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October 16, 2017
L-17-303

10 CFR 50.54(f)

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

SUBJECT:
Beaver Valley Power Station, Unit Nos. 1 and 2
Docket No. 50-334, License No. DPR-66
Docket No. 50-412, License No. NPF-73
Focused Evaluation Regarding Near-Term Task Force Recommendation 2.1 for Flooding (CAC Nos. MF3286 and MF3287)

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued a letter titled, "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," to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 2 of the 10 CFR 50.54(f) letter addresses Near-Term Task Force (NTTF) Recommendation 2.1 for flooding and requires two responses. The first response is for licensees to submit a hazard reevaluation report (HRR) in accordance with the NRC's prioritization plan. As indicated in NRC letter dated March 1, 2013, the NRC staff considers the reevaluated flood hazard to be "beyond the current design/licensing basis of operating plants." By letter dated March 2, 2016, FirstEnergy Nuclear Operating Company (FENOC) submitted the flood HRR for Beaver Valley Power Station (BVPS), Unit Nos. 1 and 2.

The second required response from the 10 CFR 50.54(f) letter regarding NTTF Recommendation 2.1 is for licensees to submit an integrated assessment report. By letter dated September 1, 2015, the NRC staff described changes in the NRC's approach to flood hazard reevaluations, including its use in evaluating mitigating strategies for beyond-design-basis external events, and the expected interactions and additional information needed to complete these activities. The NRC staff developed a graded approach for determining the need for, and scope of, plant-specific integrated assessments. One step is to perform a mitigating strategies assessment (MSA).

Guidance for performing MSAs for reevaluated flooding hazards is contained in Appendix G of Nuclear Energy Institute (NEI) 12-06, Revision 2, which was endorsed by the NRC in JLD-ISG-2012-01, Revision 1. FENOC submitted the MSA for flooding for BVPS by letter dated September 20, 2017.

Another step in the graded approach is to screen the reevaluated flooding hazards results to determine the need for, and scope of, the integrated assessment. Guidance for performing this screening is contained in NEI 16-05, Revision 1, which was endorsed by the NRC in JLD-ISG-2016-01, Revision 1. The screening results for BVPS are provided in the enclosed focused evaluation. The unbounded reevaluated flood mechanisms previously submitted in the flood HRR, local intense precipitation (LIP) flood and combined effects flooding (CEF), including wind-generated waves, do not impact key structures, systems, or components or challenge key safety functions at BVPS. Based on this focused evaluation, an integrated assessment is not needed. The actions related to the 10 CFR 50.54(f) request for information regarding NTTF Recommendation 2.1 for flooding are now complete for BVPS.

There are no new regulatory commitments contained in this letter. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing, at 330-315-6810.

I declare under penalty of perjury that the foregoing is true and correct. Executed on October 16, 2017.

Sincerely,

Richard D. Bologna

Enclosure:
Beaver Valley Power Station Unit 1 and 2 Flooding Focused Evaluation Summary

cc: Director, Office of Nuclear Reactor Regulation (NRR)
NRC Region I Administrator
NRC Resident Inspector
NRR Project Manager
Director BRP/DEP
Site BRP/DEP Representative

Enclosure
L-17-303

Beaver Valley Power Station Unit 1 and 2 Flooding Focused Evaluation Summary
(17 pages follow)

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BEAVER VALLEY POWER STATION UNIT 1 AND 2 FLOODING FOCUSED EVALUATION SUMMARY

SEPTEMBER 22, 2017

LETTER L-17-303

ATTACHMENT 1

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BEAVER VALLEY FLOODING FOCUSED EVALUATION SUMMARY

1 EXECUTIVE SUMMARY

The Beaver Valley Power Station (BVPS) has reevaluated its flooding hazard in accordance with the NRC's March 12, 2012, 10CFR50.54(f) request for information (RFI, Reference 1). 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 the NRC in a flood hazard reevaluation report (FHRR, Reference 2) on 3/2/2016 and is provided in the Mitigating Strategies Flood Hazard Information (MSFHI) documented in NRC's "Interim Staff Response to Reevaluated Flood Hazards" letter dated 2/22/2017 (ISR, Reference 10). No changes to the flooding analysis have been performed since the issuance of the MSFHI letter so that analysis will serve as the input to this Focused Evaluation (FE). There are 2 mechanisms that were found to exceed the design basis flood level at BVPS. These mechanisms are discussed below and included in this FE:

1.1 Combined Event Flood – Probable Maximum Flood with wind wave

The Combined Event Flood (CEF) is defined in the ISR at three specific site locations:

- Combined Event - Probable Maximum Flood with wind wave for Unit 1 Turbine Building north wall
- Combined Event - Probable Maximum Flood with wind wave for Unit 2 at ground slope approaching the Reactor Building
- Combined Event - Probable Maximum Flood with wind wave at ground slope approaching the Emergency Outfall Structure

The FE concludes that the CEF does not affect any key safety functions. No SSCs required for safe shutdown are subject to flooding from a CEF event. The CEF FE followed Path 2 of NEI 16-05, Rev. 1 and utilized Appendix B for guidance on evaluating the site protection features. CEF associated effects and flood event duration parameters were assessed and submitted as part of the Mitigating Strategies Assessment (MSA, Reference 13).

1.2 Local Intense Precipitation

The Local Intense Precipitation (LIP) is defined in the ISR by listing various critical doors that were identified and evaluated in the FHRR. Many of the doors listed in the ISR are not subject to flooding from the LIP. Site modifications, which have been completed, prevent water ingress through 2 critical doors and the remaining doors subject to flooding, but not modified, have been evaluated and shown to have no effect on key safety functions. The FE concludes that the LIP does not affect any key safety functions. The LIP FE followed Path 2 of NEI 16-05, Rev. 1 and utilized Appendix B for guidance on evaluating the site protection features. LIP associated effects and flood event duration parameters were assessed and submitted as a part of the Mitigating Strategies Assessment (MSA) (Reference 13).

This FE completes the actions related to external flooding required by the 10CFR50.54(f) RFI.

2 BACKGROUND

On March 12, 2012, the NRC issued 10CFR50.54(f) RFI to request information associated with Near-Term Task Force (NTTF) Recommendation 2.1 for flooding. The RFI directed licensees, in part, to develop and submit a 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 the BVPS, units 1 and 2, the FHRR Revision 0 was submitted on 3/2/2016 (Reference 2).

Following the Commission's directive to NRC Staff (Reference 4), the NRC issued a letter to the industry (Reference 7) indicating that new guidance is being prepared to replace instructions in the NRC directive 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 5), which was endorsed by the NRC in Reference 6. NEI 16-05 indicates that each flood-causing mechanism not bounded by the design basis flood (using only still-water and/or wind-wave runup level) should follow one of the following five assessment paths:

- Path 1: Demonstrate the 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: Utilize 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 10CFR50.54(f) RFI. Mechanisms in Paths 4 or 5 require an Integrated Assessment.

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. FENOC Letter to USNRC, Beaver Valley Power Station Units 1 And 2, Flood Hazard Reevaluation Report, Rev 0, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f), Regarding the Flooding Aspects of Recommendation 2.1 of the Near-Term Task Force (NTTF) Review of Insights from the Fukushima Dai-ichi Accident, dated 3/2/2016 (ML 16063A288).
3. 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.
4. 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.
5. Nuclear Energy Institute (NEI), Report NEI 16-05 [Rev 1], External Flooding Assessment Guidelines, dated June 2016.
6. U.S. Nuclear Regulatory Commission, JLD-ISG-2016-01, Guidance for Activities Related to Near-Term Task Force Recommendation 2.1, Flood Hazard Reevaluation; Focused Evaluation and Integrated Assessment, Revision 0, dated July 11, 2016.
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 12-06 [Rev 2], Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, dated December 2015.
9. U.S. Nuclear Regulatory Commission, JLD-ISG-2012-01, Revision 1, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events, dated January 22, 2016.
10. NRC Letter, 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), dated 2/22/2017 (ML 17040A011 with Enclosure ML 17039A550).
11. NRC Letter, Beaver Valley Power Station Units 1 and 2-Staff Assessment of the Flooding Walkdown Report Supporting Implementation of Near-Term Task Force Recommendation 2.3 Related to the Fukushima Dai-Ichi Nuclear Power Plant Accident (TAC Nos. MF0196 and MF0197), dated 6/16/2014 (ML 14156A233).
12. FENOC Letter to USNRC, FENOC 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 11/27/2012 (ML 12335A341).

13. FENOC Letter to USNRC, Beaver Valley Power Station Units 1 And 2, Mitigating Strategies Assessment (MSA) for Flooding, dated 9/20/2017 (ML 17263A122)

14. NORM-LP-7121, Rev 0, Beaver Valley Flooding Mitigating Strategy Assessment Support Document.

4 TERMS AND DEFINITIONS

APM – Available Physical Margin

BVPS – Beaver Valley Power Station

CEF - Combined Event Flood - including Wind Wave Action

CLB – Current Licensing Basis

DB - Design Basis

FHRR – Flood Hazard Reevaluation Report

FLEX – Diverse and flexible coping strategies covered by NRC order EA-12-049

ISR – Interim Staff Response

Key SSC – A System, Structure or Component relied upon to fulfill a Key Safety Function

KSF – Key Safety Function, i.e. core cooling, spent fuel pool cooling, or containment function.

LIP – Local Intense Precipitation

MSA – Mitigating Strategies Assessment as described in NEI 12-06 Rev 2, App G

MSFHI – Mitigating Strategies Flood Hazard Information

NTTF – Near Term Task Force commissioned by the NRC to recommend actions following the Fukushima Dai-ichi event

RFI – Request for Information

All elevations are in NGVD29/ MSL unless otherwise noted.

5 FLOOD HAZARD PARAMETERS FOR UNBOUNDED MECHANISMS

The NRC has completed the ISR which contains the Mitigating Strategies Flood Hazard Information (MSFHI) related to the BVPS FHRR. In the ISR, 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 BVPS. Further, the NRC staff has concluded that the licensee's reevaluated flood hazard information is suitable input for the Focused Evaluation associated with Near-Term Task Force Recommendation 2.1, Flooding." The enclosure to the ISR includes a summary of the current design basis and reevaluated flood hazard parameters, respectively. In Table 1 of the enclosure to the ISR, 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;
- Streams and Rivers;
- Seiche;
- Tsunami;
- Ice Induced Flooding; and
- Channel Migrations/Diversions.

In Table 2 of the enclosure to the ISR, the NRC lists reevaluated flood hazard information (specifically still-water elevation and wind-wave runup elevation) for the following flood-causing mechanisms that are not bounded by the design basis hazard flood level:

- Combined Event - Probable Maximum Flood with Wind Wave Action (CEF)
- Local Intense Precipitation (LIP)

These are the reevaluated flood-causing mechanisms that are addressed in the external flooding assessment. The two non-bounding flood mechanisms for BVPS are described in detail in the FHRR and the ISR letter. The following table summarizes how each of these unbounded mechanisms is addressed in this FE:

Table 1: Unbounded Flood Mechanisms

	Flood Mechanism	Summary of Evaluation
1	Combined Event - Probable Maximum Flood with Wind Wave Action	The CEF is evaluated using Path 2 of the Flooding Impact Assessment Process Path Determination Table, Section 6.3.3 of NEI 16-05. The flood parameters used in the evaluation are those stated in the ISR. For clarification, the still-water elevation reported in the ISR is 730.0 ft which is increased from the 727.53 ft submitted in the FHRR.
2	Local Intense Precipitation	The LIP is evaluated using Path 2 of the Flooding Impact Assessment Process Path Determination Table, Section 6.3.3 of NEI 16-05. The flood parameters used in the evaluation are those stated in the ISR.

In the ISR, the NRC states that the "staff confirms that the reevaluated flood hazards information defined in Table 2 [of the ISR] is suitable for assessment of the mitigating strategies developed in response to Order EA 12 049", and "is suitable input for other assessments associated with 50.54(f) letter". The staff also identified "Associated Effects" and "Flood Event Durations" not reported in the FHRR were expected to be provided in subsequent flooding evaluations. These parameters were provided in the Mitigating Strategies Assessment (Reference 13).

6 OVERALL SITE FLOODING RESPONSE

6.1 DESCRIPTION OF OVERALL SITE FLOODING RESPONSE

6.1.1 FLOOD MECHANISM CEF

The reevaluated CEF (Ohio River probable maximum flood with coincident wind wave activity) maximum values exceed the design basis flood elevation of 730.0 ft at three locations:

- 732.8 ft at the Unit 1 Turbine Building North wall.
- 734.0 ft at the ground slope approaching the Unit 2 Reactor Building.
- 734.5 ft at the ground slope approaching the Emergency Outfall Structure and the FLEX Storage Building.

The site is located on rolling hill terrain with the power block structures located on a terrace. Flooding in the Unit 1 Turbine Building begins when the water level exceeds elevation 707.5 ft. Once the flooding reaches the 722.5 ft elevation, the pipe tunnel leading to the Auxiliary Building and Safeguards Area will be subject to flooding. This flooding is described in the design basis to provide an offset to the uplift forces on the buildings due to buoyancy. The flooding in this area does not challenge any Key SSCs.

The Unit 1 Turbine Building is located north of the Unit 1 Service Building. The Turbine Building south wall is adjacent to the Service Building north wall (flood barrier) with a 4-inch seismic shake space in between. Based on this overall building arrangement, the wave runup at the north wall of the Unit 1 Turbine Building will result in no wave action or wave energy affecting the internal Service Building flood barrier wall. Multiple obstructions would prevent wave energy transfer including the Turbine Building north wall, which is metal siding with louvers, numerous large diameter piping runs, heavy equipment located within the Turbine Building, and the reinforced concrete Turbine Building south wall. Based on the overall arrangement, no wave action or wave energy can reasonably be considered to reach the internal Service Building flood barrier walls. The CEF flood water elevation at the internal Service Building flood barrier wall is the still-water elevation of 730.0 ft. The 730.0 ft is equal to and bounded by the existing UFSAR design basis and therefore does not challenge any Key SSCs.

The wave runup at the Unit 2 Power Block (Reactor Building) is maintained on the ground slope approaching the structures and therefore does not challenge any Key SSCs.

The wave runup adjacent to the Emergency Outfall Structure and the FLEX Storage Building is maintained on the ground slope approaching the structures and therefore does not challenge any Key SSCs.

6.1.2 FLOOD MECHANISM LOCAL INTENSE PRECIPITATION (LIP)

BVPS is located on rolling hill, terraced terrain with an approximate site grade elevation of 730 ft to 735 ft. Natural runoff from a precipitation event flows down to the Ohio River, which has a typical water surface elevation below 670 ft.

The reevaluated flood hazard concluded that due to the topography and locations of structures, various specific areas of the site could be temporarily flooded (shallow water depths with short duration). This results in several doors, leading to areas containing safety-related equipment, to be susceptible to postulated water infiltration from the LIP. Calculation 10080-DSC-0368 determined leakage by each door and evaluated the consequences of the accumulated leakage.

It has been determined that due to the shallow flood depths, short durations of the flood water, the configuration of the areas within the structures and the location of Key SSCs, all doors susceptible to water ingress during a LIP event will result in no adverse effects on Key SSC's, except for two doors. One door at the Unit 1 Fuel Building and one at the Unit 2 Service Building have been modified to install removable flood barrier panels to a level above the maximum LIP water elevation at the doors. The flood barriers are normally in the installed condition and therefore no manual actions are required prior to a LIP event.

Other permanent passive features relied upon during a LIP event, are not impacted by the reevaluated flood hazard. No additional actions or strategies are required.

The LIP will cause some difficulties with performing external activities including site access/ availability of offsite personnel. However, based on the short duration of the event, the shallow water depths and the low water velocities, this will not impact any required activities.

6.2 SUMMARY OF PLANT MODIFICATIONS AND CHANGES

The FHRR determined that based on the increased flood level from the LIP that several doors needed further evaluation. Calculation 10080-DSC-0368 performed this evaluation and determined two doors required modification. The modifications were for the installation of a removable flood barrier at each of the doors. Both have been completed.

Although not required for design basis, the Mitigating Strategies Assessment concluded that an additional door required a flood barrier to support FLEX activities. This modification is planned to be completed.

7 FLOOD IMPACT ASSESSMENT

7.1 FLOOD MECHANISM CEF (PATH 2 ASSESSMENT)

7.1.1 DESCRIPTION OF FLOOD IMPACT

Available Physical Margin

Site topographic conditions combined with the short duration of the CEF event prevents the flooding from impacting the key SSCs. The relative APM values are noted below. Since the maximum flood elevation does not impact any key SSCs, there is no consequential flood.

Table 2: CEF APM Evaluation

Location	Critical Elevation	Maximum CEF Elevation	Available Physical Margin
Unit 1 Turbine Building	707.5 ft	732.8 ft	NA-Unit 1 Turbine Bldg is flooded per design.
-Unit 1 Service Building north wall	730.0 ft (Flood Barrier)	730.0 ft (Still-water elevation)	0
Unit 2 Reactor Building	734.4 ft	734.0 ft	0.4 ft
Emergency Outfall Structure / FLEX Storage Building	Outfall Structure overflow weir - 735.0 ft	734.5 ft	0.5 ft
	ISFSI Pad - 735.5 ft		1.0 ft
	FLEX Bldg floor - 735.75 ft		1.25 ft

Relevant Associated Effects

Due to the low velocities (< 10 ft/sec) of the flood waters and the power block area consisting of hard surface materials (the area is mostly macadam and concrete), scour and erosion is not considered an issue. No significant debris is expected to be transported to the power block area based on the low velocities of the CEF event, and the multitude of obstacles, i.e. fence lines, structures, and topographical features around the power block area. Groundwater effects are negligible since the still-water elevation is equal to the site design basis. The associated wave runup does not impact Key SSC's and the design basis flood elevation is only exceeded during the period of wave runup. Therefore, impacts related to associated effects will be negligible.

7.1.2 ADEQUATE APM JUSTIFICATION AND RELIABILITY FLOOD PROTECTION

As demonstrated above, protection to all areas except the Unit 1 Turbine Building area (and subsequently flooded buildings) is provided by the plant site grade itself. Site grade and topography, which is inherently permanently-installed and passive, protects the plant from flooding. The gradual slope, obstructions and surface material between the site structures and

the river provide a reliable means of protection by minimizing the impact of erosion, groundwater affects and wave action on structures.

For the Unit 1 Turbine Building flooding, protection is provided by the Service Building north wall, which is a flood barrier up to the design basis flooding elevation of 730.0 ft. Since this is an interior wall there is not expected to be any debris loading and the flow of water is minimal, as previously discussed. The seals in this wall are designed for flooding up to 730.0 ft. In the event of leakage through penetration seals, there is a 12-inch curb on the Service Building side of the wall with provisions for installation of an electric pump (connected to the emergency power supply) designed to remove any accumulated leakage. These actions exist in the site flood abnormal operating procedure. Since the maximum CEF flooding does not exceed the 730.0 ft elevation, the wall and seals remain acceptable. There are existing site programs for structures monitoring and flood seal visual inspections.

The wind wave runup analysis for the FHRR included the following conservatisms in developing the wave impact on the site:

- 2-year annual extreme mile wind is used for wind speed analysis instead of generalized estimates or site specific data
- conservative fetch lengths are utilized in the analysis
- general methods are used for predicting wind generated wave characteristics in lieu of numerical wave modeling
- all waves are assumed to approach from a direct angle and therefore no reductions are incorporated for an angle of approach
- "upper limit" methods are used for the calculation of wind wave runup

7.1.3 Adequate Overall Site Response

This section is not applicable to BVPS as no additional manual actions are required to implement the flood protection strategy for a CEF event. Manual actions currently specified in existing site abnormal operating procedures are unchanged and would be executed during a CEF event. No temporary flood mitigation equipment is required.

7.2 FLOOD MECHANISM LIP (PATH 2 ASSESSMENT)

7.2.1 DESCRIPTION OF FLOOD IMPACT

Available Physical Margin

Site topographic conditions limit significant flooding from a LIP event over a large portion of the site. However, due to obstructions and configurations of site structures, specific areas have a potential for several inches of flooding. The structures themselves and permanent hardened flood protection features (including structures walls, doors, barriers, hatches, sumps and seals) are unaffected and therefore provide adequate protection of Key SSCs with sufficient margin available. The critical area was determined to be potential leakage past several exterior doors leading to the structures with Key SSCs. Table 3 identifies the doors that are impacted by the LIP (where the maximum flood elevation exceeds the door sill elevation).

The conservative evaluation performed for water leakage past the doors concluded that 10 of the doors would have no impact on Key SSCs. The remaining two doors were modified to mitigate the in-leakage due to the potential for excessive water volume based on the extended flooding duration at these two locations. The modifications have been completed and prevent any leakage at these locations.

Based on this, it is concluded that the LIP event will have no adverse effects on Key SSCs.

Relevant Associated Effects

Due to the low velocities (< 10 ft/sec) of the flood waters and the power block area consisting of hard surface materials (the area is mostly macadam and concrete), scour and erosion is not considered an issue. No significant debris is expected to be transported to the power block area based on the low velocities of the LIP event, and the multitude of obstacles, i.e. fence lines, structures, and topographical features around the power block area. Groundwater effects/ hydrostatic loading impacts on buildings and flood barriers, including penetration seals, are negligible due to the shallow depth of flooding and the relatively short duration (primarily less than 1.5 hours). Therefore, impacts related to associated effects are negligible.

Consequential Flooding

Determination of consequential flooding is included in Table 3 for the critical doors; however, this has a negligible affect since the maximum LIP flood event, including door leakage, does not impact any Key SSCs, based on the evaluation performed and the modifications completed.

7.2.2 ADEQUATE APM JUSTIFICATION AND RELIABILITY FLOOD PROTECTION

The LIP analysis is a conservative evaluation since it determines the associated flooding conditions assuming the following:

- The site active and passive drainage system features are non-functional.
- The entire roof drainage system contributes to surface runoff during the LIP event.
- The runoff losses for the BVPS site area are ignored.
- The Peggs Run discharge culvert (adjacent to the power block area) is assumed to be blocked and the modeling conservatively allows the overflow of Peggs Run to combine with the LIP runoff contributing to flooding of the power block area.

In actual practice, it is expected these systems will function as designed minimizing the depth of the flood waters associated with a LIP event.

The leakage evaluation performed to determine the flood impact at the critical doors is conservative. Specific flood levels were assumed at each door and the internal water level was assumed to be zero over the entire duration. Door thresholds were ignored and the leakage "gap" was conservatively determined. Also, interior floor drains were not credited.

The adequacy of the flood protection features was reviewed and affirmed under the 50.54(f) Flooding Recommendation 2.3, "Flooding Walk Downs" concluding that the structures, systems and components will function as described in the current licensing basis. The sites flood protection features are subject to periodic maintenance and there are existing procedures to control and periodically inspect flood protection features to insure there is continued functionality.

7.2.3 Adequate Overall Site Response

This section is not applicable to BVPS as no manual actions are required to implement the flood protection strategy. As noted previously, the two added door flood barriers are normally in the installed configuration alleviating any manual actions prior to a LIP event. No additional flood mitigation equipment is required.

Although not required for design basis, if FLEX activities are utilized, an additional flood barrier must be installed as described in the MSA (Reference 13).

Table 3: Evaluation of Critical Doors

	Door Number	Ground Elevation*	Door Elevation*	Consequential Flood Depth, ft (Door - Ground)	LIP Max Water Surface Elevation*	LIP Flood Depth, ft (LIP - Door)	LIP Flood Duration, hrs	Evaluation Results (Calculation 10080-DSC-0368)
Coolant Recovery Tanks	1-TA-35-1	735.3	735.5	0.2	735.6	0.1	0.3	No effect on Key SSCs
Fuel Building	1-F-35-1	735.0	735.5	0.5	735.9	0.4	6.0	**Modified** with flood barrier - 10" in height
	1-F-35-2	735.2	735.5	0.3	735.6	0.1	1.0	No effect on Key SSCs
	1-F-35-4	735.4	735.5	0.1	735.7	0.2	1.8	No effect on Key SSCs
Control Building	1-O-35-1	735.3	735.5	0.2	735.6	0.1	0.3	No effect on Key SSCs
	1-S-35-71	735.2	735.5	0.3	735.6	0.1	0.3	No effect on Key SSCs
	1-S-35-72	735.5	735.5	0.0	735.8	0.3	0.3	No effect on Key SSCs
	1-S-35-74	735.2	735.5	0.3	735.6	0.1	0.3	No effect on Key SSCs
Auxiliary Building	2-A-35-1	735.3	735.5	0.2	735.7	0.2	1.3	No effect on Key SSCs
	2-A-35-3	735.3	735.5	0.2	735.6	0.1	0.8	No effect on Key SSCs
	2-A-35-5	735.3	735.5	0.2	735.6	0.1	0.3	No effect on Key SSCs
Service Building	2-SB-30-8	731.7	732.0	0.3	732.5	0.5	6.0	**Modified** with flood barrier - 10" in height
*All elevations are in NGVD29/ MSL.								

8 CONCLUSION

This evaluation has determined that the unbounded CEF and LIP events, previously submitted in the FHRR (Reference 3), do not impact any Key SSC's or challenge Key Safety Functions at BVPS.

The reevaluated CEF is not bounded by the design basis. The primary feature protecting the site from the reevaluated flood hazard is the site grade and topography along with existing design basis flood barriers. All buildings that have Key SSCs have been shown to have adequate available physical margin.

The reevaluated local intense precipitation (LIP) is not bounded by the design basis. During a LIP event, it was estimated the maximum flood level would exceed the door elevations at 12 locations. Leakage through 10 of these doors does not impact Key SSC's or present any potential impact to Key Safety Functions. The remaining two doors have been modified with normally installed flood barriers. The site's passive permanent flood protection features were determined to be reliable and provide sufficient available physical margin to protect Key SSCs.

This FE concludes that the site flooding protection features provide adequate response to the FHRR and ISR identified reevaluated flood hazards that were not bounded by the current design basis.

This FE completes the actions related to external flooding required by the 10CFR50.54(f) RFI.