



10 CFR 50.54(f)

RS-13-047

March 12, 2013

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

Quad Cities Nuclear Power Station, Units 1 and 2  
Renewed Facility Operating License Nos. DPR-29 and DPR-30  
NRC Docket Nos. 50-254 and 50-265

**Subject:** Response to March 12, 2012, Request for Information Enclosure 2,  
Recommendation 2.1, Flooding, Required Response 2, Flooding Hazard  
Reevaluation Report

**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. NRC Letter, Prioritization of Response Due Dates for Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Flooding Hazard Reevaluations for Recommendations 2.1 of the Near-Term Task Force Review of Insights From the Fukushima Dai-ichi Accident, dated May 11, 2012
3. U.S. Nuclear Regulatory Commission, NUREG/CR-7046, "Design-Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America", dated November 2011
4. Letter from David L. Skeen, U.S. Nuclear Regulatory Commission, to Joseph E. Pollock, Nuclear Energy Institute – "Trigger Conditions for Performing an Integrated Assessment and Due Date for Response", dated December 3, 2012
5. U.S. Nuclear Regulatory Commission, JLD-ISG-2012-05, "Guidance for Performing the Integrated Assessment for External Flooding", dated November 30, 2012
6. Letter from Exelon Generation Company, LLC, to U.S. Nuclear Regulatory Commission, "180-day Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Flooding Aspects of Recommendation 2.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident", dated November 27, 2012

ADD1

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 this letter directed licensees to submit a Hazard Reevaluation Report, including the interim action plan requested in Item 1.d of Reference 1, Enclosure 2, if appropriate. On May 11, 2012, the NRC issued the prioritization plan developed by the NRC and resultant Flooding Hazard Reevaluation due dates for all sites. Reference 2, Enclosure 1 identified the Quad Cities Nuclear Power Station, Units 1 and 2 site as a Category 1 Site requiring a Flooding Hazard Reevaluation Report submittal due date of March 12, 2013. Enclosures 1 and 2 to this letter provide the Quad Cities Nuclear Power Station, Units 1 and 2 Flooding Hazard Reevaluation Report. The Quad Cities Nuclear Power Station, Units 1 and 2 Flooding Hazard Reevaluation Report follows the reevaluation process described in Reference 3.

Response to Information Requested in Reference 1, Enclosure 2

**a. Site information related to the flood hazard. Relevant SSCs important to safety and the UHS are included in the scope of this reevaluation, and pertinent data concerning these SSCs should be included. Other relevant site data includes the following:**

**i. Detailed site information (both designed and as-built), including present-day site layout, elevation of pertinent SSCs important to safety, site topography, as well as pertinent spatial and temporal data sets;**

Response:

- Site layout and topography – See Section 3.a, Section 3.b, and Figure 3-1 of Enclosure 1.
- Elevations of pertinent SSCs important to safety are as follows:
  - The following SSCs important to safety are located at or below site grade elevation 595 feet (MSL 1912): Core Spray, High Pressure Coolant Injection, Residual Heat Removal (RHR)/RHR Service Water, Emergency Diesel Generators (EDG)/EDG cooling water pumps, Reactor Core Isolation Cooling, Safe Shutdown Makeup, and associated essential electrical distribution.
  - The station batteries are located above the current design basis flood elevation of 603 feet (MSL 1912); however, some vital power inverters and other vital power distribution components associated with DC power supplies are located at or below the design basis flood elevation of 603 feet (MSL 1912).
  - The SSCs necessary to safely mitigate the design basis flood scenario are staged and can be properly transported for continued operation to elevations significantly above the current design basis flood elevation of 603 feet (MSL 1912).

- Topographic relief at the site is low compared to the land surrounding the plant and relatively flat. The site generally slopes to the west toward the Mississippi River. Areas just upslope of the station to the east partially drain through the site to the west, and drain toward the manmade channel to the east. The manmade channel runs along the eastern side of the station, outfalling to the Mississippi River at the north end of the station. Berms run along both sides of the manmade channel.
- Pertinent Site Data is provided in Enclosure 3.

**ii. *Current design basis flood elevations for all flood causing mechanisms;***

Response:

- Refer to Section 2.a of Enclosure 2 for a description of the current design basis flood elevations for flood causing mechanisms.

**iii. *Flood-related changes to the licensing basis and any flood protection changes (including mitigation) since license issuance;***

Response:

- See Section 2.b of Enclosure 2 for a description of flood-related changes to the licensing basis and any flood protection changes (including mitigation) since license issuance.

**iv. *Changes to the watershed and local area since license issuance;***

Response:

- See Section 2.c of Enclosure 2 for a description of changes to the watershed and local area since license issuance.

**v. *Current licensing basis flood protection and pertinent flood mitigation features at the site;***

Response:

- See Section 2.d of Enclosure 2 for a description of current licensing basis (CLB) flood protection and pertinent flood mitigation features at the site.

**vi. *Additional site details, as necessary, to assess the flood hazard (i.e., bathymetry, walkdown results, etc.)***

Response:

- See Reference 6 for results of the flooding walkdowns.

**b. Evaluation of the flood hazard for each flood causing mechanism, based on present-day methodologies and regulatory guidance. Provide an analysis of each flood causing mechanism that may impact the site including local intense precipitation and site drainage, flooding in streams and rivers, dam breaches and failures, storm surge and seiche, tsunami, channel migration or diversion, and combined effects. Mechanisms that are not applicable at the site may be screened-out; however, a justification should be provided. Provide a basis for inputs and assumptions, methodologies and models used including input and output files, and other pertinent data.**

Response:

- A description of the flood hazard reevaluation for each flood causing mechanism and the basis for inputs, assumptions, methodologies, and models are referenced below:
  - Local Intense Precipitation and Site Drainage: See Sections 3 (Methodology) and 4 (Results) of Enclosure 1.
  - Flooding in Streams and Rivers: See Section 3 (item 1) of Enclosure 2.
  - Dam Breaches and Failures: See Section 3 (item 2) of Enclosure 2.
  - Storm Surge: See Section 3 (item 3) of Enclosure 2.
  - Seiche: See Section 3 (item 4) of Enclosure 2.
  - Tsunami: See Section 3 (item 5) of Enclosure 2.
  - Ice Induced Flooding: See Section 3 (item 6) of Enclosure 2.
  - Channel Migration or Diversion: See Section 3 (item 7) of Enclosure 2.
  - Combined Effects (including wind-generated waves and upstream dam failure): See Section 3 (item 8) of Enclosure 2.
  - Hydrodynamic and Debris Loads: See Section 4 of Enclosure 1 and Section 3 (item 8) of Enclosure 2.
- Per NRC/NEI public meeting dated January 16, 2013, input-output files are not included with the Flood Hazard Reevaluation Report but are available for inspection upon request.

- c. Comparison of current and reevaluated flood causing mechanisms at the site. Provide an assessment of the current design basis flood elevation to the reevaluated flood elevation for each flood causing mechanism. Include how the findings from Enclosure 4 of the 50.54(f) letter (i.e., Recommendation 2.3 flooding walkdowns) support this determination. If the current design basis flood bounds the reevaluated hazard for all flood causing mechanisms, include how this finding was determined.**

Response:

- The current design basis flood hazard elevation bounds the reevaluated hazard for flooding in streams and rivers, dam breaches and failures, ice-induced flooding, and channel migration or diversion. A comparison of current and reevaluated flood hazard elevations for all flood causing mechanisms at the site is provided in Enclosure 2, Section 4, Table 1, and summarized below.

Flood-Causing Mechanism	Current Design Basis	Flood Hazard Reevaluation Elevation	Comparison
Local Intense Precipitation	Not considered	Varies	Not bounded
Flooding in Streams and Rivers	603 feet MSL	600.5 feet MSL	Bounded
Dam Breaches and Failures	Not considered	600.9 feet MSL	Bounded
Storm Surge	Not applicable	Not applicable	Not applicable
Seiche	Not applicable	Not applicable	Not applicable
Tsunami	Not applicable	Not applicable	Not applicable
Ice-Induced Flooding	Not considered	579.8 feet MSL	Bounded
Channel Migration or Diversion	See Note 1	See Note 1	Bounded
Combined Effects (PMF + Dam Failure + Wind-Generated Waves)	Not considered	605.0 feet MSL	Not bounded
Hydrodynamic and Debris Loads	Not considered	See Note 2	Not bounded

Notes:

1. Channel migration or diversion is not an issue because the river flow and geometry is controlled by USACE navigational structures.
2. Impacts from hydrodynamic and debris loads will be further evaluated in the Integrated Assessment.

- The effects associated with the combined-effect PMF (i.e. wind-generated waves, hydrodynamic loads, and debris loads) were not explicitly considered in the current design basis flood hazard.
- The effects from flooding caused by a Local Intense Precipitation event were not considered in the current design basis flood hazard.
- Available physical margin information is not applicable to this site and was not collected during the flooding walkdown. Flooding walkdown results do not impact results of the flood hazard reevaluation. See Reference 6.

**d. Interim evaluation and actions taken or planned to address any higher flooding hazards relative to the design basis, prior to completion of the integrated assessment described below, if necessary.**

Response:

i. Integrated Assessment Trigger and Plan

Per Enclosure 2 of Reference 1, an Integrated Assessment is required for plants where the current design basis floods do not bound the reevaluated hazard for all flood causing mechanisms. Reference 4 presents four approaches for performing an Integrated Assessment based on the results of the flood hazard reevaluation.

- Scenario 1 - Reevaluated Hazard Bounded by Design Basis
- Scenario 2 - Only Local Intense Precipitation
- Scenario 3 - All Permanent and Passive Flood Protection
- Scenario 4 - Integrated Assessment Required

An Integrated Assessment is not necessary in Scenario 1. Limited evaluations can be conducted and submitted with the Flood Hazard Reevaluation Report under Scenarios 2 and 3 that only address specific sections of the Integrated Assessment Interim Staff Guidance (Reference 5). Licensees in Scenario 4 and those not including limited evaluations in the Flood Hazard Reevaluation Report under Scenarios 2 and 3 are required to perform a full Integrated Assessment.

Per response Part c above, the current design basis flood does not bound the reevaluated hazard for all flood causing mechanisms. Specifically, combined-effects (dam failure and wind-generated waves), hydrodynamic/debris loads, and local intense precipitation flooding were not considered in and not bounded by the current design basis flood hazard. Therefore, Quad Cities Nuclear Power Station plans to prepare a full Integrated Assessment (Scenario 4).

ii. Interim Evaluation and Actions Taken or Planned

Cases where the current design basis floods do not bound the reevaluated hazard for all flood causing mechanisms also require an interim evaluation and description of actions taken or planned to address any higher flooding hazards prior to completing the Integrated Assessment (per Item 1.d of Reference 1, Enclosure 2). The following summarizes the interim evaluations and actions taken or planned.

- Per response Part c above, flooding from a local intense precipitation event was not considered as a design basis flood hazard. The peak water levels at plant entrances during a local intense precipitation event are being evaluated to determine the impact of this event on the plant and identify interim actions. The interim evaluation will include:

- A visual inspection of plant grade level doors to confirm proper operation and assess seal condition.
- A visual inspection of plant drainage system components to confirm functionality.
- Evaluate the effects of local intense precipitation event on the plant, with respect to:
  - Building structures and doors and amount of leakage the doors would allow;
  - How the leakage through the doors affect plant equipment;
  - Recommended actions based on the results of the evaluations; and
  - Prioritizing actions for high risk areas.
- Develop and implement appropriate operational response procedures to mitigate the effects of the LIP Event.
- Perform additional local intense precipitation calculations to further explore site drainage affects.
- Obtain a site survey so that the results of the local intense precipitation analysis can be directly correlated to the door sill elevations.
- Determine if interim flood barriers are warranted until the 2-Year Integrated Assessment Report is complete.
- Flood mitigation practices, credited in the current design basis, are not adversely affected by the reevaluated river flood hazard. However, the following interim evaluations and actions, taken or planned, applicable to the combined-effects flood, including wind-generated waves and hydrodynamic/debris loads, will be developed:
  - Evaluate the effects of wind-generated waves on the plant.
  - Evaluate the effects of hydrodynamic and debris impact loading on the plant.
  - Revise Flooding Procedures to incorporate new issues (as appropriate) in accordance with updated river flood calculations.

***e. Additional actions beyond Requested Information item 1.d taken or planned to address flooding hazards, if any.***

Response:

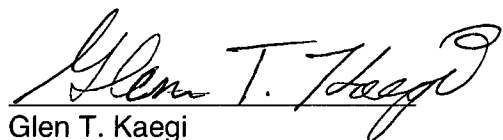
- None required.

A list of regulatory commitments contained in this letter is provided in Enclosure 4.

If you have any questions regarding this submittal, please contact Ron Gaston at (630) 657-3359.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 12<sup>th</sup> day of March 2013.

Respectfully submitted,



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

Enclosures:

1. Quad Cities Nuclear Power Station Local Intense Precipitation Evaluation Report, Revision 7
2. Quad Cities Nuclear Power Station Flood Hazard Reevaluation Report, Revision 0, In Response to the 50.54(f) Information Request Regarding Near-Term Task Force Recommendation 2.1 Flooding
3. CD-R labeled: "Quad Cities Nuclear Power Station Pertinent Site Data"  
**Document Components:**  
LIP-106 Quad Cities-DEM Locked Layers.dwg (requires AutoCAD or similar program)
  
4. Summary of Regulatory Commitments

cc: Director, Office of Nuclear Reactor Regulation (w/o Enclosure 3)  
Regional Administrator - NRC Region III (w/o Enclosure 3)  
NRC Senior Resident Inspector - Quad Cities Nuclear Power Station  
NRC Project Manager, NRR - Quad Cities Nuclear Power Station  
Ms. Jessica A. Kratchman, NRR/JLD/PMB, NRC  
Mr. Eric E. Bowman, NRR/DPR/PGCB, NRC or Ms. Eileen M. McKenna,  
NRO/DSRA/BPTS, NRC