Exelon Generation®

10 CFR 50.54(f)

RS-13-110

May 10, 2013

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

Dresden Nuclear Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Subject: Exelon Generation Company, LLC 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. Letter from Exelon Generation Company, LLC to U.S. Nuclear Regulatory Commission, "Extension Request-Response to March 12, 2012, Request for Information Enclosure 2, Recommendation 2.1, Flooding, Required Response 2, Flooding Hazard Reevaluation Report," dated March 11, 2013.
4. 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.
5. 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.
6. U.S. Nuclear Regulatory Commission, JLD-ISG-2012-05, "Guidance for Performing the Integrated Assessment for External Flooding", dated November 30, 2012.

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7. 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 (RS-12-168).

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 Dresden Nuclear Power Station, Units 2 and 3 site as a Category 1 Site requiring a Flooding Hazard Reevaluation Report submittal due date of March 12, 2013. In Reference 3, Exelon Generation Company, LLC (EGC) requested an extension to May 10, 2013 to submit the Dresden Nuclear Power Station, Units 2 and 3 Flooding Hazard Reevaluation Report. The information in the enclosures provides the Dresden Nuclear Power Station, Units 2 and 3 Flooding Hazard Reevaluation Report. The Dresden Nuclear Power Station, Units 2 and 3 Flooding Hazard Reevaluation Report follows the reevaluation process described in Reference 4.

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 Sections 2 & 3, Figures 1 & 2 of Enclosure 1.
- Topographic relief at the site is characterized by grades averaging approximately 2%. The site grading generally slopes away from the center of the site toward the cooling canals to the north and west, the Kankakee River to the east, and a concrete drainage channel along the western boundary of the site. No off-site areas drain onto the site; however, some off-site drainage does drain to the channel along the southern boundary of the site.
- Pertinent Site Data is provided in Enclosure 3.

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

Response:

- See Section 2.d of Enclosure 1, which describes the current design basis flood hazards for the local intense precipitation flood causing mechanism.
- See Section 2.a of Enclosure 2, which describes the current design basis flood hazards for all other 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 License 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 7 for results of the flooding walkdowns.
- See Section 3 of Enclosure 2 for additional site and watershed information used to assess the flood hazard.

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 3 (item 9) 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.
- Per Enclosure 2 of Reference 1 and Reference 4, the flood hazard reevaluation includes the affects of upstream dam failures. Reference 4 indicates that three dam failure mechanisms should be considered: 1) hydrologically-induced, 2) seismically-induced, and 3) sunny-day dam failures. The reevaluation assumes upstream dams fail under seismic loading conditions. The affects of sunny-day failure are

considered bounded, in terms of flood magnitude and warning time, by the seismically-induced failure mechanism. Upstream dams are also assumed to fail under hydrologic loading conditions. However, two of the more critical upstream dams (Lockport and Brandon Road Locks/Dams) are considered as only partially-failing during the postulate flood at the site.

At Lockport, the US Army Corps of Engineers (USACE) owns and operates the navigation lock (including concrete walls and lock gate). The remaining structures (including earth embankments, sluice gates, and power house) are owned and operated by the Metropolitan Water Reclamation District of Greater Chicago (MWRD). All structures at the Brandon Road facility (including lock gates, concrete walls, earth embankments, sluice gates, headgates, and tainter gates) are owned and operated by the USACE.

The upstream earth embankments at the Lockport and Brandon Road facilities have a high potential of breaching because of overtopping during the postulated flood at the site. An assessment of the other structures was conducted to demonstrate that these structures would remain stable under postulated flood loading conditions. The assessment considered scourabilty/erodability of foundation rock and stability of concrete structures and lock gates. Therefore, only the earthen embankments are modeled as breaching at these two dams for the hydrologic dam failure mechanism. Below is a summary of the non-failure justification for the concrete and gate structures:

- Headwater/tailwater differences are less during historic flood events and the postulated flood at the site than during normal operating conditions at both facilities. The net horizontal force in the downstream direction also is less during flood conditions than during the normal operating conditions.
- The foundation rock at both projects is a durable, competent dolomitic limestone resistant to scour/erosion. The rock is classified as "hard." The inverts of the navigation locks do not have a concrete floor slab. The minor erosion at Brandon Road occurred after 45 years of operation and was repaired and concrete aprons were added. No evidence of recent erosion was noted in the materials reviewed.
- Laboratory testing of the rock indicates that it is strong and resistant to scour/erosion. Any overtopping of the concrete structures is judged not to produce scour at the foundation.
- The Lockport powerhouse is a massive structure with draft tubes keyed into rock. The construction characteristics and geometry add to the stability of the structure.
- Side friction between the Lockport powerhouse, the 48-foot wide gravity section, and the 12-foot wide gravity section add to the stability of these structures.
- The abandoned MWRD lock at Lockport has a gravity concrete bulkhead on the upstream side.
- The navigation lock miter gate at Lockport has additional strength equivalent to a 15-foot hydrostatic head which is considered adequate to withstand the 3.74 feet of overtopping predicted in the postulated flood at the site.

- The navigation lock miter gates at Brandon Road have additional strength equivalent to a 15-foot hydrostatic head. It is concluded that the Brandon Road miter gates have adequate strength to withstand 8.72 feet of overtopping predicted in the postulated flood at the site.
- The USACE considers the stability of the Lockport navigation lock to be adequate.
- The Joliet flood walls upstream from Brandon Road are considered by the USACE to have adequate stability. If the walls did fail while being overtopped during the postulated flood, the effect would be to lower the elevation of the downstream flood water surface. Water flowing out of the Des Plaines River at the floodwall locations would pond in the City of Joliet and not produce a flood wave to the site.
- The concrete structures forming the dam at Brandon Road were anchored to provide adequate factors of safety.

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. (The surge, seiche, and tsunami flood-causing mechanisms were screened as being not applicable.) The current design basis flood does not bound the reevaluated hazard for combined-effects flooding, hydrodynamic/debris loads, and local intense precipitation flooding. A comparison of current and reevaluated flood hazards is provided in Section 5 of Enclosure 1 for Local Intense Precipitation; Section 4, Table 6 of Enclosure 2 for all other flood-causing mechanism; and summarized below.

Flood-Causing Mechanism	Current Design Basis Hazard (Elevation in feet MSL*)	Flood Hazard Reevaluation Hazard (Elevation in (feet MSL or NGVD-29* unless otherwise noted)	Design Basis Bounds Reevaluation Flood Hazard?
Local Intense Precipitation	517.45	517.59 to 518.08	Not bounded
Flooding in Streams & Rivers (from the Probable Maximum Flood (PMF))	525	See Dam Breaches	Bounded
Dam Breaches and Failures	525 (basis for comparison is 'Streams and Rivers' elevation. Elevation from cooling lake dam failure only is 508.2)	524.22 to 524.88	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	515.77 feet	Bounded (below plant grade)
Channel Migration or Diversion	Channel migration or diversion not expected to affect flooding at the site	Channel migration or diversion not expected to affect flooding at the site	Bounded
Combined Effects (River Flooding from Precipitation + Dam Failure + Wind-Generated Waves)	528	526.48 to 529.01	Not bounded
Hydrodynamic and Debris Loads	Not considered	20.88 to 117.20 psf	Not bounded

* NGVD-29 is equivalent to the Mean Sea Level (MSL) datum. See Section 3 of Enclosure 2 for more information.

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 5 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 6). 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 Part c above, the current design basis flood does not bound the reevaluated hazard for all flood causing mechanisms. Specifically, combined-effects (combination of river flooding from precipitation, upstream dam failure, and wind-generated waves), hydrodynamic/debris loads, and local intense precipitation flooding were not bounded by the current design basis flood hazard. Therefore, Dresden 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. The following summarizes the interim evaluations and actions taken or planned.

- Local Intense Precipitation: Results of the local intense precipitation hazard reevaluation shows peak flooding depths between 0.09 and 0.58 foot above the bottom of non-water tight door openings to the reactor building, with corresponding durations between 0.65 and 1.75 hours. The reactor building is kept under a negative pressure and the air in-leakage is minimized. This leads to small flow paths for local intense precipitation induced flood water into the reactor building. Additionally, each reactor building basement is equipped with two sumps. Each sump has two pumps, each capable of handling up to 50 gallons per minute of flow rate. Therefore, the local intense precipitation event is not anticipated to adversely affect the safe operation of the reactors.

- The higher levels seen as a result of the reevaluation do not adversely affect the current flood mitigation strategy. However, the following measures are being implemented to enhance current flood coping strategies.

  - Enhanced river and rainfall forecasting information in flood emergency procedures (completed January 25, 2013).

  - Installed markers at the Dresden 2/3 cribhouse between elevations 509 and 517 feet MSL, to support the enhanced river forecasting procedures (completed January 25, 2013).

- Installed permanent flood barriers, in lieu of sandbagging, to protect the isolation condenser makeup pump building (completed January 25, 2013).

- Purchased and mobilized floatable platform to raise the diesel driven pump as high as elevation 545 feet MSL (with the crane being the backup option); included in the latest update to flood emergency procedure (completed January 25, 2013).

- Modification plans are currently being evaluated to harden 11 penetrations around the reactor building with passive flood protection features.

- An evaluation of the Unit 2/3 Emergency Diesel Generator Building for exposure to flooding is currently in progress.

- Exelon has procured approximately 4,000 feet of Aqua Dam material and associated supplies to protect the power block and the administration building. The filled height of the Aqua Dam is 8 feet and the vendor's user guide recommends a flood protection height of 6 feet with an 8-foot high dam. With a plant grade elevation of 517 feet MSL, the Aqua Dam will provide protection for floods up to elevation 523 feet MSL. The Aqua Dam provides defense in depth while protecting the station assets for flood levels up to 523 feet MSL.

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 10th day of May 2013.

Respectfully submitted,

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

Enclosures:

1. Dresden Nuclear Power Station, Units 2 and 3, Local Intense Precipitation Evaluation Report, Revision 3
2. Dresden Nuclear Power Station, Units 2 and 3, Flood Hazard Reevaluation Report, Revision 0
3. CD-R labeled: "Dresden Nuclear Power Station Pertinent Site Data"
   Document Components:
   LIP-106 Dresden-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 - Dresden Nuclear Power Station
NRC Project Manager, NRR - Dresden 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
Illinois Emergency Management Agency - Division of Nuclear Safety (w/o Enclosure 3)