Exelon Generation.

RS-16-182

10 CFR 50.54(f)

October 28, 2016

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

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: 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-14-055)

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 5, 2015 (RS-15-110).

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, LaSalle County 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. MF3655 and MF3656), dated September 3, 2015

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 LaSalle County 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, LaSalle County Station, Units 1 and 2 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. 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. In Reference 10, the NRC concluded that the "reevaluated flood hazards information, 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 LaSalle County Station, Units 1 and 2.

The enclosure to this letter provides the Mitigating Strategies Assessments for Flooding for the LaSalle County Station, Units 1 and 2. This assessment indicated that the FLEX design basis did not bound the reevaluated flood hazard (i.e., Mitigating Strategies Flood Hazard Information (MSFHI)) for the local intense precipitation (LIP) flood and the Cooling Lake Probable Maximum Storm Surge (PMSS) flooding, but the FLEX strategy was not impacted and can be successfully implemented as designed. As a result, no changes to the FLEX strategies or additional flood mitigation modifications are required.

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 28th day of October 2016.

Respectfully submitted,

Glen T. Kaegi
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure: LaSalle County Station, Units 1 and 2, Mitigating Strategies Assessments for Flooding, dated October 28, 2016

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region III
NRC Senior Resident Inspector – LaSalle County Station
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Enclosure

LaSalle County Station, Units 1 and 2

Mitigating Strategies Assessments for Flooding

dated October 28, 2016

(22 Pages)

Mitigating Strategies Assessments for Flooding

LaSalle County Nuclear Generating Station

Exelon

October 28, 2016

Contents

1 Executive Summary

This Mitigating Strategies Assessment (MSA) evaluates the impact of the reevaluated flood hazard on FLEX strategy implementation. The LaSalle County Nuclear Generating Station (LSCS) FLEX design basis (DB) flood was set to be equivalent to the DB Local Intense Precipitation (LIP) event (localized Probable maximum precipitation event) and the DB Probable Maximum Storm Surge (PMSS) flooding in the Cooling Lake. The Mitigating Strategies Flood Hazard Information (MSFHI), submitted with the Flood Hazard Reevaluation Report (FHRR), showed that the DB and, by relationship, the FLEX DB, does not bound the MSFHI for both mechanisms. This is affirmed in the NRC's interim response letter to the FHRR submittal (dated September 3, 2015). Therefore, a Mitigating Strategies Assessment (MSA) for both mechanisms are required.

The LIP event results in potential water ingress through the reactor building D19/D20/D391 doors at ground level and causes less than 5 inches of flooding in the reactor basement (Unit 1 Northeast Corner Room, elevation 673 feet Mean Seal Level (MSL) datum), without impacting installed plant safety or FLEX equipment. The primary impact of the reevaluated (MSFHI) PMSS is higher wind-wave runup levels and hydrodynamic loads at the Lake Screen House and Inlet Structure, which are not credited as available in the FLEX strategy. Nevertheless, a plant evaluation showed that these structures can withstand the higher levels and loads.

Although the MSFHI for LIP and Cooling Lake PMSS are not bounded by the plant's DB and FLEX DB, the MSA showed that all aspects of the FLEX strategy, as designed, can be successfully implemented for LSCS's reevaluated flood hazard (i.e. MSFHI). As a result, no changes to the FLEX strategies or additional flood mitigation modifications are required.

2 List of Acronyms

- AMS – Alternate Mitigation Strategy
- BDBEE – Beyond Design Basis External Event
- CLB – Current Licensing Basis
- DB – Design Basis
- ELAP – Extended Loss of A/C Power
- EOP – Emergency Operating Procedure
- FHRR – Flood Hazard Reevaluation Report
- FLEX – Strategy response to an ELAP and LUHS, postulated from a BDBEE
- FLEX DB – FLEX Design Basis (flood hazard)
- FSG – FLEX Support Guideline
- IR – Issue Report
- LSCS – LaSalle County Nuclear Generating Station
- LIP – Local Intense Precipitation
- LUHS – Loss of Ultimate Heat Sink
- MSA – Mitigating Strategies Assessment
- MSFHA – Mitigating Strategy Flood Hazard Assessment
- MSFHI – Mitigating Strategy Flood Hazard Information
- MSL – Mean Sea Level
- NRC – Nuclear Regulatory Commission
- NTTF – Near-Term Task Force
- PA – Protected Area
- PMF – Probable Maximum Flood
- PMP – Probable Maximum Precipitation

- PMSS – Probable Maximum Storm Surge
- RB – Reactor Building
- RCIC – Reactor Core Isolation Cooling
- RHR – Residual Heat Removal
- RPV – Reactor Pressure Vessel
- SE – Special Event
- SFP – Spent Fuel Pool
- SRV – Safety Relief Valve
- TB – Turbine Building
- THMS – Targeted Hazard Mitigating Strategy
- TPDU – Temporary Power Distribution Unit
- TRIPs – Transient Response Implementation Procedures
- TSA – Time Sensitive Action
- UFSAR – Updated Final Safety Analysis Report
- WSE – Water Surface Elevation

3 Background

3.1 Purpose

This MSA evaluates the ability to implement FLEX for the reevaluated flood hazard as defined by the MSFHI. It is performed in accordance with NEI 12-06 Appendix G and contains the following elements:

- Section G.2 – Characterization of the MSFHI
- Section G.3 – Basis for Mitigating Strategy Assessment (MSFHI-FLEX DB Comparison)
- Section G.4.1 – Assessment of current FLEX Strategy (if necessary)
- Section G.4.2 – Assessment for modifying FLEX Strategy (if necessary)
- Section G.4.3 – Assessment of AMS (if necessary)
- Section G.4.4 – Assessment of THMS (if necessary)

On March 12, 2012, the NRC issued Reference 1 to request information associated with NTTF Recommendation 2.1 for Flooding. One of the required responses in Reference 1 directed licensees to submit a FHRR. The LSCS 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 design/licensing basis of operating plants".

Concurrent to the flood hazard reevaluation, LSCS 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". Those strategies are described in the LaSalle County Station Implementation of Diverse and Flexible Coping Strategies (FLEX) and Spent Fuel Pool Instrumentation Program (Reference 11). In Reference 6, the Commission affirmed that licensees need to address the reevaluated flooding hazards within their mitigating strategies for BDBEE's. Guidance for performing MSFHAs is contained in Appendix G of Reference 8, endorsed by the NRC in Reference 9.

If a Section G.3 assessment shows that the FLEX 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.

3.2 Site Description

The LaSalle County Station is located in the southeastern part of LaSalle County, 6 miles southeast of Marseilles, Illinois. The LSCS site contains two side-by-side operating BWR's (Units 1 and 2) that are essentially independent, although certain components are shared, such as the common control room, common radwaste facility, the station vent stack, etc.

The LSCS site occupies approximately 3060 acres, of which 2058 acres comprise the Cooling Lake. At normal pool, the cooling lake has a water surface elevation of 700 feet MSL. The plant grade and floor elevations are 710 feet and 710.5 feet MSL, respectively. The terrain around the plant site is gently rolling, with ground surface elevations varying from 700 feet to 724 feet MSL, which is 217 feet above the normal pool elevation in the Illinois River. The Illinois River is approximately 5 miles north of the site.

3.3 Overview of FLEX Strategy

The LSCS FLEX strategy, which was developed using Rev 0 of Reference 8, consists of storage of FLEX equipment in a dedicated building that provides protection for all hazards. In the event of an ELAP and LUHS, this equipment is transported via a predefined deployment path that has been evaluated to remain viable for all applicable hazards. Equipment is available to clear the deployment path of any debris that may result from the event. Following relocation to the pre-established deployment location electrical cables and hoses are connected to the FLEX equipment. These cables and hoses are deployed in parallel with equipment transport and are connected to plant systems via standard plug in or hose couplings. Procedures have been developed and the staffing necessary for implementation have been verified.

The onsite FLEX storage areas consist of two (2) protected buildings, one (1) commercial building and various smaller storage areas throughout protected areas in the existing plant structure (Reactor Building, Aux Building, etc.). Building #22 is a 60X90 protected structure located on the NE corner of the ISFSI Pad area. Building #23 is a 30X40 protected structure located outside of the fence east of the ISFSI Building on the north shore of the intake canal to the Lake Screen House. This structure has a concrete road down to a concrete pad on the edge of the Ultimate Heat Sink (intake canal to the Lake Screen House).

Outside the PA, equipment arriving from offsite will be processed through the Onsite Staging Area (Staging Area 'B') that will be located on the south side of the large plant parking lot. This equipment can then be moved inside of the PA along existing paved roadways. There are no actions required outside the PA within the first hour of the ELAP, which is assumed to start at peak LIP level. Inside the protected area, FLEX deployment paths utilize existing paved roadways from the FLEX protected buildings to the east side of Reactor Building.

FLEX external cable and hose connection points are through penetrations to the DG Aisle adjacent to the Reactor Building. Hardened hose stations and hydrants are located near the FLEX storage buildings and ISFSI pad. FLEX pumps can be placed directly into the lake or in the 'open area inlet' beside the pad located in front of Building 23 in the event of lake flooding.

There are no outside actions required for the FLEX strategy within the first hour of the ELAP, which is assumed to start at peak LIP level, and since the water recedes within an hour of the start of the LIP, outside FLEX actions are not impacted. All initial internal actions do not require deployment of FLEX equipment and are therefore not affected by the duration of the LIP event. The storm surge does not affect the Reactor Building or the FLEX storage Buildings as these buildings are located above the maximum water elevation in the lake.

The LSCS FLEX response strategies to maintain key safety functions (Core Cooling, Containment, and Spent Fuel Pool Cooling) are summarized below. This summary is derived from Reference 11 implemented to satisfy the capabilities required by NRC Order EA-12-049.

FLEX Phase 1, This strategy relies on installed plant equipment.

1. Reactor Core Cooling

    a. RCIC will be operated with suction from the Suppression Pool. Reactor vessel water inventory is maintained by RCIC.

    - RCIC operation will continue for as long as possible to utilize the cleaner suppression pool water source (vice raw lake water)
    - Reactor pressure will be lowered to the 150-250 psig band (either due to reaching a blowdown limit or as a result of the normal cooldown) to provide for continued RCIC operation

    b. RPV pressure will be controlled with ADS SRV's to initiate a 20^{O}F/hr cooldown rate.

    Additional nitrogen supply (bottles) will be provided prior to ~5 hours to extend ADS SRV operation. An air compressor will be connected prior to exhaustion of the nitrogen bottles to ensure continued operation of the ADS SRV's.

    c. Venting of primary containment will be initiated to remove energy from the suppression pool to help maintain suppression pool water temperatures for longer-term RCIC use. [NOTE: The severe accident capable vent (SACV) required by NRC Order EA-13-109 will not be installed on the first unit until 2017. NRC approval to delay the FLEX early containment venting strategy until 2017 and 2018 for Units 2 and 1, respectively, has been received (Reference 27).

    - DC load shedding will be performed to extend 125VDC (Division 1, Division 2) and 250VDC battery capability

2. Containment Integrity

    a. Containment integrity is maintained by the normal design features of the containment.

    b. Containment pressure limits are not expected to be reached during the event (based on opening the severe accident containment vent in Phase 2).

3. Spent Fuel Pool Cooling

    No actions required for Phase 1.

FLEX Phase 2, This strategy relies on installed plant equipment and portable equipment. FLEX equipment can be deployed in a timely manner to meet the planned deployment times (i.e. flowing water to the plant in six (6) hours and providing 480VAC power to the plant no later than eight (8) hours) (Ref. 26).

1. Reactor Core Cooling

    a. For the core cooling function, Phase 2 will be entered when the transition from RCIC to the portable FLEX pump occurs.

The portable FLEX pump will take suction on the ultimate heat sink and provide water to the fuel pool emergency makeup (FC EMU) and residual heat removal (RHR) systems. The 'B' trains will be utilized for the Primary connection strategy and the 'A' trains will be utilized for the Alternate connection strategy. The Low Pressure Coolant Injection (LPCI) path is preferred.

b. 125VDC and 250VDC battery chargers will be reenergized from the portable diesel generator as required.

c. Containment venting via Hardened Vent System (to be installed later) will be initiated to maintain acceptable Suppression Pool water temperature for RCIC operation

d. Water will be injected to the Suppression Pool from the portable FLEX pump for makeup after containment venting is initiated to maintain level for RCIC NPSH.

2. Containment Integrity

   a. Venting of the Containment will be via the to-be-installed Severe Accident Capable Vent (SACV) System.

   b. FLEX pumps will provide makeup water to the Suppression Pool.

3. Spent Fuel Pool Cooling

   Provide makeup to the Spent Fuel Pool via the portable FLEX pump and the FC Emergency Makeup Piping.

FLEX Phase 3, For the above Reactor Core Cooling, Containment Integrity, and Spent Fuel Pool Cooling, Phase 3 will utilize Phase 2 connections and Phase 2 onsite FLEX equipment. The NSRC equipment will be utilized as spares.

4 Characterization of MSFHI (NEI 12-06, Rev 2, Section G.2)

NRC has completed the "Interim Staff Response to Reevaluated Flood Hazards" (Reference 10) related to LSCS's Flood Hazard Reevaluation Report (Reference 2). In Reference 10, the NRC states that the "staff has concluded that the licensee's reevaluated flood hazards information is suitable for the assessment of mitigation strategies developed in response to Order EA-12-049 (i.e., defines the mitigating strategies flood hazard information described in guidance documents currently being finalized by the industry and NRC staff [NEI 12-06, Reference 8]) for LaSalle". NEI 12-06 (Reference 8) was subsequently finalized. Tables 1 and 2 of the enclosure to Reference 10 includes a summary of the plant's DB and non-bounding reevaluated flood hazard parameters, respectively. In Table 1 of the enclosure to Reference 10, the NRC lists the following flood-causing mechanisms for the current design basis flood:

- Local Intense Precipitation;
- Streams and Rivers;
- Failure of Dams and Onsite Water Control/Storage Structures;
- Storm Surge;
- Seiche;
- Tsunami;
- Ice Induced Flooding; and
- Channel Migrations/Diversions.

In Table 2 of the enclosure to Reference 10, the NRC lists flood hazard information (specifically stillwater and wind-wave runup elevations) for the following flood-causing mechanisms that are not bounded by the CLB hazard:

- Local Intense Precipitation; and
- Storm Surge.

It should be noted that the "storm surge" flood-causing mechanism for LSCS's Cooling Lake represents the NUREG/CR-7046 (Reference 12), Section H.4.2, Combined-Effects Flood (Floods along Shores of Enclosed Bodies of Water (Streamside Location)). The reevaluation in Reference 2 also developed the PMF mechanism for LSCS's Cooling Lake, which represents the NUREG/CR-7046 (Reference 12), Section H.1, Combined-Effects Flood (Floods Caused by Precipitation Events). The Cooling Lake PMF is addressed further, even though it is not included in Table 2 of the enclosure to Reference 10, because the stillwater elevation was not bounded by the plant's DB stillwater elevation in the Cooling Lake.

As previously discussed with NRC Staff, subsequent to the flood hazard reevaluation being submitted in Reference 2, the model used to develop the LIP flood-causing mechanism was found to incorrectly model roof runoff. The issue was entered into the plant's corrective action program (Issue Report (IR) 02400974) and the model was corrected to conservatively assume building runoff is conveyed directly to adjacent grade, ignoring storage on the roofs (References 18 and 20). The corrections resulted in maximum LIP flood elevations next to the main building in the power block area to generally range from 710.61 feet MSL at the east side of the reactor building to 710.95 feet MSL at the south side of the trackway building, which is higher than the corresponding CLB LIP flood elevation. The increases also resulted in higher maximum LIP flood water surface elevations and longer flood durations above the CLB LIP elevations as well as increased hydrodynamic and hydrostatic loads. An evaluation conducted in EC 399280 concluded that flood water ingress due to higher LIP levels and potential LIP floodwater ingress on the plant from the corrected LIP model would have no adverse impact on the plant's safety functions. The revised LIP information in Reference 18 was used for this assessment. Table 1 and Figures 1 through 3 provide additional details on the non-bounding LIP and Cooling Lake PMF and PMSS flood mechanisms for LSCS.

During the site's TI-190 flooding inspection (Reference 16), two additional issues were identified in the FHRR by IRs 02406288 and 02406306. These were 1) FHRR Section 3.4.1.8 2-year wind speed should correctly reference Section 3.4.2.7 as the source for 2-year wind speed (Reference 19) and 2) FHRR Tables 4.0.3 and 4.0.4, Flood Scenario Parameter 2, should have included the UFSAR identified DB WSE at three locations, those being 707.2 feet MSL at the dike, 705.6 feet MSL at the site, and 706.11 feet MSL at the Lake Screen House (Reference 17).

Table 1 – Summary of Reevaluated (MSFHI) Flood Hazard Parameters

Flood-Causing Mechanism	Stillwater Elevation (feet MSL)	Wind-Wave Runup Height (feet)	Maximum Flood Elevation (feet MSL)
Local Intense Precipitation[1]	711.0	Minimal	711.0
Cooling Lake PMF[2]			
• Lake Screen House	705.7	1.6	707.3
• Inlet Structure	705.7	2.9	708.6
Cooling Lake PMSS[3]			
• Lake Screen House	701.0	9.6	710.6
• Inlet Structure	701.0	11.0	712.0

[1] See Reference 18 for stillwater; Enclosure 2 to Reference 22 for hydrodynamic loads and flood event duration parameters; and Enclosure 1 to Reference 2 for other associated effects. See also Figure 1 for the LIP flood depths in the power block area.

[2] See Enclosure 1 to Reference 2 for stillwater, wind-wave runup, associated effects, and flood event duration parameters. Additional information for wind-wave runup height is provided in Table 7.5.2 of Calculation L-003861 (Beyond Design Basis External Flooding Combined Events Analysis (Fukushima).

[3] See Enclosure 1 to Reference 2 for stillwater, wind-wave runup, associated effects, and flood event duration parameters. Additional information for debris loads is provided in Enclosure 2 to Reference 22.

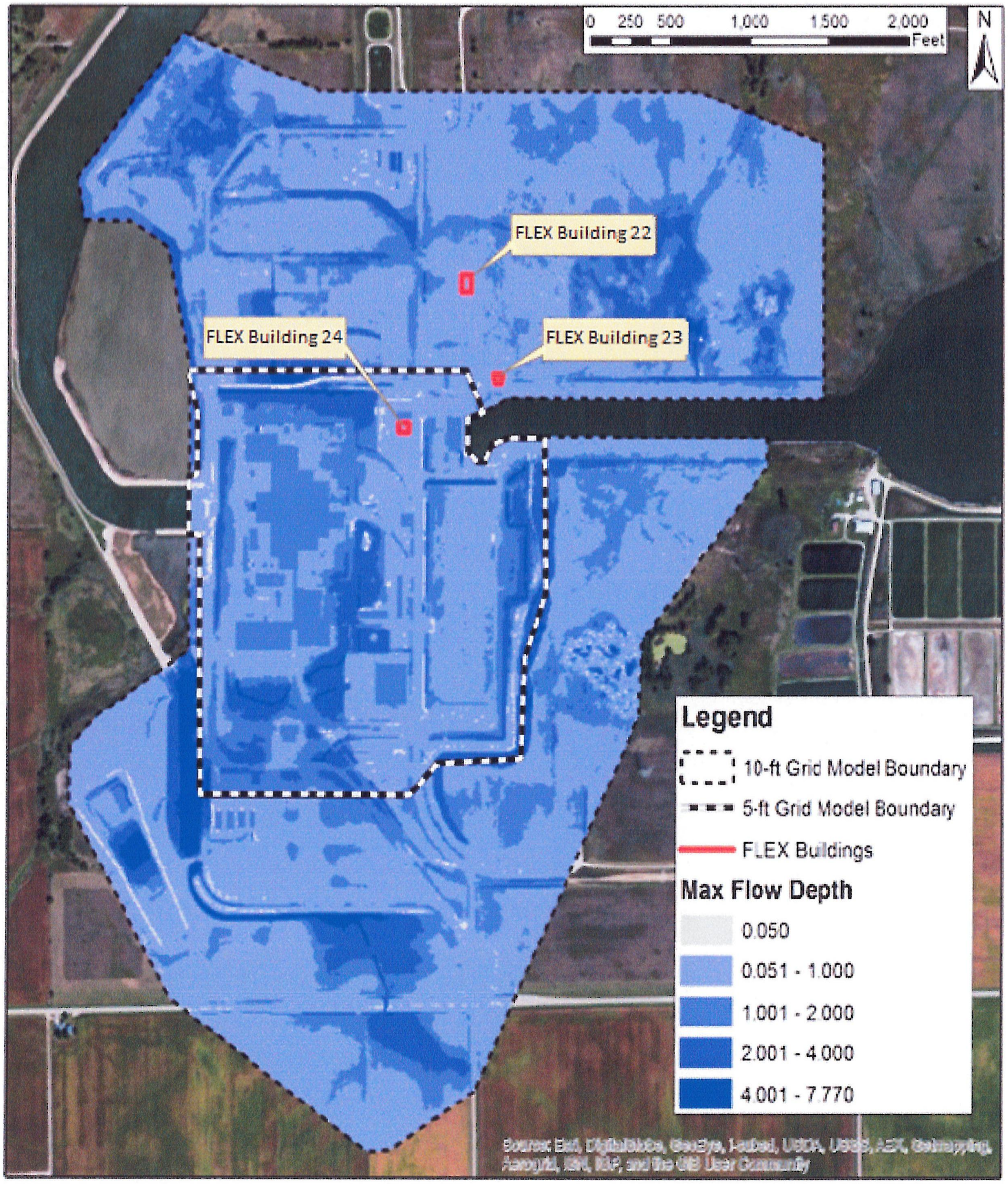
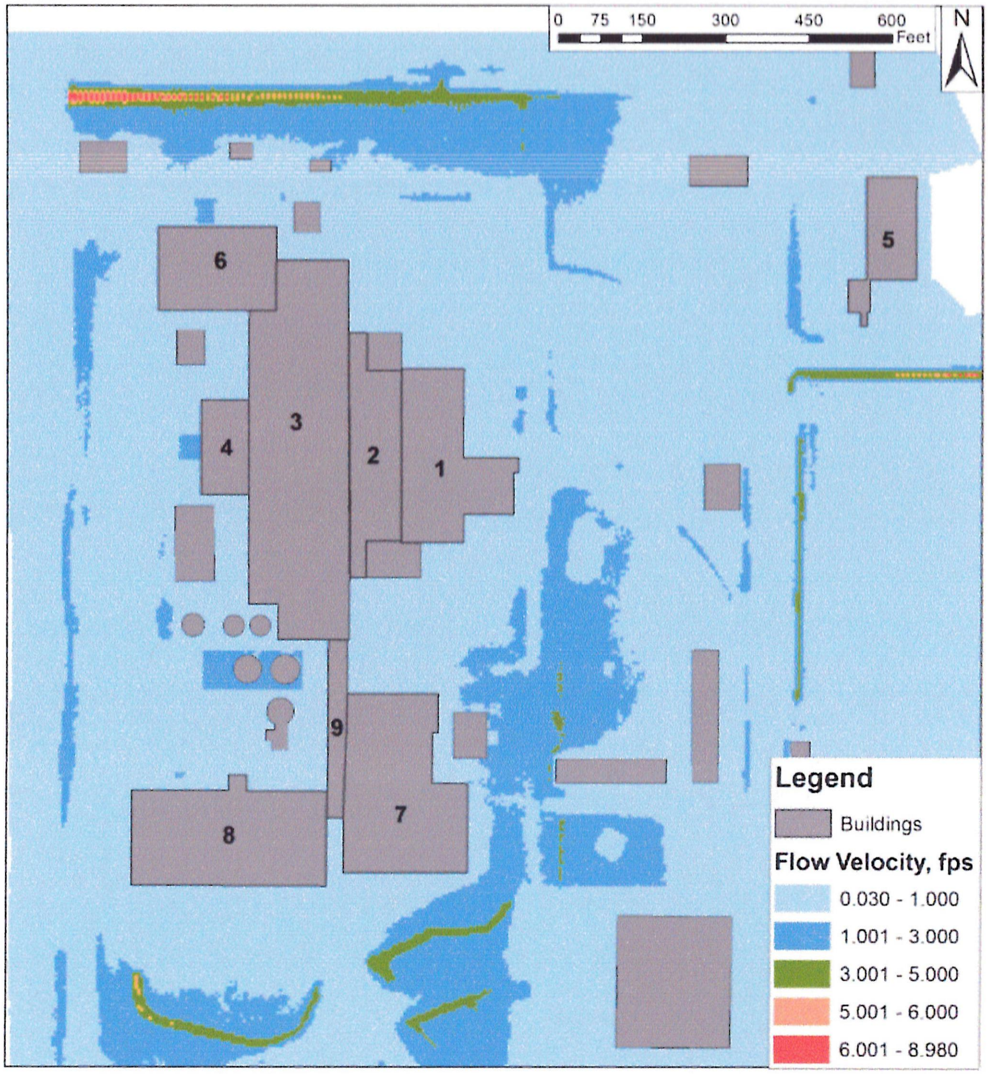


Figure 1 – Reevaluated LIP Maximum Water Depths around Power Block



ID	Building
1	Reactor Building
2	Auxiliary Building
3	Turbine Building
4	Radwaste Building
5	Lake Screen House
6	Old Service Bldg and Maintenance Shop
7	New Service Bldg and Maintenance Shop
8	New Stores Warehouse
9	New Service Bldg Trackway

Figure 2 – Reevaluated LIP Maximum Water Velocities around Power Block

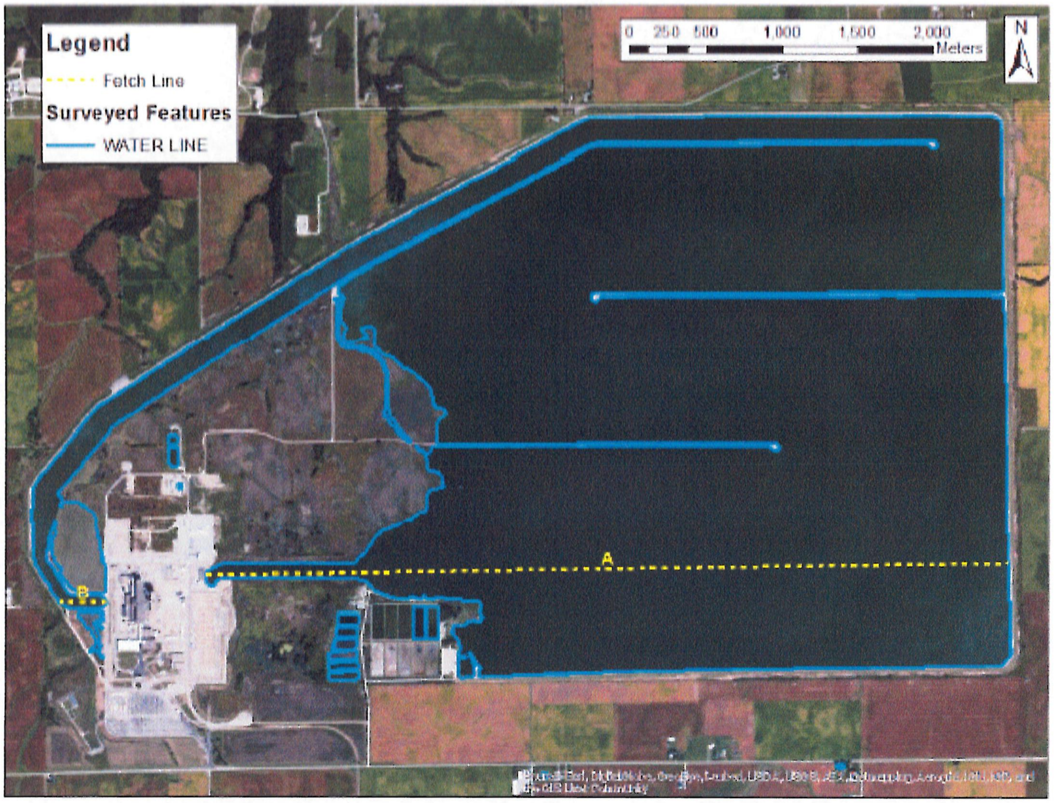


Figure 3 – LaSalle Cooling Lake Normal Pool Water Line (approximately the same as the stillwater PMF and PMSS flood boundary)

5 Basis for Mitigating Strategy Assessment (NEI 12-06, Rev 2, Section G.3)

The plant's DB was incorporated as the design input for all FLEX-related modifications, described in Reference 13, for LIP and the Cooling Lake PMSS, which did not bound the MSFHI. A complete comparison of the plant's DB and reevaluated flood hazards, including associated effect and flood duration parameters, are provided in Tables 4.0.2 through 4.0.4 of Reference 2, Enclosure 1. As described in Reference 2 and affirmed by the NRC in Reference 10, the DB and, by relationship, FLEX DB floods do not completely bound the reevaluated flood (i.e. MSFHI) for LIP and Cooling Lake PMSS flooding. The Cooling Lake PMF stillwater elevation also did not bound the plant's DB stillwater elevation but is still 4.3 feet below plant grade and is, therefore, not assessed further. Therefore, further evaluation is required to address the reevaluated flooding hazards for LIP and Cooling Lake PMSS within its BDB mitigating strategies. Section 6 below addresses the impact of non-bounding flooding mechanisms on FLEX strategies.

6 Assessment of Current Flex Strategy (NEI 12-06, Rev 2, Section G.4.1)

LIP and PMSS are not bounded by the FLEX DB and were, therefore, evaluated below as part of the MSA for LaSalle Station. The current FLEX strategies, developed per Rev 0 of Reference 8 and as described in Reference 11, are acceptable without modification for the MSFHI.

6.1 Assessment Methodology and Process

This assessment reviews the effect of a LIP event, PMSS and concurrent ELAP/LUHS on the FLEX strategy. The assessment addresses the following key aspects of the FLEX strategy from NEI 12-06, Section G.4.1 (Reference 9):

- In the sequence of events for the FLEX strategies, if the reevaluated flood hazard does not cause the ELAP/LUHS, then the time when the ELAP/LUHS is assumed to occur should be specified and a basis provided (e.g., the ELAP/LUHS occurs at the peak of the flood).

  Effect from LIP: Initiation of an ELAP, assumed to occur approximately 60 minutes after the beginning of the 1 hour PMP rainfall, corresponding to the peak LIP level, will result in deployment of FLEX equipment. The local intense precipitation (LIP) is equal to the 1-hour PMP of total rainfall after which flood water depths decrease across the site. The LIP flood elevation is higher than the DB flood elevation, however initial activities will be conducted internal to the Reactor Building and therefore not be impacted by the LIP event.

  Effect from Storm Surge: The timing of an ELAP during the PMSS does not factor into the assessment because the FLEX equipment is stored above the maximum water elevation in the lake. Wind waves near the facilities are not expected to impede the operation of the FLEX equipment and therefore will not impede the FLEX equipment functionality, regardless when the ELAP occurs.

- The impacts of the MSFHI should be used in place of the FLEX DB flood to perform the screening and evaluation per Section 6 of NEI 12-06:
  - Protection of FLEX Equipment (Section 6.2.3.1 of NEI 12-06)
    - Confirm that the guidance for protection of FLEX equipment (NEI 12-06, Section 11.3) was followed. Confirm that FLEX equipment is not impacted by MSFHI.

      Effect from LIP: FLEX equipment has been stored and designed to the requirements of NEI 12-06. The protection of FLEX equipment will not be affected by an LIP event. The LIP stillwater elevations at the FLEX equipment storage locations are below the level at which FLEX equipment will have their functionality impeded.

      - *FLEX Building 22 floor elevation is 720.0 feet MSL. The FLEX Building is located on an existing grade of 718.5 feet MSL and subject to 1.0 foot of BDB LIP water depth and therefore not impacted by the LIP event.*
      - *FLEX Building 23 will not be inundated during the LIP event (Reference 24).*

- *FLEX Building 24 elevation is 716.5 feet MSL, compared to a maximum reevaluated LIP water surface elevation of 716.2 feet MSL, resulting in a margin of 0.3 foot.*
- *There is no FLEX equipment stored in the Unit 1 Northeast Corner Room (673 feet MSL elevation). RCIC ventilation equipment is stored on Unit 2 Reactor Building on the 710.5 feet elevation (column line E-20). However, this is a remote location from D19/D20/D391 doors in an area with no external doors or openings susceptible to the external LIP event. The potential water ingress at Reactor Building D19/D20/D391 doors was evaluated in EC 399280 and found to have limited depth at that location (less than 1 inch) during the LIP event. Therefore, this equipment would not be impacted by the LIP event.*

Effect from Storm Surge: Per Section 3.4.4 of Enclosure 1 to Reference 2, even though the maximum water elevation (including wind-wave runup) at the lake screen house (710.6 feet MSL) is above the plant grade elevation (710.0 feet MSL), the PMSS does not result in a flooding hazard for the site and FLEX Building 24 because the lake flood level is below the ground surface elevation around the lake screen house and intake flume (approximately 713.8 feet MSL). Therefore, the water at its maximum level is contained in the intake flume; with an available margin of 3.2 feet (713.8 feet MSL – 710.6 feet MSL). The maximum water elevation in the lake, including wave runup, at the west side of the plant is equal to 707.3 feet MSL. This elevation is below the plant grade elevation of 710.0 feet MSL and plant floor elevation of 710.5 feet. The available margin between the maximum water level and plant floor elevation is equal to 3.2 feet (710.5 feet MSL – 707.3 feet MSL = 3.2 feet).

The protection of FLEX equipment will not be affected by wind waves at the storage building locations since wind generated wave heights are well below the FLEX equipment as not to impede their functionality. The Lake Screen House and CSCS inlet structure are not credited in the LaSalle FLEX strategy. Nevertheless, an evaluation showed that these structures can withstand the higher levels and loads due to the Cooling Lake PMSS.

FLEX Building 22 is 720.0 feet MSL, well above the nearby cooling lake wind-wave runup elevation of 710.6 foot MSL.

FLEX Building 23 elevation is 712.0 feet MSL. FLEX pumps can be placed in the 'open area inlet' beside the pad located in front of Building 23 in the event of lake flooding. The top of the inlet trough is 712.5 feet MSL. Wind generated wave heights at this location are 710.6 feet MSL. The margin for FLEX Building 23 is 1.4 foot above the wind-wave runup elevation.

Therefore, FLEX equipment storage locations are protected from the external flood hazards.

- If applicable, document that any flood protection features credited in the FLEX strategy meet the performance criteria (NEI 12-06, Section

G.5). How were the flood protection features evaluated? Confirm that the flood protection features are not impacted by MSFHI.

Effect from LIP: Flood protection features are not credited for FLEX.

Effect from Storm Surge: Flood protection features are not credited for FLEX. Wind generated waves will not affect FLEX because the waves are below the height of the FLEX equipment which are at elevation 712.0 feet MSL, 1.4 foot of margin above the wind-wave runup elevation at the storage locations. The Lake Screen House and CSCS inlet structure are not credited in the LaSalle FLEX strategy. Nevertheless, an evaluation showed that these structures can withstand the higher levels and loads due to the Cooling Lake PMSS.

- Deployment of FLEX Equipment (Section 6.2.3.2 of NEI 12-06)
  - Document that deployment of FLEX Equipment is not impacted by MSFHI – e.g., warning time, ability to move equipment and re-stock supplies, and availability of fuel.

    Effect from LIP: Figure 4 shows the FLEX Equipment deployment paths from the onsite FLEX buildings. Figure 1 shows the maximum water depths during the reevaluated LIP event. The ability to deploy the FLEX equipment is not impacted. There are no external actions dependent on the FLEX equipment during the duration of the LIP event. All initial internal actions do not require deployment of FLEX equipment and are therefore not affected by the duration of the LIP event.

    FLEX equipment deployed to the Unit 1 Northeast Corner Room, 673 feet MSL elevation is not impacted by potential water ingress through the reactor building D19/D20/D391 doors at ground level due to the LIP event. FLEX actions are to provide external air flow to lower RCIC Room from the adjacent access stairway beyond 11 hours of an ELAP, if required. This action is deployed well after the LIP event and potential ingress of water. Therefore, stairway access or the air flow path will not be impacted by MSFHI.

    Effect from Storm surge: Wind generated waves will not affect the deployment of the FLEX equipment since wave heights are at max 710.6 feet MSL and the adjacent FLEX Building 23 elevation is approximately 712.0 feet MSL, resulting in 1.4 feet of margin above the wind-wave runup elevation. If normal access to the UHS/cooling lake is not available due to flooding, FLEX deployment is available at FLEX Building 23 that is well above the cooling lake wind-wave runup elevation of 710.6 feet MSL.

  - Document that availability and access to all connection points is not impacted by the MSFHI.

    Effect from LIP: The local intense precipitation (LIP) is equal to the 1-hour PMP of total rainfall after which floodwater depths decrease across the site. The LIP flood elevation is higher than the DB flood elevation. However, initial activities will be conducted internal to the Reactor Building and therefore not be impacted by the LIP event. The stored FLEX equipment will not be affected by an LIP event as LIP stillwater elevations at the FLEX equipment storage locations are below *the level at which FLEX equipment will have their functionality impeded. The LIP stillwater elevations at the DG Aisle adjacent to the Reactor Building immediately begin to decrease after the LIP event. All initial internal actions do not require deployment of FLEX equipment and are therefore not affected by the duration of the LIP event. Access to FLEX equipment is not required during the LIP event as there are no external actions dependent on the FLEX equipment during the LIP event. However, it will not inhibit the implementation of the FLEX strategy. In the event of an ELAP and LUHS, this equipment is transported via a predefined deployment path that has been evaluated to remain viable for all applicable hazards. Equipment is available to clear the deployment path of any debris that may result from the event. Following relocation to the pre-established deployment location electrical cables and hoses are connected to the FLEX equipment. These cables and hoses are deployed in parallel with equipment transport and are connected to plant systems via standard plug in or hose couplings. The pump discharge connection point at FLEX Building 23 is the hardened hose hydrant. If this is flooded, an adequate amount of spare hose is available as an alternate route to underground piping. A hole is cut in the fence and the pump discharge hose is run to the dry cask storage road down to the RB.*

FLEX external cable and hose connection points are through penetrations to the DG Aisle adjacent to the Reactor Building and hardened hose stations and hydrants are located near the FLEX storage buildings and ISFSI pad. The maximum water depth and velocity are less than or equal to 1 foot and 1 feet per second, respectively, during the LIP event along deployment paths. These conditions were reviewed and deemed not to cause any significant delay in deployment of operators and reasonable assurance that the required tasks for FLEX strategies may be executed within the required time constraints. There are no outside actions required for the FLEX strategy within the first hour of the ELAP, which is assumed to start at peak LIP level, and since the water recedes within an hour of the start of the LIP, outside FLEX actions are not impacted.

Effect from Storm surge: The availability and access to all connection points is not impacted by the wind generated waves, including at the Reactor Building. If normal access to the UHS/cooling lake is not available due to flooding, alternate FLEX connection points are available near FLEX Building 23 that are well above the cooling lake wind-wave runup elevation of 710.6 feet MSL. FLEX pump suction can be lowered into a concrete lined pit outside the FLEX building, but the discharge from the pump to the hardened hose station is the same location for flood and non-flood events.

Therefore, the availability and access to all connection points is not impacted by the MSFHI.

- Document that deployment of temporary flood barriers is not impacted by MSFHI.

  Effect from LIP: FLEX does not credit the deployment of temporary flood barriers and is therefore not impacted by an LIP event.

Effect from Storm Surge: FLEX does not credit the deployment of temporary flood barriers and is therefore not impacted by wind generated waves.

Therefore, deployment of temporary flood barriers is not impacted by MSFHI.

- Procedural Interfaces (Section 6.2.3.3 of NEI 12-06)
  - Confirm that no procedural changes are required due to MSFHI.

    Effect from LIP: Procedural changes are not required to support FLEX deployment during the LIP event. FLEX deployment does not credit time sensitive actions to address the LIP event. Temporary flood barriers and extraction pumps are not credited to support FLEX deployment.

    Effect from Storm surge: Procedural changes are not required to support FLEX deployment due to effects from storm surge. The storm surge does not affect the Reactor Building or the FLEX storage Buildings. Procedures incorporate alternate actions if normal access to the UHS/cooling lake is not available due to flooding by MSFHI. Temporary flood barriers and extraction pumps are not credited to support FLEX deployment.

    Therefore, no procedural changes are required due to MSFHI.

- Utilization of Off-site Resources (Section 6.2.3.4 of NEI 12-06)
  - Confirm that site access routes are not impacted by MSFHI.

    Effect from LIP: The LIP event will not impede site access routes and the functionality of FLEX deployment.

    Effect from Storm surge: The storm surge event, including wind-generated waves, will not impede site access routes and the functionality of FLEX deployment. PMSS does not result in a flooding hazard for the site because the lake flood level is below the ground surface elevation around the screen lake house and intake flume (approximately 713.8 feet MSL).

    Therefore, site access routes are not impacted by MSFHI.

- The equipment storage guidance of Section 11.3 should be reassessed based on the impacts of the MSFHI.

  Equipment storage was reassessed using the MSFHI for both LIP and storm surge and it resulted in no impacts because the floor elevation is above peak flood height.

- The impacts of the MSFHI should be used in place of the FLEX DB flood in the consideration of robustness of plant equipment as defined in Appendix A of NEI 12-06. For determining robustness only, the MSFHI should be used as the applicable hazard.

  The FLEX equipment was evaluated for the worst case MSFHI flood height with wave runup and will still be capable to perform their functions due to the elevated heights.

  Effect from LIP: LIP will cause a stillwater elevation well below that for installed plant equipment that supports FLEX implementation and the storage location elevations for FLEX equipment and therefore will not affect their function or robustness.

Effect from Storm surge: Storm surge will cause a wind wave elevation, but well below the elevation of installed plant equipment that supports FLEX implementation and the storage location elevation and deployment paths for the FLEX equipment and will not affect their function or robustness.

- The impacts of the MSFHI should be used to evaluate the location of connection points in accordance with Section 3.2.2.17 of NEI 12-06.

  Effect from LIP: The location of the FLEX connection points is not impacted by the LIP event. The location of the FLEX connection points in the Reactor Building on 710 feet MSL floor elevation internally remote from Reactor Building D19/D20/D391 doors with potential water ingress due to the LIP event. External connections at the Reactor Building are capped and above the reevaluated stillwater elevation.

  Effect from Storm Surge: If normal access to the UHS/cooling lake is not available due to flooding, alternate FLEX connection points are available at FLEX Building 23 that are well above the cooling lake wind-wave runup elevation of 710.6 feet MSL. Therefore, diversity and flexibility have been considered in the location of connection points for the FLEX strategies with regard to the impacts of the MSFHI.

- Any flood protection features credited in the FLEX strategies meet the performance criteria in Section G.5.

  Effect from LIP: The current FLEX strategy does not credit any flood protection features.

  Effect from Storm surge: There are no flood protection features credited in the FLEX from the wind generated waves.

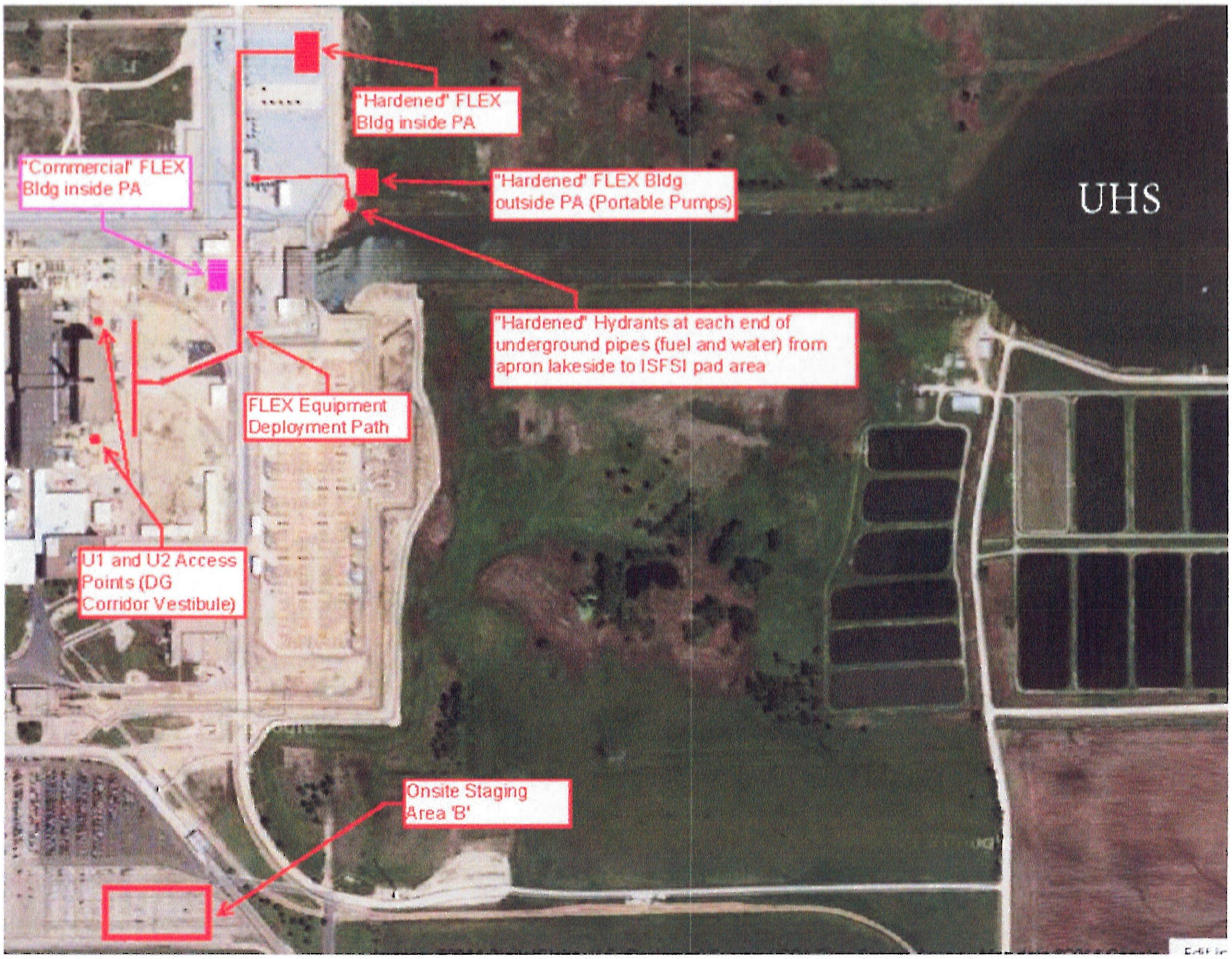


Figure 4 – FLEX Deployment Paths

6.2 *Results*

- Confirm that boundary conditions and assumptions in the initial FLEX design are maintained. If not, describe the differences. Describe the basis for this determination.

  The boundary conditions and assumptions in the initial FLEX design are maintained and would not change based on MSFHI. While the FLEX DB flood does not completely bound the reevaluated flood, the increased flood water elevations do not result in impacts to the FLEX strategy. Initial FLEX actions are internal to the power block and are not impacted by the reevaluated flood hazards. External FLEX actions are not impacted by the reevaluated flood levels. Therefore the boundary conditions and assumptions of the initial FLEX design are maintained.

- Confirm that the sequence of events for the FLEX strategies is not impacted by MSFHI (including impacts due to the environmental conditions created by MSFHI) in such a way that the FLEX strategies cannot be implemented as currently developed. If yes, describe the impacts. Describe the basis for this determination.

  The sequence of events was reviewed with the occurrence of the LIP and storm surge flood causing mechanisms. No new or re-ordered tasks were identified as a result of

MSFHI. All initial FLEX actions (within 60 minutes) are internal to the power block. The first external FLEX actions are deployment of the pump and generator within 6 hours (Reference 25). The primary debris removal will be focused on activities inside the PA until such time as the FLEX strategies are operational. This equipment can then be moved outside of the PA, if required, to assist with debris removal on the parking lot and travel paths into the PA. There is considerable time between implementation of the FLEX strategies (~6 hours into the event) and when equipment will be expected to be arriving from the NSRC or other sources (~24 hours into the event). Therefore, there is no impact on the sequence of events for the FLEX strategies due to LIP flood mechanism by MSFHI.

For the storm surge flood mechanism on the cooling lake, FLEX equipment or deployment paths will not be affected by wind waves at the storage building locations since wind generated wave heights are well below the FLEX equipment as not to impede their functionality. If normal access to the UHS/cooling lake is not available due to flooding, alternate FLEX connection points are available at FLEX building 23 that are well above the cooling lake wind-wave runup elevation of 710.6 feet MSL. Wind generated waves are below the height of the FLEX equipment deployment areas at elevation 712.0 feet MSL, having 1.4 feet of margin above the wind-wave runup elevation. Therefore, there is no impact on the sequence of events for the FLEX strategies due to storm surge flood mechanism on the cooling lake by MSFHI.

- Confirm that the validation performed for the deployment of the FLEX strategies is not impacted by MSFHI. If yes, describe the impacts. Describe the basis for this determination.

The earliest required completion of external FLEX time sensitive actions is 6 hours after event starts which include deployment of the FLEX pump and portable diesel generator. The maximum water depth and velocity are less than or equal to 1 foot and 1 feet per second, respectively, during the LIP event along deployment paths. The flood level above grade is of very limited duration. These conditions were reviewed and deemed not to cause any significant delay in deployment of operators and reasonable assurance that the required tasks for FLEX strategies may be executed within the time constraints with margin and including limiting environmental factors of the validation plan for activities conducted outside plant buildings. Therefore, there is no impact on the validation performed for the deployment of the FLEX strategies due to LIP flood mechanism by MSFHI.

For the storm surge flood mechanism on the cooling lake, the FLEX validation performed for the deployment of the FLEX strategies is not impacted by MSFHI. The initial deployment of the FLEX pump and portable diesel generator are deployed from locations near the cooling lake. The FLEX strategy for preparation of water connections in the event of flooding, include use of an alternate location with an inconsequential change in deployment path. The pump deployment location can be utilized for both the DB and MSFHI flooding levels because the location is above the maximum water surface elevations in the cooling lake. The storm surge flood mechanism on the cooling lake has no impact on the generator deployment will not be affected by wind waves at the storage building locations since wind generated wave heights are well below the FLEX deployment paths.

The subsequent steps are not impacted as they occur long after the LIP flooding event is over or are above the wind generated wave heights in the cooling lake.

"Other Considerations", "Performance Attributes", and "Conclusion" sections of the Validation Plan were reviewed and no additional significant challenges were identified for the MSFHI.

6.3 Conclusions

The assessment concluded that the existing FLEX strategy can be successfully implemented and deployed as designed for LSCS's reevaluated flood hazard (i.e. MSFHI). For the LIP event, the assessment showed that storage and deployment of FLEX equipment is not adversely impacted and no additional actions or procedural changes were required. For the Storm Surge event, the reevaluated stillwater elevation is well below the elevation of the FLEX equipment and therefore will not impede the flex equipment functionality. Any additional wave runup effects will be minimal and will not impact FLEX deployment. The current FLEX strategy will not have to be modified for MSFHI. No other applicable flood-causing mechanisms will affect the hauling routes of FLEX equipment. Therefore, the current FLEX strategies can be successfully deployed as designed for all applicable flood-causing mechanisms and no further actions, including modifications to FLEX, are required.

7 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-14-055).
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 5, 2015 (RS-15-110).
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 [Effective February 29, 2016 per Federal Register / Vol. 81, No. 39].

10. NRC Letter to Exelon, "LaSalle County 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. MF3655 and MF3656)", dated September 3, 2015.

11. Exelon, LaSalle Procedure, LaSalle Station Implementation of Diverse and Flexible Coping Strategies (FLEX) and Spent Fuel Pool Instrumentation Program (CC-LA-118-1001).

12. Design-Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America, NUREG/CR-7046 November 2011.

13. CB&I Specification 151871-DC-C-00001-0, Civil/Structural Design Criteria for Exelon FLEX Storage and Commercial Buildings, dated May 1, 2014.

14. Nuclear Energy Institute (NEI), Report NEI 15-05 [Rev 6], Warning Time for Local Intense Precipitation Events, dated April 2015.

15. Exelon Generation Company, LLC Letter to USNRC, Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated February 28, 2013 (RS-13-021).

16. NRC Letter, LaSalle County Station, Units 1 and 2, NRC Integrated Inspection Report 05000373/2014005;05000374/2014005, Temporary Instruction 2515/190 – Inspection of the Proposed Interim Actions Associated with Near-Term Task Force Recommendation 2.1 Flooding Hazard Evaluations, dated February 10, 2015.

17. Exelon Generation Company, LaSalle Updated Final Safety Analysis (UFSAR), Rev 22.

18. Exelon Generation Company, Calculation L-003856, Beyond Design Basis Effects of Local Intense Precipitation Analysis, Rev 1.

19. Exelon Generation Company, Calculation L-003861, Beyond Design Basis External Flooding Combined Events Analysis, Rev 0.

20. Exelon Generation Company, Calculation L-003862, Beyond Design Basis External Flooding Error/Uncertainty Analysis, Rev 1.

21. Exelon, LaSalle Procedure, LaSalle FLEX (BDBEE) Validation Process (CC-LA-118-1004).

22. Exelon Generation Company, LLC Letter to USNRC, Response to March 12, 2012, Request for Information Enclosure 2, Recommendation 2.1, Flooding, Required Response 2, Flood Hazard Reevaluation Supplemental Information Regarding Associated Effects and Flood Event Duration Parameters, dated October 4, 2016 (RS-16-186, RA-16-074, and TMI-16-087).

23. Exelon, EC 397436, Lake Screen House and CSCS Inlet Structure Technical Evaluation for Beyond Design Basis External Event Flood Levels, Rev 0.

24. Exelon, EC 399280, Beyond Design Basis Flooding Analysis for NRC Fukushima NTTF Recommendation 2.1 – Plant LIP Ingress, Rev 3.

25. Exelon, LaSalle Procedure, FLEX Beyond Design Basis External Event Guidance (LOA-FSG-011).

26. Exelon, LaSalle Procedure, FLEX Deployment Path Debris Removal (LOA-FSG-012).

27. NRC Letter to Exelon, Approval of LaSalle Request for Relaxation from NRC Order EA-12-049, dated April 15, 2014 (ML14071A455).