



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
WASHINGTON, D.C. 20555-0001

November 1, 2016

Mr. Bryan C. Hanson  
Senior Vice President  
Exelon Generation Company, LLC  
President and Chief Nuclear Officer  
Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

**SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2 – FLOOD HAZARD  
EVALUATION OF LIMITED INTEGRATED ASSESSMENT (CAC NOS. MF6107  
AND MF6108)**

Dear Mr. Hanson:

The purpose of this letter is to provide the U.S. Nuclear Regulatory Commission's (NRC's) evaluation of the limited integrated assessment, as described in the March 12, 2015, flood hazard reevaluation report (FHRR) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15093A216), submitted by Exelon Generation Company, LLC (Exelon, the licensee) for Limerick Generating Station, Units 1 and 2 (Limerick). The NRC staff reviewed the information provided in the FHRR and determined that sufficient information was provided to be responsive to Enclosure 2 of the Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f), "Conditions of Licenses" letter (hereafter referred to as the "50.54(f) letter"). The NRC staff concludes that the licensee will not need to submit an integrated assessment or focused evaluation for any of the flooding hazards as described in the "Closure Plan for the Reevaluation of Flooding Hazards for Operating Nuclear Power Plants" (COMSECY-15-0019). This completes the NRC's efforts associated with CAC Nos. MF6107 and MF6108.

**BACKGROUND**

By letter dated March 12, 2012 (ADAMS Accession No. ML12053A340), the NRC issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to 10 CFR 50.54(f). The request was issued in connection with implementing lessons-learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant.

Enclosure 2 of the 50.54(f) letter requested that licensees reevaluate flood hazards for their respective sites using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses. If the reevaluated hazard for any flood-causing mechanism is not "bounded" by the plant's current design-basis (CDB) flood hazard, an additional assessment of plant response would be necessary.

Specifically, the 50.54(f) letter addresses the situation in which an integrated assessment (IA) should be provided and described the information that the IA should contain. According to the NRC guidance, an IA is required for plants where the CDB floods do not bound the reevaluated hazard for all flood causing mechanisms. The NRC provided guidance for performing an IA in Japan Lessons-Learned Project Directorate (JLD) Interim Staff Guidance (ISG) JLD-ISG-2012-05, "Guidance for Performing the Integrated Assessment for External Flooding," dated November 30, 2012 (ADAMS Accession No. ML12311A214).

On December 3, 2012, the NRC issued a letter providing additional clarification regarding trigger conditions for performing an IA (ADAMS Accession No. ML12326A912). Often referred to as the "trigger letter," this document identifies four IA approach scenarios that are possible based on the results of the flood hazard reevaluation. The four possible scenarios are:

- Scenario 1 - Reevaluated flood hazard bounded by design basis;
- Scenario 2 - only local intense precipitation (LIP) hazard unbounded;
- Scenario 3 - all permanent and passive flood protection effective for unbounded hazards; and
- Scenario 4 - integrated assessment required.

As described in the trigger letter, an IA is not necessary for Scenario 1. A limited IA that only addresses specific sections of the ISG is required under Scenarios 2 and 3, in which case a limited IA could be submitted with the FHRR. If Scenarios 1 through 3 do not apply, then per Scenario 4, a full IA would be submitted.

The results of the flood hazard reevaluation for Limerick indicate the reevaluated flooding hazard is not bounded by the CDB flood for all applicable flood-causing mechanisms. However, because LIP is the only unbounded flood mechanism, Scenario 2 can be used to satisfy the IA requirements in Enclosure 2 of the 50.54(f) letter. Per the trigger letter, under Scenario 2, if LIP is the only portion of the reevaluated hazard that is not bounded by the CDB, the licensee can limit the assessment to only the site drainage. This limited IA could be performed using Section A.1.1.6 of Appendix A to the JLD-ISG-2012-05 and the application of guidance contained in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [light-water reactor] Edition."

As documented in the interim staff response letter issued by the NRC staff to the licensee, dated December 24, 2015 (ADAMS Accession No. ML15357A517), the reevaluated LIP flood hazard for Limerick is not bounded by the CDB. As such, the NRC staff has reviewed the portion of the Limerick FHRR that contains the limited IA for LIP, and documented its evaluation for this hazard mechanism.

#### LIMITED INTEGRATED ASSESSMENT EVALUATION

The licensee stated that the Limerick FHRR was developed and the site flood hazard was assessed consistent with the guidance in JLD-ISG-2012-05 and that LIP is the only portion of the reevaluated hazard that is not bounded. The licensee clarified in the Limerick FHRR that the south side of the plant, near the emergency diesel generators (EDGs), was not analyzed with the design-basis LIP flood; thus, this was the only area where LIP was determined to be unbound. The licensee further explained that Section A.1.1.6 of JLD-ISG-2012-05 is not

applicable since the reevaluated LIP flood elevation is lower than the design basis LIP. Therefore, the focus of the licensee's limited IA was to determine the impact of LIP on the EDGs and if additional compensatory measures are needed to maintain plant safety. The NRC staff agrees that Section A.1.1.6 of JLD-ISG-2012-05 is not applicable since the reevaluated LIP flood is less than the design basis and noted that the licensee has proactively assessed the impact of LIP on the south side of the plant.

In the Limerick FHRR, the licensee stated that it analyzed the ingress volume of floodwater entering the doors to the EDG rooms from a LIP event and compared it to the allowable volume in the diesel rooms in the diesel pit area. The results of the licensee's evaluation determined that there is no effect on safety-related equipment in the diesel generator rooms during the LIP flood and no compensating actions are necessary.

The NRC staff reviewed the licensee's Engineering Technical Evaluation 01550669-36 (ADAMS Accession No. ML16291A445) that analyzed the ingress volume of floodwater entering the doors to the EDG rooms. This evaluation reviewed the amount of water that could enter the rooms through a small door undercut and compared it to the allowable volume in the diesel pit area in each of the rooms. As long as the volume of water entering the rooms does not reach the EDGs, then no safety-related equipment will be affected. The NRC staff noted that the licensee's evaluation included several conservatisms when determining whether the EDGs would be impacted by the ingress of floodwaters. Specifically, the licensee's evaluation (1) assumed the bottom of the EDGs were lower than the actual configuration; (2) did not model the external diesel room doors being located under 6-foot overhangs, which prevent water from running down the walls directly to the external doors; and (3) did not consider the 2-foot parapet on the building that would initially collect water prior to running off onto the walls and two drains near the top of the 2-foot parapet. The NRC staff determined that even with these conservatisms in the licensee's evaluation, the volume of floodwater entering the EDG rooms does not exceed the diesel pit area and the EDGs are not impacted by the floodwaters. Based on the conservatisms included in the licensee's evaluation yielding results that floodwaters do not reach the bottom of the EDGs, the NRC staff finds the licensee has adequately assessed the reevaluated LIP hazard on the south side of the plant and that compensating actions are not necessary.

## CONCLUSION

Based on the information provided in the Limerick FHRR for the limited IA, the NRC staff confirmed that the licensee responded appropriately to Enclosure 2, Required Response 2, of the 50.54(f) letter. In reaching this determination, NRC staff confirmed the licensee's conclusions that Limerick has adequate protection reliability and margin against potential flood water infiltration. The NRC staff concludes that the licensee conducted the hazard reevaluation using present-day methodologies and regulatory guidance used by the NRC staff in connection with early site permit and combined operating license reviews.

B. Hanson

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If you have any questions, please contact me at (301) 415-6197 or e-mail at [Tekia.Govan@nrc.gov](mailto:Tekia.Govan@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Tekia V. Govan". The signature is fluid and cursive, with a long horizontal flourish extending to the right.

Tekia Govan, Project Manager  
Hazards Management Branch  
Japan Lessons-Learned Division  
Office of Nuclear Reactor Regulation

Docket Nos.: 50-352 and 50-353

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B. Hanson

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If you have any questions, please contact me at (301) 415-6197 or e-mail at [Tekia.Govan@nrc.gov](mailto:Tekia.Govan@nrc.gov).

Sincerely,

**/RA/**

Tekia Govan, Project Manager  
Hazards Management Branch  
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Docket Nos.: 50-352 and 50-353

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**ADAMS Accession No.: ML16265A152**

**\*via email**

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