Exelon Generation.

10 CFR 50.54(f)

RS-17-026

March 10, 2017

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

R. E. Ginna Nuclear Power Plant
Renewed Facility Operating License No. DPR-18
NRC Docket No. 50-244

Subject: Exelon Generation Company, LLC Response to March 12, 2012, Request for Information Enclosure 2, Recommendation 2.1, Flooding, Required Response 3, Flooding Focused Evaluation Summary 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. Constellation Energy Nuclear Group, 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 11, 2015, RS-15-069

3. Exelon Generation Company, LLC Letter to USNRC, Response to NRC Audit Review Request for Additional Information Regarding Fukushima Lessons Learned - Flood Hazard Reevaluation Report, dated September 30, 2015, RS-15-255

4. Exelon Generation Company, LLC Letter to USNRC, Response to Request for Additional Information Regarding Fukushima Lessons Learned – Flood Hazard Reevaluation Report, dated October 4, 2016 (RS-16-186)

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 16-05, Revision 1, External Flooding Assessment Guidelines, dated June 2016

9. U.S. Nuclear Regulatory Commission, JLD-ISG-2016-01, Revision 0, Guidance for Activities Related to Near-Term Task Force Recommendation 2.1, Flood Hazard Reevaluation; Focused Evaluation and Integrated Assessment, dated July 11, 2016

10. NRC Letter, R. E. Ginna Nuclear Power Plant – Interim Staff Response to Reevaluated Flood Hazards Submitted in Response to 10 CFR 50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (TAC No. MF6098), dated December 4, 2015

11. NRC Letter, R. E. Ginna Nuclear Power Plant – Staff Assessment of Response to 10 CFR 50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (CAC No. MF6098), dated November 18, 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 R. E. Ginna Nuclear Power Plant the FHRR was submitted on March 11, 2015 (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".

Following the Commission's directive to NRC Staff (Reference 6), the NRC issued a letter to industry (Reference 7) indicating that new guidance is being prepared to replace instructions (Reference 6), and provide for a "graded approach to flooding reevaluations" and "more focused evaluations of local intense precipitation and available physical margin in lieu of proceeding to an integrated assessment".

The Nuclear Energy Institute (NEI) prepared NEI 16-05, "External Flooding Assessment Guidelines" (Reference 8). The NRC endorsed NEI 16-05 (Reference 9) and recommended changes, which have been incorporated into NEI 16-05, Revision 1. NEI 16-05 indicates that each flood-causing mechanism not bounded by the Design Basis (DB) flood (using only stillwater and/or wind-wave runup level) should follow one of the following five assessment paths:

- Path 1: Demonstrate Flood Mechanism is Bounded Through Improved Realism
- Path 2: Demonstrate Effective Flood Protection
- Path 3: Demonstrate a Feasible Response to Local Intense Precipitation (LIP)
- Path 4: Demonstrate Effective Mitigation
- Path 5: Scenario Based Approach

Non-bounded flood-causing mechanisms in Paths 1, 2, or 3 would only require a Focused Evaluation to complete the actions related to external flooding required by the March 12, 2012 10 CFR 50.54(f) letter. Mechanisms in Paths 4 or 5 require an Integrated Assessment.

The enclosure to this letter provides the Flooding Focused Evaluation Summary Report for the R. E. Ginna Nuclear Power Plant.

The flooding analysis documented in References 10 and 11 (NRC MSFHI letter and Staff Assessment Report) were utilized as input to this Flooding Focused Evaluation. The Flooding Focused Evaluation reaffirms that R. E. Ginna Nuclear Power Plant's SSCs that support Key Safety Functions are effectively protected from the non-bounded reevaluated flood-causing mechanisms (LIP and Streams/Rivers) with adequate margin. The R. E. Ginna Nuclear Power Plant site relies on a combination of permanent and temporary passive flood protection barriers to prevent ingress of flood waters in the areas with key SSCs and maintain Key Safety Functions.

The Flooding Focused Evaluation follows Path 2 of NEI 16-05, Revision 1 (Reference 8), and utilized Appendices B and C for guidance on evaluating the flood protection features and overall site response. This submittal completes the actions related to external flooding required by the March 12, 2012 10 CFR 50.54(f) letter.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact David J. Distel at (610) 765-5517.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 10th day of March 2017.

Respectfully submitted,

James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure: R. E. Ginna Nuclear Power Plant, Flooding Focused Evaluation Summary, dated March 10, 2017

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region I
NRC Senior Resident Inspector – R. E. Ginna Nuclear Power Plant
NRC Project Manager, NRR – R. E. Ginna Nuclear Power Plant
Ms. Tekia V. Govan, NRR/JLD/JHMB, NRC

Enclosure

R. E. Ginna Nuclear Power Plant

Flooding Focused Evaluation Summary

dated March 10, 2017

(16 Pages)

R. E. GINNA NUCLEAR POWER PLANT FLOODING FOCUSED EVALUATION SUMMARY

MARCH 10, 2017
LETTER # RS-17-026
ENCLOSURE

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R. E. GINNA NUCLEAR POWER PLANT FLOODING FOCUSED EVALUATION SUMMARY

1 EXECUTIVE SUMMARY

The R. E. Ginna Nuclear Power Plant (Ginna) has reevaluated its flooding hazard in accordance with the Near-Term Task Force (NTTF) Rec. 2.1 and NRC's 10 CFR 50.54(f) request for information (RFI). The RFI was issued as part of implementing lessons learned from the Fukushima Dai-ichi accident; specifically, to address Recommendation 2.1 of the NRC's Near-Term Task Force report. This information was submitted to NRC in a flood hazard reevaluation report (FHRR) on March 11, 2015, and is summarized in the NRC "Interim Staff Response to Reevaluated Flood Hazards Submitted in Response to 10 CFR 50.54(f) Information Request – Flood Causing Mechanism Reevaluation" letter dated December 4, 2015. Following the submittal of the FHRR, Exelon performed a new site-specific Probable Maximum Precipitation (PMP) analysis to more accurately characterize the Streams and Rivers flood hazard. The results of the study were submitted as part of the Mitigating Strategies Flood Hazard Assessment (MSFHA). Therefore, both the information provided in the Mitigating Strategies Flood Hazard Information (MSFHI) letter and in the MSFHA submittal will serve as the input to this Focused Evaluation (FE). There are two mechanisms that were found to exceed the current licensing basis (CLB) at Ginna. These mechanisms are listed below and included in this FE:

- Local Intense Precipitation (LIP); and
- Streams and Rivers.

Associated effects (AE) and flood event duration (FED) parameters were assessed and submitted as a part of the MSFHA and the FHRR. The FE concludes that for the bounding LIP and rivers/streams flood parameters, Ginna has effective flood protection through the calculation of Available Physical Margin (APM) and the reliability of protection features. This FE followed Path 2 of NEI 16-05, Rev. 1 and utilized Appendix B and C for guidance on evaluating the flood protection features and the site strategy. This submittal completes the actions related to External Flooding required by the March 12, 2012, 10 CFR 50.54(f) letter.

2 BACKGROUND

On March 12, 2012, the NRC issued Reference 1 to request information associated with Near-Term Task Force (NTTF) Recommendation 2.1 for flooding. The RFI (Reference 1) directed licensees, in part, to submit a Flood Hazard Reevaluation Report (FHRR) to reevaluate the flood hazards for their sites using present-day methods and guidance used for early site permits and combined operating licenses. For Ginna, the FHRR was submitted on March 11, 2015 (Reference 2).

Following the Commission's directive to NRC Staff in Reference 3, the NRC issued a letter to industry (Reference 4) indicating that new guidance is being prepared to replace instructions in Reference 3 and provide for a "graded approach to flooding reevaluations" and "more focused evaluations of local intense precipitation and available physical margin in lieu of proceeding to an integrated assessment." NEI prepared the new "External Flooding Assessment Guidelines" in NEI 16-05 (Reference 9), which was endorsed by the NRC in Reference 5. NEI 16-05 indicates that each flood-causing mechanism not bounded by the design basis flood (using only stillwater and/or wind-wave run-up level) should follow one of the following five assessment paths:

- Path 1: Demonstrate Flood Mechanism is Bounded Through Improved Realism
- Path 2: Demonstrate Effective Flood Protection
- Path 3: Demonstrate a Feasible Response to LIP
- Path 4: Demonstrate Effective Mitigation
- Path 5: Scenario-Based Approach

Non-bounded flood-causing mechanisms in Paths 1, 2, or 3 would only require an FE to complete the actions related to external flooding required by the March 12, 2012, 10 CFR 50.54(f) letter. Mechanisms in Paths 4 or 5 require an Integrated Assessment. Ginna follows Path 2 since key SSCs and KSFs are effectively protected from flooding.

3 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, Constellation Energy Nuclear Group, 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 11, 2015 (RS-15-069).

3. 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.

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

5. U.S. Nuclear Regulatory Commission, JLD-ISG-2016-01, Revision 0, Guidance for Activities Related to Near-Term Task Force Recommendation 2.1, Flood Hazard Reevaluation, Focused Evaluation and Integrated Assessment, dated July 11, 2016.

6. NRC Letter to Exelon, "R. E. Ginna Nuclear Power Plant – Interim Staff Response to Reevaluated Flood Hazards Submitted in Response to 10 CFR 50.54(f) Information Request (TAC NO MF6098)", dated December 4, 2015.

7. 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).

8. Exelon Generation Company, LLC Letter to USNRC, Mitigating Strategies Flood Hazard Assessment (MSFHA) Submittal, dated November 18, 2016 (RS-16-101).

9. Nuclear Energy Institute Report NEI 16-05, Revision 1, External Flooding Assessment Guidelines, June 2016.

10. EDOC-MISC-2016-0037, "Warning Time for Local Intense Precipitation (LIP) Events.

11. Exelon Generation Company, LLC Letter to USNRC, Response to NRC Audit Review Request for Additional Information Regarding Fukushima Lessons Learned – Flood Hazard Reevaluation Report, dated September 30, 2015 (RS-15-255).

12. DA-CE-16-002 Auxiliary Building Masonry Wall, Flood Loading Analysis, Revision 000.

13. O-6.11, Surveillance Requirement/Routine Operations Check Sheet, Revision 182.

14. ER-SC.2, High Water (Flood) Plan, Revision 15.

15. SC-3.17, Auxiliary Building Flood Barrier Installation/Removal/Inspection, Revision 00500.

16. SC-3.17.1, SAFW Annex Flood Barrier Installation/Removal/Inspection, Revision 00000.

17. GMM-23-99-FLOODBARRIER, Flood Barrier Installation and Removal in Turbine Building Basement, Revision 00100.

18. CORRES-20170216-00001, Flooding Capacity versus Demand for Ginna Structures, Revision 000.

19. EPRI 3002008113, "Evaluation of Deterministic Approaches to Characterizing Flood Hazards", December 2016.

4 TERMS AND DEFINITIONS

- AB – Auxiliary Building
- APM – Available Physical Margin
- AVT - All-Volatile Treatment
- BDB – Beyond Design Basis
- CLB – Current Licensing Basis
- CDB – Current Design Basis
- DB – Design Basis
- DG – Diesel Generator
- FE – Focused Evaluation
- FHRR – Flood Hazard Reevaluation Report
- FLEX – Diverse and Flexible Coping Strategies
- Key SSC – A System, Structure, or Component relied upon to fulfill a Key Safety Function
- KSF – Key Safety Function
- LIP – Local Intense Precipitation
- MSA – Mitigating Strategies Assessment
- MSFHA – Mitigating Strategy Flood Hazard Assessment
- NWS – National Weather Service
- NEI – Nuclear Energy Institute
- NRC – Nuclear Regulatory Commission
- NTTF – Near-Term Task Force
- PMP – Probable Maximum Precipitation
- PMF – Probable Maximum Flood
- PQPF – Probabilistic Quantitative Precipitation Forecasts
- RB – Reactor Building
- RFI – Request for Information
- SAFW – Standby Auxiliary Feedwater
- SSC – Structures, Systems, and Components
- TB – Turbine Building
- TCA – Time Critical Action
- TSA – Time Sensitive Action
- WSEL – Water Surface Elevation

5 FLOOD HAZARD PARAMETERS FOR UNBOUNDED MECHANISMS

NRC has completed the "Interim Staff Response to Reevaluated Flood Hazards Submitted in Response to 10 CFR 50.54(f) Information Request – Flood Causing Mechanism Reevaluation" dated December 4, 2015, (Reference 6) related to the Ginna FHRR (Reference 2). In Reference 6, 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 Nuclear Energy Institute (NEI) guidance document NEI 12-06, 'Diverse and Flexible Coping Strategies (FLEX) Implementation Guide') for Ginna. Further, the licensee's reevaluated flood hazard information is suitable input for the focused evaluations associated with Near-Term Task Force Recommendation 2.1 'Flooding'." Enclosure 1 to Reference 2 includes a summary of the current design basis and reevaluated flood hazard parameters, respectively. In Table 1 of the enclosure to Reference 6, the NRC lists the following flood-causing mechanisms for the 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 Reference 6, the NRC lists flood hazard information (specifically stillwater elevation and wind-wave run-up elevation) for the Local Intense Precipitation and Streams and Rivers flood-causing mechanisms, which are the two mechanisms not bounded by the design basis hazard flood level. The Streams and Rivers flood-causing mechanism was further refined by Ginna and included in the MSFHA submittal (Reference 8). The non-bounded flood mechanisms are described in detail in the Reference 2 FHRR submittal and the Reference 8 MSFHA submittal. See Section 5.1 and Table 5-2 for additional details on the Streams and Rivers flood hazard refinements. Table 5-1 below summarizes how the unbounded mechanisms were addressed in this external flooding assessment. A bounding set of parameters from the LIP and Streams and Rivers hazards were used in the FE for determination of APM. Table 5-3 shows the bounding set of flood parameters used in the FE.

Table 5-1 – Summary of Flood Impact Assessment

	Flood Mechanism	Summary of Assessment
1	Local Intense Precipitation	Path 2 was determined to be the appropriate path for Ginna since key SSCs are protected with temporary passive barriers and available physical margin is adequate to protect KSFs (see FIAP Path Determination Table, Section 6.3.3 of NEI 16-05). Any potential ingress into other areas of the plant does not impact KSFs.
2	Streams and Rivers	Path 2 was determined to be the appropriate path for Ginna since key SSCs are protected with temporary passive barriers and available physical margin is adequate to protect KSFs (see FIAP Path Determination Table, Section 6.3.3 of NEI 16-05). Any potential ingress into other areas of the plant does not impact KSFs. Parameters were revised for the FIAP.

5.1 Basis for Revised Streams and Rivers Flood-Causing Mechanism

This section contains a description and justification of assumption, input, and methods (AIMs) that were revised in the updated flood hazard reevaluation submitted on November 18, 2016 (Reference 8) for the Streams and River Flood-Causing Mechanism. See Reference 8 for more details on the revised approach.

Table 5-2 – Discussion of Revised AIMs for Streams and Rivers

	Description of Revised AIM	Justification of Reduced Conservatism
1	The original FHRR was based on generalized probable maximum precipitation (PMP) estimates obtained from the NOAA Hydrometeorological Reports (HMR) 51 and 52. The revised FHRR is based on a site-specific meteorological PMP study, which produced a more accurate rainfall depth-area-duration relationship.	HMRs 51 and 52 provide generalized PMP values over large geographic areas without considering specific watershed characteristics. The site-specific meteorological study provides a more accurate representation of the PMP by considering local and regional orographic effects of topography, refined and updated observed PMP-type storms, transposition limits, and maximization factors. Further justification for using site-specific meteorological information is provided in EPRI 3002008113 Report, Section 3.1.a (Reference 19). No actions or changes are

	Description of Revised AIM	Justification of Reduced Conservatism
		needed by the site to validate the revised input.

5.2 Bounding Set of Flood Parameters

Ginna flood protection strategy is based on the bounding riverine flood hazard with a shorter flood warning that would be available in case of the LIP event. Therefore, a bounding set of parameters (Table 5-3) was developed for the FE.

Table 5-3 – Bounding Set of Flood Parameters

	Parameter Description	Associated Flood Mechanism	Values/Discussion	
1	Max Stillwater Elevation	Streams and Rivers (Revised)	Reactor Containment	271.5 ft NGVD29
			AB (E. Wall/S. End)	271.7 ft NGVD29
			AB (South Wall)	273.7 ft NGVD29
			Turbine Building	257.1 ft NGVD29
			Control Building	271.5 ft NGVD29
			AVT Building	270.9 ft NGVD29
			SAFW Building	271.9 ft NGVD29
			SAFW Building Annex	272.7 ft NGVD29
			Screen House	257.0 ft NGVD29
			DG Building	257.1 ft NGVD29
2	Max Wave Run-up Elevation	Streams and Rivers (Revised)	Reactor Containment	271.5 ft NGVD29
			AB (E. Wall/S. End)	272.6 ft NGVD29
			AB (South Wall)	273.7 ft NGVD29
			Turbine Building	257.1 ft NGVD29
			Control Building	271.5 ft NGVD29
			AVT Building	270.9 ft NGVD29
			SAFW Building	272.8 ft NGVD29
			SAFW Building Annex	273.6 ft NGVD29
			Screen House	257.0 ft NGVD29
			DG Building	257.1 ft NGVD29

	Parameter Description	Associated Flood Mechanism	Values/Discussion
3	Max Hydrodynamic/Debris Loading	Streams and Rivers (Revised)	The hydrostatic and hydrodynamic loads generally do not exceed 600 and 1,000 pounds per foot, respectively; with an exception on the southern side of the Admin building where the hydrostatic load reaches approximately 3600 pounds per foot. Where wind-wave activity is a factor (AB East Wall, SAFWB, and SAFWB Annex), any impact from the 0.9-foot wind-wave run-up would be minimal. Debris loads are also expected to be insignificant. The Auxiliary Building block wall is shielded from wind-wave and hydrodynamic effects. It is qualified for hydrostatic, wind, and debris loads.
4	Effects of Sediment Deposition/Erosion	Any	None
5	Other Associated Effects	Any	None
6	Concurrent Site Conditions	Streams and Rivers (Revised)	Winds of up to 73.9 ft/sec (50.4 miles per hour) can occur simultaneously with an H.1 combined-effects flood. The plant is designed to safely shutdown following tornados with winds up to 132 miles per hour. An evaluation of the wind loading (Reference 12) on the Auxiliary Building South Wall shows no effect due to the 50.4 mph winds, concurrent with the BDB flood hazards.
7	Effects on Ground Water	Streams and Rivers (Revised)	The DB groundwater level of 265 feet NGVD29 is well above the regulated maximum Lake Ontario level, and would only be exceeded by surface flooding for relatively short durations during the postulated flood events (PMF on Deer Creek and LIP at the site). As a result, groundwater elevations are not anticipated to be significantly impacted by flood mechanisms detailed in the FHRR. Additionally, the evaluation performed to determine the impacts of groundwater on below-grade safety related structures indicated that no adverse impacts would occur if groundwater levels were at plant grade (270.0 feet NGVD29) (Reference 11).

	Parameter Description	Associated Flood Mechanism	Values/Discussion
8	Warning Time	LIP	Warning time for operator actions credited in the flood protection strategy is governed by the LIP flood and documented in Reference 10 (per NEI 15-05). Warning time for the Streams and River Flood is implemented in ER-SC.2, High Water (Flood) Plan (Reference 14). Two warning time levels of action are described in ER-SC.2 with Level 1 actions taken when 5 inches of rain is forecasted over a 24-hour period in the next three days and Level 2 actions taken when 10 inches of rain is forecasted over a 24-hour period in the next three days.
9	Period of Site Preparation	LIP	Generically defined as the time between entry into flood procedures and before floodwaters reach site grade. For LIP, period of site preparation is not directly applicable and is considered to be covered by "warning time". For Streams and River flooding, flood response actions are initiated during the warning time period. However, as a backup to actions not being completed within the warning time period, flood response actions occur from the point at which floodwaters reach the driveway bridge handrail (approximately 263.0 feet NGVD29) to site grade elevation (270.0 feet NGVD29). According to Figure 9-19 of Reference 11, it takes approximately 5 hours[1] for floodwaters to rise from elevation 263 feet to 270 feet NGVD29 immediately upstream of the Ginna Access Road at the Driveway Bridge.
10	Period of Inundation[1]	Streams and Rivers	7 hours
11	Period of Recession[1]	Streams and Rivers	Some residual flood depth remains on site (0.5 ft or less) once most of the floodwaters recede. However, passive barriers used to protect the key SSCs can perform their function independent of the recession time.
12	Plant Mode of Operation	Any	Any

[1]Note that the "Streams and Rivers" flood event duration parameters from the original (March 2015) flood hazard reevaluation were conservatively used for the Focused Evaluation.

6 OVERALL SITE FLOODING RESPONSE

6.1 DESCRIPTION OF OVERALL SITE FLOODING RESPONSE

Ginna is a one-unit site located on the southern shore of Lake Ontario, in Ontario, NY. The site property consists of approximately 426 acres of partially-wooded land. The surface of the land on the southern shore of Lake Ontario is either flat or gently rolling and it slopes upward to the south from an elevation of about 255 feet near the edge of the lake to 440 feet at Ridge Road. The confluence of two streams, Deer Creek and Mill Creek, is located near the southwestern portion of the site. The streams flow along the southern portion of the site into Lake Ontario.

The main plant area and buildings are at grade elevation 270.0 feet NGVD29. The north side of the Turbine Building and the Screen House are at elevation 253.5 feet NGVD29. The plant grade entrances to the Auxiliary Building are at elevation 271 feet NGVD29. The lowest safety-related equipment is in the subbasement of the Auxiliary Building at elevation 221.5 feet NGVD29.

The site relies on a combination of permanent and temporary passive flood protection barriers to prevent ingress of flood waters in the areas with key SSCs and to ensure that KSFs are maintained. The permanent features include concrete masonry block walls on the south side of the plant, exterior doors to the Diesel Generator Building, and an armor stone revetment along the Lake Ontario shoreline.

The temporary/portable flood barriers (Presray) are provided at the Auxiliary Building and Standby Auxiliary Feedwater Pump Building Annex (SAFW Building Annex). See References 15 and 16 for additional details on the barrier installation. Installed water-resistent doors provide protection at the Battery and Diesel Generator Rooms. AquaFence portable flood barriers provide added protection at the Battery and Diesel Generator Rooms for defense-in-depth. The AquaFence installation includes sealing of one penetration once the AquaFence panel near the seal is installed. See Reference 17 for additional details on the AquaFence installation.

All key safety functions could be impacted by a flood if the site's flood strategy is not successfully implemented. The flood protection actions are described in procedure ER-SC.2 and are initiated based on the severity of the forecast or observed flood conditions. There are two action levels described in ER-SC.2 – Level 1 and Level 2. Both Level 1 and Level 2 (critical path) actions include installation of Presray portable flood barriers at the Auxiliary Building and SAFW Building Annex and defense-in-depth AquaFence in the Turbine Building.

The site determined that all vulnerabilities due to the rivers/stream and LIP flood causing mechanisms are addressed by available physical margin, which was deemed adequate to protect key SSCs and maintain KSFs. This places Ginna in Path 2 to address these unbounded flooding mechanisms. See Section 7 for further discussion on the flood impact assessment.

6.2 Summary of Plant Modifications and Changes

There are no remaining actions, including planned plant modifications, procedural changes or procurement activities, necessary to implement the flood strategy described above.

7 FLOOD IMPACT ASSESSMENT

7.1 DESCRIPTION OF FLOOD IMPACT

The bounding maximum BDB flood elevations for the FE are based on the combined event resulting from the Mill Creek and Deer Creek PMF, 25-year surge, maximum controlled water level in Lake Ontario, and wind-wave activity, as shown in Table 7-1. This event combination is also referred to as the "Streams and Rivers" flood-causing mechanism. It should be noted that the CDB flood elevation at the respective structures is exceeded by the bounding BDB flood elevations only at three of the structures of interest: Battery Rooms, Screen House, and Diesel Generator Building. At the remaining structures, the BDB flood elevations are bounded by the CDB PMF flood levels. However, a comparison of the flood protection elevation to the door threshold/sill elevation is provided for all buildings containing safe-shutdown equipment. The maximum duration of flooding is approximately 7 hours. Once the flood has passed through the site, some residual flooding remains on site (0.5 ft or less) for an undefined amount of time; however, passive flood barriers used to protect the key SSCs can perform their function independent of the recession time.

Table 7-1 – Flood Impact Summary for Bounding Set of Parameters (Reference 18)

Structure	**Door**	**BDB – Rivers/ Streams[2],** ft NGVD29	**Threshold Elevation,** ft NGVD29	**Flood Protection Height,** ft	**Flood Protection Elevation,** ft NGVD29	**APM,** ft
Auxiliary Building (South Wall)	BSD/29F	273.7	271.0	3.3	274.3	0.6
Auxiliary Building (South Wall)	Block Wall	273.7	271.0	3.0	274.0	0.3
Auxiliary Building (East Wall)	Block Wall	*272.6*	271.0	3.0	274.0	1.4
Auxiliary Building (East Wall)	BSD/28	*272.6*	271.0	2.0	273.0	0.4
Auxiliary Building (East Wall)	BSD/27	*272.6*	271.0	2.0	273.0	0.4
Auxiliary Building (North Wall)	BSD/26	*272.4*	271.0	2.0	273.0	0.6
Battery Rooms[1]	SD/34 SD/35 SD/48	257.1	253.5	11.0	264.5	7.4
SAFW Building	SD/99	*272.8*	271.0	4.0	275.0	2.2

Structure	Door	BDB – Rivers/ Streams[2], ft NGVD29	Threshold Elevation, ft NGVD29	Flood Protection Height, ft	Flood Protection Elevation, ft NGVD29	APM, ft
SAFW Building Annex	BAFA/1	*273.6*	271.0	3.8	274.8	1.2
DG Building (North Wall)	SD/15 SD/16 SD/17 SD/18	257.1	253.5	7.0	260.5	3.4
DG Building[1] (South Wall)	SD/32 SD/33	257.1	253.5	9.4	262.9	5.8
DG Building[1] (South Wall)	Superwall	257.1	253.5	9.8	263.3	6.2
Penetration TBP-9-P	Control Building	257.1	253.5	3.62	257.12	0.02

Notes:

[1] The flood elevation at interior doors is assumed to be equal to the exterior BDB rivers/streams flood elevation along the north face of the TB and DG Building, as provided in the MSFHA submittal.

[2] BDB flood elevations in *Italics* include wave run-up of 0.9 ft.

7.2 Adequate APM Justification and Reliability Flood Protection

In accordance with NEI 16-05, the APM (even 0.02-foot APM at the penetration seal) was determined to be adequate by considering the following conservatisms in the rivers/streams analysis in developing the maximum flood elevation (per Reference 11, responses to Information Needs 4 and 7):

1. Conservative Manning n-value in the Deer Creek hydraulic model.
2. Conservative runoff curve number values, particularly in areas with dual-classifications.
3. Assigning conservative land use classifications to err on the side of higher runoff.
4. Assuming "wet" antecedent moisture conditions in the soil of the watershed.

Additional conservatisms are discussed in Enclosure 2 of the MSFHA submittal (Reference 8) as part of a sensitivity analysis performed for the revised Streams and Rivers flood hazard. Specifically, the sensitivity analysis concluded that the infiltration (NRCS Curve Number) method in the hydrologic model and building inputs to the FLO-2D are conservative, leading to approximately 0.2 to 0.3 foot overestimated flood levels at the Auxiliary Building block wall.

7.3 Adequate Overall Site Response

This evaluation, performed in accordance with NEI 16-05 Appendix C, has demonstrated the overall site response to flooding is adequate. The site response includes manual actions required to install the temporary flood protection barriers and implement the overall flood protection strategy. The following sections outline the results of evaluating the criteria in NEI 16-05 Appendix C.

7.3.1 Defining Critical Path and Identifying Time Critical/Sensitive Actions (TCAs/TSAs)

The overall strategy for protecting Ginna includes installation of temporary flood protection barriers at critical locations to protect key SSCs and maintain KSFs. The steps included in the installation of the respective barriers are provided in References 13, 14, 15, 16, and 17. The critical path actions include:

- Weather monitoring per procedure O-6.11. If more than 4 inches are predicted over the 24-hour period using the NWS Day 95th percentile PQPF, then entry into procedure ER-SC.2 is initiated.
- Depending on the severity of the weather forecast or flooding, Level 1 or Level 2 actions are initiated per procedure ER-SC.2.
- Level 1 and Level 2 (critical path) actions include installation of Presray portable flood barriers at the Auxiliary Building and SAFW Building Annex and defense-in-depth AquaFence in the Turbine Building.

7.3.2 Demonstrating All TCAs/TSAs Are Feasible

Per the TCA assessment performed by the site, installation of the Presray portable flood barriers requires a total of 45 minutes to be performed (Reference 14). Installation of the AquaFence requires 32 hours to install, including 24 hours of curing time for the seals around the barrier, but this action is considered defense-in-depth and not a TSA.

7.3.3 Establishing Unambiguous Procedural Triggers

The monitoring and action triggers were developed in accordance with NEI 15-05 and are based on the consequential rainfall threshold. Procedure O-6.11 requires daily monitoring of the NWS WPC online tools. Once a certain threshold is exceeded, the monitoring intensity increases to every 12 hours. Once a threshold of 4 inches over a period of 24 hours based on the 95th percentile PQPF is exceeded, entry into procedure ER-SC.2 is initiated. Depending on the severity of the forecast or actual flood conditions, actions are initiated per ER-SC.2.

7.3.4 Proceduralized and Clear Organizational Response to a Flood

Procedures O-6.11, ER-SC.2, SC-3.17, SC-3.17-1, and GMM-23-99-FLOODBARRIER provide clear guidance on the responsibilities for all groups involved in the preparation for the rainfall/flood event.

7.3.5 Detailed Flood Response Timeline

The Presray portable flood barriers are stored in the vicinity of the doors they protect and the defense-in-depth AquaFence barriers are stored in the L-shaped building. The barriers are installed in locations identified in the respective procedures (SC-3.17, SC-3.17-1, and GMM-23-99-FLOODBARRIER).

7.3.6 Accounting for the Expected Environmental Conditions

For the LIP and "Streams and Rivers" flood-causing mechanisms, winds of up to 73.9 ft/sec (50.4 miles per hour) can occur simultaneously with a NUREG/CR-7046 Section H.1 flood event combination. However, all temporary barriers are installed prior to the onset of the rainfall/flood events. As such, the installation of the barriers should not be impacted by the expected environmental conditions. Furthermore, the AquaFence flood barriers are installed inside the Turbine Building and not subject to high wind loads.

7.3.7 Demonstration of Adequate Site Response

The site response to LIP and "Streams and Rivers" flooding events has been demonstrated as adequate by meeting the guidelines in NEI 16-05 Appendix C. TCAs were identified and determined to be feasible.

8 CONCLUSION

The FHRR concluded that the Local Intense Precipitation and Streams and Rivers flood-causing mechanisms are not bounded by the CDB flood. The Streams and Rivers flood-causing mechanism was further refined by Ginna but was not completely bounded by the CDB flood. The flood scenario used in the FE represented a bounding set of parameters from both mechanisms. The CDB flood elevation is exceeded by the bounding BDB flood elevations only at three of the structures of interest: Battery Rooms, Screen House, and Diesel Generator Building. At the remaining structures, the BDB flood elevations are bounded by the CDB PMF flood levels. To maintain the KSFs, portable flood barriers are installed at potential ingress locations. The FE demonstrated that the protection measures are reliable with adequate margin and the site response to the flood event is adequate. This submittal completes the actions related to External Flooding required by the March 12, 2012, 10 CFR 50.54(f) letter.