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

February 22, 2017

Mr. Marty L. Richey
Site Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Mail Stop A-BV-SEB1
P.O. Box 4, Route 168
Shippingport, PA 15077

SUBJECT: BEAVER VALLEY POWER 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 (CAC NOS. MF3286 AND MF3287)

Dear Mr. Richey:

The purpose of this letter is to provide a summary of the U.S. Nuclear Regulatory Commission (NRC) staff's assessment of the reevaluated flood-causing mechanisms described in the March 2, 2016, flood hazard reevaluation report (FHRR) submitted by FirstEnergy Nuclear Operating Company (FENOC, the licensee) for Beaver Valley Power Station, Units 1 and 2 (Beaver Valley) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16063A288), as well as supplemental information resulting from audits.

By letter dated March 12, 2012, the NRC issued a request for information pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.54(f) (hereafter referred to as the 50.54(f) letter) (ADAMS Accession No. ML12053A340). The request was issued as part of implementing lessons learned from the accident at the Fukushima Dai-ichi nuclear power plant. Enclosure 2 to the 50.54(f) letter requested licensees to reevaluate flood-causing mechanisms using present-day methodologies and guidance. Concurrent with the reevaluation of flooding hazards, licensees were required to develop and implement mitigating strategies in accordance with NRC Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). On March 30, 2015, the Commission provided staff requirements memorandum (SRM) (ADAMS Accession No. ML15089A236) to COMSECY-14-0037, "Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flooding Hazards," dated November 21, 2014 (ADAMS Accession No. ML14309A256), affirming that licensees need to address the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis external events. Revision 2 of Nuclear Energy Institute (NEI) guidance document NEI 12-06, dated December 2015, includes a methodology for performing a mitigating strategies assessment (MSA) with respect to the reevaluated flood hazards. On February 29, 2016, the NRC staff published Japan Lessons-Learned Division (JLD) Interim Staff Guidance (ISG) JLD-ISG-2012-01, Revision 1, "Compliance with Order EA-12-049, 'Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events'" (ADAMS Accession No. ML15357A142), in the *Federal Register (*81 FR 10283).

This ISG endorses Revision 2 of NEI 12-06 (ADAMS Accession No. ML16005A625). Based on the guidance provided in Revision 2 of NEI 12-06, any flood event duration parameters and applicable flood associated effects that were not provided in the FHRR should be considered as part of the Beaver Valley MSA. The NRC staff will evaluate the flood event duration parameters (including warning time and period of inundation) and flood-related associated effects developed by the licensee during the NRC staff's review of the MSA.

In addition to the MSA, in order to complete its response to the information requested by Enclosure 2 to the 50.54(f) letter, the licensee is expected to submit an integrated assessment or a focused evaluation, as appropriate, to address the reevaluated flood hazards that exceed the current design basis, as described in the NRC letter, "Coordination of Request for Information Regarding Flooding Hazard Reevaluation and Mitigating Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML15174A257). This letter describes the changes in the NRC's approach to the flood hazard reevaluations that were approved by the Commission in its SRM to COMSECY-15-0019, "Closure Plan for the Reevaluation of Flooding Hazards for Operating Nuclear Power Plants" (ADAMS Accession No. ML15209A682).

The NRC staff has reviewed the information submitted by the licensee in its FHRR and has summarized the results of the review in the tables provided as an enclosure to this letter. Table 1 provides the current design-basis flood hazard mechanisms. Table 2 provides the reevaluated flood hazard mechanisms; however, the reevaluated flood hazard mechanisms bounded by the current design basis (Table 1) are not included.

The NRC staff performed a confirmatory analysis of the information provided in the FHRR to independently evaluate the sensitivity of the reevaluated hazards to input parameters. The confirmatory analysis indicated that the streams and rivers flood causing mechanism is sensitive to the input parameters and methodology used. The sensitivities identified have been discussed with the licensee. As a measure of conservatism, the licensee agreed to use the current design basis stillwater elevations for streams and rivers for the subsequent flood evaluations addressing flooding due to streams and rivers. The water elevations summarized in Table 2 reflect this commitment.

Based on the information provided by the licensee and the staff's confirmatory analysis, the NRC staff has concluded that the reevaluated flood hazard information, as summarized in Table 2 of the enclosure, is suitable for the assessment of mitigating 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 Beaver Valley. Further, the NRC staff has concluded that the enclosed reevaluated flood hazard information is suitable input for other flooding assessments associated with the 50.54(f) letter. The NRC staff plans to issue a staff assessment documenting the basis for these conclusions at a later time.

If you have any questions, please contact me at (301) 415-3809 or e-mail at Juan.Uribe@nrc.gov.

Sincerely,

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

Docket Nos. 50-334 and 50-412

Enclosure:
Summary of Results of Flooding
Hazard Re-Evaluation Report

cc w/encl: Distribution via Listserv

Table 1. Current Design Basis Flood Hazards for Use in the MSA

Mechanism	Stillwater Elevation	Waves/ Runup	Design Basis Hazard Elevation	Reference
Local Intense Precipitation				
BVPS Unit 2: Safeguards Building	732.5 ft NGVD29	Minimal	732.5 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 1	No Impact on the Site Identified	No Impact on the Site Identified	No Impact on the Site Identified	FHRR Section 2.1.1
BVPS Unit 2: Main Steam Valve Building Area	732.5 ft NGVD29	Minimal	732.5 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 2: Emergency Diesel Generator Building (1 Door)	732.5 ft NGVD29	Minimal	732.5 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 2: Auxiliary Building (3 Doors)	735.4 ft NGVD29	Minimal	735.4 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 2: Fuel and Decontamination Building (1 Door)	735.3 ft NGVD29	Minimal	735.3 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 2: Control Building (3 Doors; South)	735.4 ft NGVD29	Minimal	735.4 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 2: Control Building (1 Door; North)	735.4 ft NGVD29	Minimal	735.4 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 2: Service Building (1 Door; SB30-8)	732.5 ft NGVD29	Minimal	732.5 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 2: Reactor Containment (Equipment Hatch)	735.1 ft NGVD29	Minimal	735.1 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6

Table 1. Current Design Basis Flood Hazards for Use in the MSA

Mechanism	Stillwater Elevation	Waves/ Runup	Design Basis Hazard Elevation	Reference
BVPS Unit 2: Service Building (1 Door)	732.5 ft NGVD29	Minimal	732.5 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 2 Fuel and Decontamination Building (3 Doors)	735.3 ft NGVD29	Minimal	735.3 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
BVPS Unit 2: Emergency Diesel Generator Building (3 Doors)	732.4 ft NGVD29	Minimal	732.4 ft NGVD29	FHRR Section 2.1.1 & UFSAR Table 2.4-6
Streams and Rivers				
Probable Maximum Flood	730.0 ft NGVD29	Not applicable	730.0 ft NGVD29	FHRR Section 2.1.2 & Table 3
Peggs Run - BVPS Unit 1	Not included in DB	Not included in DB	Not included in DB	FHRR Section 2.1.2 & Table 3
Peggs Run - BVPS Unit 2	No Impact on the Site Identified	No Impact on the Site Identified	No Impact on the Site Identified	FHRR Section 2.1.2 & Table 3
Combined Event - Probable Maximum Flood with Wind Wave for Units 1 & 2 at the Intake Structure	730.0 ft NGVD29	6.7 ft	736.7 ft NGVD29	FHRR Section 2.1.8 & Table 3
Failure of Dams and Onsite Water Control/Storage Structures				
Conemaugh Dam with Standard Project Flood - Units 1 & 2	725.2 ft NGVD29	Not applicable	725.2 ft NGVD29	FHRR Section 2.1.3 & Table 3
Storm Surge				
BVPS Unit 1	Not included in DB	Not included in DB	Not included in DB	FHRR Section 2.1.4 & Table 3
BVPS Unit 2	No Impact on the Site Identified	No Impact on the Site Identified	No Impact on the Site Identified	FHRR Section 2.1.4 & Table 3

Table 1. Current Design Basis Flood Hazards for Use in the MSA

Mechanism	Stillwater Elevation	Waves/ Runup	Design Basis Hazard Elevation	Reference
Seiche				
BVPS Unit 1	Not included in DB	Not included in DB	Not included in DB	FHRR Section 2.1.4 & Table 3
BVPS Unit 2	No Impact on the Site Identified	No Impact on the Site Identified	No Impact on the Site Identified	FHRR Section 2.1.4 & Table 3
Tsunami				
BVPS Unit 1	Not included in DB	Not included in DB	Not included in DB	FHRR Section 2.1.5 & Table 3
BVPS Unit 2	No Impact on the Site Identified	No Impact on the Site Identified	No Impact on the Site Identified	FHRR Section 2.1.5 & Table 3
Ice-Induced Flooding				
	No Impact on the Site Identified	No Impact on the Site Identified	No Impact on the Site Identified	FHRR Section 2.1.6 & Table 3
Channel Migrations/Diversions				
BVPS Unit 1	Not included in DB	Not included in DB	Not included in DB	FHRR Section 2.1.7 & Table 3
BVPS Unit 2	No Impact on the SIte Identified	No Impact on the Site Identified	No Impact on the Site Identified	FHRR Section 2.1.7 & Table 3

Note 1: Reported values are rounded to the nearest one-tenth of a foot.

Table 2. Reevaluated Flood Hazards for Flood-Causing Mechanisms for Use in the MSA

Mechanism	Stillwater Elevation	Waves/ Runup	Reevaluated Hazard Elevation	Reference
Local Intense Precipitation				
BVPS Unit 1: Main Steam Cable Vault (MS-35-1)	735.5 ft NGVD29	Minimal	735.5 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Diesel Generator Building (G-35-2)	735.3 ft NGVD29	Minimal	735.3 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Diesel Generator Building (G-35-3)	735.3 ft NGVD29	Minimal	735.3 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Diesel Generator Building (Removable Shield E)	735.2 ft NGVD29	Minimal	735.2 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Diesel Generator Building (Removable Shield W)	735.3 ft NGVD29	Minimal	735.3 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Coolant Recovery Tanks (TA-35-1)	735.6 ft NGVD29	Minimal	735.6 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Coolant Recovery Tanks (Removable Panel)	735.6 ft NGVD29	Minimal	735.6 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Safeguards (SG-47-1)	735.4 ft NGVD29	Minimal	735.4 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Fuel Building (F-35-1; F-35-3)	735.9 ft NGVD29	Minimal	735.9 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Fuel Building (F-35-2)	735.6 ft NGVD29	Minimal	735.6 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Fuel Building (F-35-4)	735.7 ft NGVD29	Minimal	735.7 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3

Table 2. Reevaluated Flood Hazards for Flood-Causing Mechanisms for Use in the MSA

Mechanism	Stillwater Elevation	Waves/ Runup	Reevaluated Hazard Elevation	Reference
BVPS Unit 1: Decontamination Building (D-35-1)	735.2 ft NGVD29	Minimal	735.2 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Decontamination Building (D-35-2)	735.3 ft NGVD29	Minimal	735.3 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Service Building (S-35-44)	735.5 ft NGVD29	Minimal	735.5 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Service Building (S-35-48)	735.5 ft NGVD29	Minimal	735.5 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Service Building (S-35-49)	735.5 ft NGVD29	Minimal	735.5 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Service Building (S-35-67)	735.5 ft NGVD29	Minimal	735.5 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Warehouse (W-35-1)	735.5 ft NGVD29	Minimal	735.5 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Waste Gas Storage Area (DT-27-1)	735.6 ft NGVD29	Minimal	735.6 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Containment (Equipment Hatch)	735.2 ft NGVD29	Minimal	735.2 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Control Building (O-35-1)	735.6 ft NGVD29	Minimal	735.6 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Control Building (S-35-71)	735.6 ft NGVD29	Minimal	735.6 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 1: Control Building (S-35-72)	735.8 ft NGVD29	Minimal	735.8 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3

Table 2. Reevaluated Flood Hazards for Flood-Causing Mechanisms for Use in the MSA

Mechanism	Stillwater Elevation	Waves/ Runup	Reevaluated Hazard Elevation	Reference
BVPS Unit 1: Control Building (S-35-74)	735.6 ft NGVD29	Minimal	735.6 ft NGVD29	FHRR Section 3.8.4 & Tables 1 & 3
BVPS Unit 2: Safeguards (SG-37-4)	734.7 ft NGVD29	Minimal	734.7 ft NGVD29	FHRR Section 3.8.4 & Tables 2 & 3
BVPS Unit 2: Diesel Generator Building (DG-32-5)	732.3 ft NGVD29	Minimal	732.3 ft NGVD29	FHRR Section 3.8.4 & Tables 2 & 3
BVPS Unit 2: Auxiliary Building (A-35-1)	735.7 ft NGVD29	Minimal	735.7 ft NGVD29	FHRR Section 3.8.4 & Tables 2 & 3
BVPS Unit 2: Auxiliary Building (A-35-3)	735.6 ft NGVD29	Minimal	735.6 ft NGVD29	FHRR Section 3.8.4 & Tables 2 & 3
BVPS Unit 2: Auxiliary Building (A-35-5)	735.6 ft NGVD29	Minimal	735.6 ft NGVD29	FHRR Section 3.8.4 & Tables 2 & 3
BVPS Unit 2: Fuel Building (F-35-1)	735.5 ft NGVD29	Minimal	735.5 ft NGVD29	FHRR Section 3.8.4 & Tables 2 & 3
BVPS Unit 2: Fuel Building (F-35-2)	735.4 ft NGVD29	Minimal	735.4 ft NGVD29	FHRR Section 3.8.4 & Tables 2 & 3
BVPS Unit 2: Containment (Equipment Hatch)	734.6 ft NGVD29	Minimal	734.6 ft NGVD29	FHRR Section 3.8.4 & Tables 2 & 3
BVPS Unit 2 Main Steam Cable Vault (MS-35-3)	732.5 ft NGVD29	Minimal	732.5 ft NGVD29	FHRR Section 3.8.4 and Table 2 & 3
BVPS Unit 2 Safeguards (SG-37-5)	732.5 ft NGVD29	Minimal	732.5 ft NGVD29	FHRR Section 3.8.4 and Table 2 & 3
BVPS Unit 2 Fuel Building (F-35-3)	735.3 ft NGVD29	Minimal	735.3 ft NGVD29	FHRR Section 3.8.4 and Table 2 & 3

Table 2. Reevaluated Flood Hazards for Flood-Causing Mechanisms for Use in the MSA

Mechanism	Stillwater Elevation	Waves/ Runup	Reevaluated Hazard Elevation	Reference
Streams and Rivers				
Combined Event - Probable Maximum Flood with Wind Wave for Unit 1 Turbine Building North Wall	730.0 ft [4] NGVD29	2.8 ft	732.8 ft NGVD29	USACE 2015 Evaluation of Upper Ohio River Basin FHRR Section 3.7 & Table 3
Combined Event - Probable Maximum Flood with Wind Wave for Unit 2 at Ground Slope Approaching Reactor Building	730.0 ft [4] NGVD29	4.0 ft	734.0 ft NGVD29	USACE 2015 Evaluation of Upper Ohio River Basin FHRR Section 3.7 & Table 3
Combined Event - Probable Maximum Flood with Wind Wave at Ground Slope Approaching the Emergency Outfall Structure	730.0 ft [4] NGVD29	4.5 ft	734.5 ft NGVD29	USACE 2015 Evaluation of Upper Ohio River Basin FHRR Section 3.7 & Table 3

Note 1: The licensee is expected to develop flood event duration parameters and applicable flood associated effects to conduct the MSA. The staff will evaluate the flood event duration parameters (including warning time and period of inundation) and flood associated effects during its review of the MSA.

Note 2: Reevaluated hazard mechanisms bounded by the current design basis (see Table 1) are not included in this table

Note 3: Reported values are rounded to the nearest one-tenth of a foot.

Note 4: Reported value is the Current Design Basis (CDB).

BEAVER VALLEY POWER 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 DATED February 22, 2017

DISTRIBUTION:

PUBLIC	JLD R/F	RidsNRRJLD Resource
JUribe, NRR	LQuinn-Willingham, NRO	RidsNroDsea Resource
RidsNrrDorlLpl1 Resource	RidsNrrDorl Resource	RidsNrrPMBeaverValley Resource
RidsRgn1MailCenter Resource	RidsNrrLASLent	RidsOgcMailCenter Resource
RidsOpaMail Resource	RidsAcrsAcnw_MailCtr Resource	CCook, NRO
ACampbell, NRO	RRivera-Lugo, NRO	LGibson, NRR
MWillingham, NRO	KSee, NRO	BHarvey, NRO
MShams, NRR		

ADAMS Accession Nos.: Letter ML17040A011 ; Enclosure ML17039A550 *via email

OFFICE	NRR/JLD/JHMB/PM*	NRR/JLD/LA	NRR/JLD/JHMB/BC(A)	NRR/JLD/JHMB/PM
NAME	JUribe	SLent	LGibson	JUribe
DATE	2/8/2017	2/10/2017	2/22/2017	2/22/2017

OFFICIAL AGENCY RECORD