect floods. Only Local Intense Precipitation (LIP) and the NUREG/CR-7046, Appendix H, H.1 combined-effect flood (floods caused by precipitation events, including hydrologic dam failure) for the Rock River were determined to be applicable flood-causing mechanisms at Byron Station.

In Reference 10, the NRC concluded that Byron Station's "reevaluated flood hazards information, as summarized in the Enclosure [to Reference 10], is suitable for the assessment of mitigating strategies developed in response to Order EA-12-049" for Byron Station. Reference 10, including its enclosure entitled "Summary Tables of Reevaluated Flood Hazard Levels", reference Byron Station's flood hazard reevaluation submittal (Reference 2).

Reference 9, Section G.3 – Basis for Mitigating Strategies Assessment

For Byron Station, the FLEX DB flood, described in Reference 11, 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 Reference 2, the CDB and, by relationship, FLEX DB floods bound the reevaluated flood (i.e. MSFHI) for all applicable flood-causing mechanisms, including combined-effect floods, associated effects, and flood event duration parameters.

The NRC further affirms in Reference 10 that all reevaluated flood hazard mechanisms are bounded by the CDB and it is unnecessary for Byron Station to perform an integrated assessment or focused evaluation. This is further affirmed by the NRC in Reference 12.

Therefore, since the MSFHI is bounded by the FLEX DB (equivalent to the CDB), as affirmed by the NRC, Byron Station has determined that the current FLEX design remains valid for all flood-causing mechanisms, including aspects related to the storage and deployment of FLEX equipment, validation of FLEX actions, and viability of FLEX connection points. Therefore, further assessment of the impact on FLEX for the MSFHI is not required.

As previously discussed, subsequent to the flood hazard reevaluation being submitted in Reference 2, the FLO-2D model used to develop the LIP flood-causing mechanism was found to incorrectly simulate rain-on-buildings. The issue was entered into the plant's corrective action program (Issue Report (IR) No. 2400815) and the model was revised to conservatively assume building runoff is conveyed directly to adjacent grade, ignoring storage on the roofs.

The revised maximum LIP water surface elevation in the Immediate Station Area (i.e. the western wall of the main power block structure) is 870.7 feet (National Geodetic Vertical Datum of 1929 (NGVD 1929)). This is approximately 0.1 foot below the current maximum water surface elevation at the west wall listed in the Updated Final Safety Analysis Report (UFSAR) (870.82 feet (United States Geological Survey of 1929 (USGS 1929)) and below the top of reinforced concrete/steel barriers which protect safety-related structures, systems, and components (SSCs).

The revised maximum LIP water surface elevation on the east side and southeast side of the Turbine Building is 870.94 feet (NGVD 1929) at both locations, which is 0.04 feet above the current local flooding peak elevation listed in the UFSAR (870.9 feet (NGVD 1929)). The CDB LIP water level of 870.9 feet and the reevaluated flood level are above the Turbine Building ground floor level, so water would enter the turbine building and main steam tunnel through louvers and door gaps. The reevaluated LIP flood also shows a longer period of inundation and ingress into the Turbine Building than in the CDB. However, Byron Station completed an evaluation (Engineering Change (EC) 403370) which concluded that ingress from the revised LIP flood, with higher flood levels and period of inundation, is bounded by an internal flood. UFSAR Section 10.4.5 describes an internal flood mechanism (a circulating water (CW) pipe expansion joint failure) that would put significant water into the Turbine Building basement and into the main steam tunnel. The UFSAR describes potential effects to the main steam (MS) pipes and the Main Steam Isolation Valves (MSIVs) but the plant would be able to shutdown safely. The CW pipe expansion joint failure flood level bounds the ingress volume from a LIP

flooding event. Furthermore, the revised LIP flood will not affect the FLEX strategy. The MS tunnel contains FLEX connections to the Feedwater (FW) system but parallel connections are available above elevation 870.94 feet (NGVD 1929) and therefore are not impacted by the reevaluated LIP flood.

Note that elevations for structures at Byron Station are listed in the UFSAR as being referenced to the USGS 1929 datum. No such official vertical elevation datum exists. However, the NGVD 1929 is often used to establish elevations which are marked on or listed for benchmarks established by the USGS. As discussed in Byron Station Fukushima LIP calculation (BYR13-FUK-06), it is generally understood that USGS 1929 and NGVD 1929 are one in the same datum.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact Ron Gaston at (630) 657-3359.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 30th day of September 2016.

Respectfully submitted,

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