Dominion Nuclear Connecticut, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
Web Address: www.dom.com

Dominion®

June 28, 2017

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

Serial No.	17-268
NRA/WDC	R0
Docket Nos.	50-336/423
License Nos.	DPR-65
	NPF-49

DOMINION NUCLEAR CONNECTICUT, INC
MILLSTONE POWER STATION UNITS 2 AND 3
MITIGATING STRATEGIES ASSESSMENT (MSA) 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. Dominion Nuclear Connecticut, Inc letter to NRC, "Millstone Power Station Units 2 and 3, Flood Hazard Reevaluation Report in Response to March 12, 2012 Information Request Regarding Flooding Aspects of Recommendation 2.1," dated March 12, 2015 (Serial No. 15-106)

3. Dominion Nuclear Connecticut, Inc. letter to NRC, "Millstone Power Station Units 2 and 3 Flood Hazard Reevaluation Report Audit Preparation Documents," dated June 29, 2015 (Serial No. 15-106A)

4. Dominion Nuclear Connecticut, Inc. letter to NRC, "Millstone Power Station Units 2 and 3 Flood Hazard Reevaluation Report Audit Preparation Documents," dated December 18, 2015 (Serial No. 15-106B)

5. 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

6. Nuclear Energy Institute (NEI), Report NEI 12-06, Rev. 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," dated December 2015

7. 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

8. NRC letter (Lauren Gibson) to Dominion Nuclear Connecticut, Inc. (David A. Heacock), "Millstone Power Station, Units 2 and 3 – Interim Staff Response to

A010
NRR

Reevaluated Flood Hazards Submitted in Response to 10CFR50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (CAC Nos. MF6109 and MF6110)," dated December 21, 2016, (Serial No. 16-494)

9. Dominion Nuclear Connecticut, Inc. letter to NRC, "Millstone Power Station Unit 3, Compliance Letter and Final Integrated Plan in Response to the March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated June 23, 2015, (Serial No. 14-393D)

10. Dominion Nuclear Connecticut, Inc. letter to NRC, "Millstone Power Station Unit 2, Compliance Letter and Final Integrated Plan in Response to the March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," dated December 29, 2015, (Serial No. 14-393F)

On March 12, 2012, the Nuclear Regulatory Commission (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 Reference 1 directed licensees to submit a Flood Hazard Reevaluation Report (FHRR). For Millstone Power Station, Units 2 and 3, the FHRR was submitted on March 12, 2015 (Reference 2). The reevaluated flood hazard was further developed in response to requests for additional information (References 3 and 4). Per Reference 8, the NRC considers the reevaluated flood hazard to be "beyond the current design/licensing basis of operating plants".

Concurrent to the flood hazard reevaluation, Millstone Power Station developed and implemented mitigating strategies in accordance with NRC Order EA-12-049, "Requirements for Mitigation Strategies for Beyond-Design-Basis External Events". In Reference 5, the Commission affirmed that licensees need to address the reevaluated flooding hazards within their mitigating strategies for BDB external events, including the reevaluated flood hazards. Guidance for performing mitigating strategies assessments (MSAs) is contained in Appendix G of Reference 6, endorsed by the NRC (with conditions) in Reference 7. For the purpose of the MSAs, the NRC has termed the reevaluated flood hazard results, summarized in Reference 8, as the "Mitigating Strategies Flood Hazard Information" (MSFHI). Reference 6, Appendix G, describes the MSA for flooding as containing the following elements:

- Section G.2 – Characterization of the MSFHI
- Section G.3 – Comparison of the MSFHI and FLEX DB Flood
- Section G.4.1 – Assessment of Current FLEX Strategies (if necessary)
- Section G.4.2 – Assessment for Modifying FLEX Strategies (if necessary)
- Section G.4.3 – Assessment of Alternative Mitigating Strategies (if necessary)
- Section G.4.4 – Assessment of Targeted Hazard Mitigating Strategies (if necessary)

In Reference 8, the NRC concluded that the reevaluated flood hazards information [i.e. MSFHI], as summarized in the Attachment, is suitable for the assessment of mitigating strategies developed in response to Order EA-12-049.

The FLEX design basis flood hazards, i.e., the current licensing basis flood hazards, bound the reevaluated flood hazards MSFHI, with the exception of the beyond design basis reevaluated flood hazards for the following flood-causing mechanisms:

- Local Intense Precipitation (LIP) with site-specific Probable Maximum Precipitation (PMP) – 17.5 ft (MPS2)
- Flooding in Streams and Rivers – 11.2 ft (MPS2 and MPS3)
- *Probabilistic Storm Surge - 21.0 ft Stillwater Elevation, (MPS2 and MPS3)
- *Combined Effects Flooding with Probabilistic Storm Surge – 28.8 ft at MPS2 intake structure
- Probable Maximum Tsunami – 14.7 ft (MPS2 and MPS3).

* From FHRR and currently under NRC review

The attachment to this letter provides the Mitigating Strategies Assessment Report for Millstone Power Station Units 2 and 3. The MSA concludes that the reevaluated LIP flood hazard and the reevaluated combined effects with probabilistic storm surge flood hazard are the only reevaluated flood hazards required to be assessed for impact on the FLEX mitigating strategies. The MSA further concludes that the current FLEX mitigating strategies can be deployed as designed during the unbounded reevaluated flood hazards.

Since the probabilistic storm surge analysis is currently under review by the NRC, the impact of the reevaluated combined effects with probabilistic storm surge flood hazard on the FLEX mitigating strategies will be reassessed, if required, when the NRC review is completed.

If you have any questions regarding this information, please contact Wanda Craft at (804) 273-4687.

Sincerely,

Mark D. Sartain
Vice President – Nuclear Engineering and Fleet Support
Dominion Energy Nuclear Connecticut, Inc.

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mark D. Sartain, who is Vice President - Nuclear Engineering and Fleet Support of Dominion Energy Nuclear Connecticut, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 28th day of June, 2017.

My Commission Expires: January 31, 2020

Wanda D. Craft
Notary Public

WANDA D. CRAFT
Notary Public
Commonwealth of Virginia
Reg. # 7520495
My Commission Expires January 31, 2020

Commitments made in this letter: No new regulatory commitments

Attachment: Mitigating Strategies Assessment Report for Flooding, Millstone Power Station

cc: U.S. Nuclear Regulatory Commission
Region I
2100 Renaissance Blvd, Suite 100
King of Prussia, PA 19406-2713

R. V. Guzman
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop 08 C-2
11555 Rockville Pike
Rockville, MD 20852-2738

F. G. Vega
Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop 08 13H12
11555 Rockville Pike
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Millstone Power Station

ATTACHMENT

MITIGATING STRATEGIES ASSESSMENT REPORT FOR FLOODING

DOMINION NUCLEAR CONNECTICUT, INC
MILLSTONE POWER STATION UNITS 2 AND 3

Millstone Power Station – Units 2 and 3

Mitigating Strategies Assessment Report for Flooding

Acronyms:

- MSFHI – Mitigating Strategies Flood Hazard Information (from the FHRR and Interim MSFHI letter)
- FHRR – Flood Hazard Reevaluation Report
- BDB – Beyond Design Basis
- FLEX – Diverse and Flexible Coping Strategies
- MSA – Mitigating Strategies Assessment
- FIP – FLEX Strategies Final Integrated Plan
- AMS – Alternative Hazard Mitigating Strategies
- TSA – Time Sensitive Action
- PMF – Probable Maximum Flood
- PMP – Probable Maximum Precipitation
- PMSS – Probable Maximum Storm Surge
- LIP – Local Intense Precipitation
- AFW – Auxiliary Feedwater
- ELAP – Extended Loss of AC Power
- LUHS – Loss of Ultimate Heat Sink
- FSG – FLEX Support Guideline
- EDG – Emergency Diesel Generator
- SBO – Station Blackout

Definitions:

FLEX Design Basis Flood Hazard: The current design basis flood hazards, which are the flood parameters used in development of the FLEX mitigating strategies.

1. Summary

   The FLEX design basis flood hazards, (i.e., the current licensing basis flood hazards), bound the reevaluated flood hazards MSFHI (Reference 2), with the exception of the beyond design basis reevaluated flood hazards for the following flood-causing mechanisms:

   - LIP with site-specific PMP – 17.5 ft (MPS2)
   - Flooding in Streams and Rivers – 11.2 ft (MPS2 and MPS3)
   - *Probabilistic Storm Surge - 21.0 ft Stillwater Elevation, (MPS2 and MPS3)
   - *Combined Effects Flooding with Probabilistic Storm Surge – 28.8 ft at MPS2 intake structure

- Probable Maximum Tsunami – 14.7 ft (MPS2 and MPS3).

* From the FHRR (Reference 1) and currently under NRC review

The FHRR concluded that no further evaluations or interim actions are required for the reevaluated flooding in streams and rivers flood hazard since the reevaluated flooding level is below the site grade for both MPS2 and MPS3. Therefore, an assessment of impact of the reevaluated flooding in streams and rivers flood hazard on the FLEX mitigating strategies is not required.

The reevaluated probabilistic storm surge is an input to and thus bounded by the reevaluated combined effects flooding with probabilistic storm surge. Therefore, the FHRR concluded reevaluated probabilistic storm surge flood hazard does not require an assessment of impact on the FLEX mitigating strategies.

The reevaluated maximum tsunami flood elevations of 14.7 ft at the intake structures for both units and at the MPS2 general site area results in shallow flooding (up to 0.7 ft) above the MPS2 average site grade. MPS3 is not impacted by maximum tsunami flooding due to its 24 ft average site grade. The maximum tsunami flood levels are bounded by the storm surge, but the warning time for the tsunami is less than that of a storm surge. The abnormal weather procedures have been revised to include actions to implement existing station flood protection features (e.g. closing flood gates) based on a notification of an imminent tsunami. Since the potential 0.7 ft flood depth in the MPS2 general site area would result in insignificant impact on execution of FLEX mitigating strategies performed in the yard in the general site area of MPS2 and would result in no impact on the MPS3 general site power block area, the FHRR concludes that further assessment of tsunami flooding impact on the FLEX mitigating strategies is not required.

Thus, the reevaluated LIP flood hazard and the reevaluated combined effects with probabilistic storm surge flood hazard are the only reevaluated flood hazards addressed by this MSA. Since the probabilistic storm surge analysis is currently under review by the NRC (Reference 2), the impact of the reevaluated combined effects with probabilistic storm surge flood hazard on the FLEX mitigating strategies will be reassessed, if required, when the NRC review is completed.

The MSA concludes that the MPS2 and MPS3 EDGs and the MPS3 SBO diesel generator are flood protected from the reevaluated LIP flood hazard and the reevaluated combined effects with probabilistic storm surge flood hazard. Thus, the MSA concludes that an ELAP occurring in association with either of these flood hazards is not plausible and an assessment of impact of the reevaluated flood hazards on the FLEX mitigating strategies is not required.

Therefore, the current FLEX mitigating strategies can be deployed as designed during the unbounded reevaluated flood hazards and the MSA is considered complete.

2. Documentation

2.1 NEI 12-06, Rev. 2, Section G.2 – Characterization of the MSFHI

The Millstone FHRR is provided as Attachment 1 to Reference 1. Attachment 2 to Reference 1 provides the "Millstone NTTF 2.1: Flooding Hazard Re-evaluation Interim Actions Plan", which is based on Section 4.0, Interim Evaluations and Actions, of the FHRR.

The FHRR (Tables 3.0-1 and 3.0-2) identified the flood causing mechanisms for which the reevaluated flood hazard exceeds the current design basis flood elevation at one or more areas of the plant site, and FHRR Section 4.0 presented interim protection measures for the safety-related and important-to-safety SSCs.

The flood causing mechanisms for which the reevaluated flood hazards exceed the current design basis are:

- Combined Effects Flooding with Probabilistic Storm Surge – MPS2
- Storm Surge – MPS2 and MPS3
- Local Intense Precipitation (LIP) resulting from the site-specific Probable Maximum Precipitation (PMP) event – MPS2
- Probable Maximum Tsunami – MPS2 and MPS3
- Flooding in Streams and Rivers – MPS2 and MPS3.

The FHRR concluded that reevaluations for the Probable Maximum Flood (PMF) in Streams and Rivers, Dam Failure, Seiche, Ice Induced Flooding, and Channel Migration/Diversion flood causing mechanisms produced results that are either below the current design basis, do not challenge existing flood protection features, or are not a threat to generate a new flooding condition for the Millstone site. Therefore, the current design basis evaluation is consistent with the conclusions of these reevaluated flood hazards' evaluations and no further evaluation or interim actions are required for these flood causing mechanisms.

The FHRR evaluated the Probable Maximum Storm Surge (PMSS) flood hazard in a manner consistent with the Hierarchal Hazard Assessment (HHA) approach. The evaluation included detailed analyses of the Probable Maximum Hurricane (PMH), which provided input to the deterministic storm surge analysis for the deterministic stillwater evaluation (i.e., the water surface elevation in the absence of waves, wave set-up and river flood PMSS), and to the probabilistic storm surge analysis for the probabilistically derived 1E-6 Annual Exceedance Probability (AEP) stillwater elevation.

The FHRR evaluated the combined effects flood for both deterministic and probabilistic storm surge analyses and coincident wind-wave activity. The FHRR was based on the probabilistic analysis approach to combined effects flooding only, but reported the elevations for both the probabilistic storm surge and the combined effects with probabilistic storm surge.

The NRC issued Reference 2, the interim MSFHI letter, as the staff assessment of the Millstone FHRR. The interim MSFHI letter, Table 2 – MPS2 and Table 2 – MPS3, summarizes the results of the staff's review of the information submitted in the FHRR for the reevaluated flood hazard that are not bounded by the current design basis. Prior to issuance of the interim MSFHI letter, DNC informed the NRC that the probabilistic storm surge analysis would be used in the reevaluated flood hazard analyses. The interim MSFHI letter does not include the staff's assessment of flooding due to storm surge, since the NRC is currently reviewing the probabilistic storm surge analysis. The FHRR and Mitigating Strategies Assessment (MSA) may need to be revised based on the results of the NRC's review.

In the interim MSFHI letter, the NRC concluded that, except for the reevaluated probabilistic storm surge flood hazard information, the Millstone reevaluated flood hazards information provided in the FHRR is suitable for the assessment of the FLEX mitigating strategies developed in response to NRC Order EA-12-049 and is suitable input for other assessments associated with Near-Term Task Force Recommendation 2.1 "Flooding". In addition, the NRC endorsed Revision 2 of NEI 12-06 (Reference 3), which includes a methodology to perform a MSA with respect to the reevaluated flood hazards.

The unbounded reevaluated flood hazards' flood water elevations (MSL) from the FHRR and the interim MSFHI letter are given below:

- LIP with site-specific PMP – 17.5 ft (MPS2)
- Flooding in Streams and Rivers – 11.2 ft (MPS2 and MPS3)
- *Probabilistic Storm Surge - 21.0 ft Stillwater Elevation, (MPS2 and MPS3)
- *Combined Effects Flooding with Probabilistic Storm Surge – 28.8 ft at MPS2 intake structure
- Probable Maximum Tsunami – 14.7 ft (MPS2 and MPS3).

* From the FHRR and currently under NRC review

These reevaluated flood hazards define the MSFHI evaluated by the MSA.

LIP with site-specific PMP

The Millstone LIP with site-specific PMP flood-causing mechanism is documented in the FHRR (Reference 1). The FHRR provides a detailed description of the methodology and analyses used to develop the reevaluated LIP flood hazard.

Flooding in Streams and Rivers

The FHRR concluded that reevaluations for the Probable Maximum Flood (PMF) in Streams and Rivers, Dam Failure, Seiche, Ice Induced Flooding, and Channel Migration/Diversion flood causing mechanisms produced results that are either below the current design basis, do not challenge existing flood protection features, or are not a threat to generate a new flooding condition for the Millstone site. Therefore, no further evaluation or interim actions are required for these flood causing mechanisms.

The current design basis for flooding in streams and rivers states that no flooding is expected for this hazard with no site flooding level specified. The FHRR reevaluated flooding in streams and rivers flood hazard flooding level elevation of 11.2 feet is considered not bounded by the current design basis in the interim MSFHI letter. However, the reevaluated flooding in streams and rivers flood hazard flooding level is below the site grade for both units, which is the basis for the FHRR conclusion that no further evaluations or interim actions are required for this flood hazard.

Therefore, an assessment of impact of the reevaluated flooding in streams and rivers flood hazard on the FLEX mitigating strategies is not required.

Probabilistic Storm Surge

The reevaluated probabilistic storm surge flood is an input to and bounded by the reevaluated combined effects probabilistic storm surge flood. Therefore, the reevaluated probabilistic storm surge flood hazard does not require an assessment of impact on the FLEX mitigating strategies.

Probable Maximum Tsunami

Tsunami flooding was not included in the current design basis for MPS2 or for MPS3. The FHRR predicted reevaluated maximum tsunami flood elevations of 14.7 ft at the intake structures for both units and at the MPS2 general site area. Shallow flooding (up to 0.7 ft) above the MPS2 average site grade of 14 ft is possible. MPS3 is not impacted by maximum tsunami flooding due to its 24 ft average site grade. The maximum tsunami flood levels are bounded by the storm surge, but the warning time for the tsunami is less than that of a storm surge. The tsunami is predicted to reach the Millstone site approximately 8.7 hours after the initiation of the event. The FHRR provided interim actions to review, revise, and include necessary steps to enhance the applicable station abnormal weather procedures for prevention and mitigation of a potential tsunami flooding event. The abnormal weather procedure has been revised to include an entry condition to initiate required actions based on a tsunami warning from NOAA's/NWS National Tsunami Warning Center and to include actions to implement existing station flood protection features (e.g. closing flood gates) based on a notification of an imminent tsunami.

Updates to the abnormal weather procedures for tsunami flood protection have been implemented. The potential 0.7 ft flood depth in the MPS2 general site area would result in insignificant impact on execution of FLEX mitigating strategies performed in the yard in the general site area of MPS2 and no impact on the MPS3 general site area. Thus, the FHRR concludes that further assessment of tsunami flooding impact on the FLEX mitigating strategies is not required.

Combined Effects Flooding with Probabilistic Storm Surge

The Millstone combined effects flooding with probabilistic storm surge flood-causing mechanism is documented in the FHRR. The FHRR provides a detailed description of the methodology and analyses used to develop the reevaluated combined effects with probabilistic storm surge flood hazard.

The reevaluated LIP flood hazard and the reevaluated combined effects with probabilistic storm surge flood hazard are assessed below for impact on the FLEX mitigating strategy actions required to cope with an ELAP/LUHS occurring when both units are at power (Modes 1 through 4), and with an ELAP/LUHS occurring with at least one of the units in shutdown/refueling modes (Modes 5 and 6).

2.2 NEI 12-06, Rev. 2, Section G.3 – Basis for Mitigating Strategy Assessment

The reevaluated LIP and reevaluated combined effects with probabilistic storm surge flood hazards are compared to their respective FLEX design basis flood hazards in Tables 1 and 2 below.

Table 1
Flood Causing Mechanism (LIP with Site-Specific PMP) or Bounding Set of Parameters

Flood Scenario Parameter		FLEX Design Basis Flood Hazard MPS2 / MPS3	Reevaluated Flood Hazard MPS2 / MPS3	Bounded (B) or Not Bounded (NB) MPS2 / MPS3
Flood Level and Associated Effects	1. Max Stillwater Elevation (ft. MSL) – Main site/Power Block	14.5 ft / 24.9 ft	17.5 ft / 24.8 ft See Note 1.	NB / B (See Note 1)
	2. Max Wave Run-up Elevation (ft. MSL)	14.5 ft - Minimal wave effects / 24.9 ft – Minimal wave effects	17.5 ft - Minimal wave effects / 24.8 ft – Minimal / wave effects See Note 2.	N/A / N/A
	3. Max Hydrodynamic/Debris Loading (psf)	N/A / N/A	Hydrodynamic loading - Minimal (MPS2 & MPS3) / Debris Loading – Unlikely (MPS2 & MPS3) See Note 3.	N/A / N/A
	4. Effects of Sediment Deposition/Erosion	N/A / N/A	Minimal / Minimal See Note 4.	N/A / N/A
	5. Concurrent Site Conditions	N/A / N/A	N/A / N/A See Note 5.	N/A / N/A
	6. Effects on Groundwater	N/A / N/A	Minimal / Minimal See Note 6.	N/A / N/A
Flood Event Duration	7. Warning Time (hours)	24 hours (See Note 7) / N/A	24 hours (See Note 7) / N/A	B / N/A
	8. Period of Site Preparation (hours)	24 hours (See Note 8) / N/A	24 hours (See Note 8) / N/A	B / N/A
	9. Period of Inundation (hours)	N/A / N/A	6 hours / N/A See Note 9.	NB / N/A
	10. Period of Recession (hours)	N/A / N/A	10 hours / N/A See Note 10.	NB /N/A
Other	11. Plant Mode of Operations	Modes 1, 2, 3, 4, 5, 6 / Modes 1, 2, 3, 4, 5, 6 See Note 11.	Modes 1, 2, 3, 4, 5, 6 / Modes 1, 2, 3, 4, 5, 6 See Note 11.	B / B
	12. Other Factors	N/A / N/A	Minimal / Minimal See Note 12.	N/A / N/A

Additional notes, 'N/A' justifications, and explanations regarding the bounded/non-bounded determination.

1. Reevaluated LIP flood hazard maximum flood depths and flood surface elevations vary by location in the main plant site/power block. The reevaluated LIP maximum water surface elevations in the immediate vicinity of MPS2 range from 14.3 ft MSL at Flood Gate No. 20 at the intake structure to

Flood Scenario Parameter	FLEX Design Basis Flood Hazard MPS2 / MPS3	Reevaluated Flood Hazard MPS2 / MPS3	Bounded (B) or Not Bounded (NB) MPS2 / MPS3

17.5 ft MSL at Flood Gate No. 13 at the northern perimeter of the Containment Enclosure building (Ref. 1, Section 2.1.3.3). The current FLEX MPS3 design basis LIP flood hazard bounds the MPS3 reevaluated LIP flood hazard. Therefore, assessment of impact of the MPS3 reevaluated LIP flood hazard on the FLEX mitigating strategies is not required. (Refs. 1 and 2)

2. Wind waves and runup associated effects input are considered minimal for the current design basis and reevaluated LIP. (Ref. 2, Unit 2 - Tables 1 & 2, Unit 3 - Table 1).
3. Hydrodynamic and hydrostatic loading against buildings at the site are likely to be minimal due to the generally shallow flood depths and low flood velocities during the reevaluated LIP. The protected area surface is impervious and does not contain natural sources of vegetation and debris. The maximum velocities of up to 4.5 fps north of the MPS2 Containment Enclosure building and up to 6.4 fps at the MPS3 intake structure during the reevaluated LIP are unlikely to result in debris loading issues. (Ref. 1, Section 2.1.3)
4. The maximum velocities of up to 4.5 fps (MPS2) and up to 6.4 fps (MPS3) during the reevaluated LIP (Ref. 1, Section 2.1.3) are unlikely to result in erosion and sediment loading issues. Therefore, sediment deposition and erosion and sediment loading at plant grade are considered minimal associated effects for the reevaluated LIP event and associated drainages. The protected area is impervious and does not contain natural sources of vegetation and debris.
5. Concurrent conditions, including adverse weather, are not considered in the formulation of the reevaluated LIP with site-specific PMP event for the Millstone site. (Ref. 1, Sections 2.1.3 and 2.1.4)
6. Groundwater, i.e. groundwater ingress, is considered a minimal associated effect for the LIP event and associated drainages, as the protected area surface is assumed to be impervious and no infiltration losses were considered in the reevaluated LIP flooding analysis model (Ref. 1, Section 2.1.3.3).
7. The current and reevaluated LIP flood hazard MPS2 LIP flood protection design basis are both based on the procedural closing of the MPS2 flood gates and other associated flood protection procedural actions in anticipation of a LIP storm (forecast of > 12 inches of rain in a 24 hour period) arriving on site (Ref. 4 and Ref. 5, Step 3.1 and Attachment 6). Therefore, the MPS2 FLEX mitigating strategies take credit for a 24 hour flood warning time/period of site preparation to procedurally establish MPS2 flood protection for the reevaluated LIP flood hazard. The MPS3 FLEX mitigating strategies do not define or take credit for any required actions during the warning time/period of site preparation for the current or the reevaluated LIP flood hazard. As part of the development of the Focused Evaluation, DNC is assessing available warning time/period of site preparation associated with the LIP event consistent with the NEI White Paper, "Warning Time for Maximum Precipitation Events", dated April 8, 2015 (ML15104A157) and the related NRC letter dated April 23, 2015 (ML15110A080).
8. See Note 7. As part of the development of the Focused Evaluation, DNC is currently evaluating need to refine the LIP warning time/period of site preparation.
9. LIP flood water is predicted to become measureable on the MPS2 site from the beginning of the 6-hour PMP, which includes the 1-hour LIP when flood depths peak, and recede to below the door threshold elevations of interest at approximately 10 hours after the end of the 6-hour PMP. Peak flood depths occur essentially concurrently with the peak of the 1-hour LIP and reduce significantly within 1 hour after they peak. At the end of the 6-hour PMP, the flood depths begin an asymptotic recession. Therefore, the reevaluated LIP flood hazard period of inundation, defined as the time from the arrival of flood waters on the site to when water begins to recede from the site, is

Flood Scenario Parameter	FLEX Design Basis Flood Hazard MPS2 / MPS3	Reevaluated Flood Hazard MPS2 / MPS3	Bounded (B) or Not Bounded (NB) MPS2 / MPS3

approximately 6 hours.

10. At the end of the 6-hour PMP, the predicted MPS2 site reevaluated LIP flood water begins an asymptotic recession, and recedes to below the door threshold elevations of interest at approximately 10 hours after the end of the 6-hour PMP. The reevaluated LIP flood hazard period of recession, defined as the time from when water begins to recede from the site to when water has completely receded from the site and the plant is in a stable state that can be maintained indefinitely, is assumed to be approximately 10 hours. Note that the FLEX mitigating strategies actions are assessed for impact at the time of their occurrence during the period of inundation and/ or the period of recession as applicable.
11. Impact of the current and the reevaluated LIP flood hazards on FLEX mitigating strategies were both assessed for all modes of operation for MPS2 and MPS3.
12. Other pertinent factors, e.g., waterborne projectiles, are considered minimal for MPS2 and MPS3. (See Note 3 above).

Table 2
Flood Causing Mechanism (Combined Effects with Probabilistic Storm Surge) or Bounding Set of Parameters

Flood Scenario Parameter		FLEX Design Basis Flood Hazard MPS2 / MPS3	Reevaluated Flood Hazard MPS2 / MPS3	Bounded (B) or Not Bounded (NB) MPS2 / MPS3
Flood Level and Associated Effects	1. Max Stillwater Elevation (ft. MSL)	18.1 ft within the intake structure & 18.1 ft at the powerblock / 19.7 ft at seaward wall of intake structure & 19.7 ft at power block See Note 1.	21 ft at intake structure & 21 ft at power block / 21 ft at intake structure & 21 ft at power block See Note 1.	NB / NB
	2. Max Wave Run-up Elevation (ft. MSL)	26.5 ft max water level (standing wave) in the Intake Structure & 25.1 ft (18.1 ft + 3.2 ft max wave crest + 3.8 ft runup) at the powerblock / 41.2 ft (19.7 ft + 16.2 ft max	28.8 ft (21 ft + 7.8 ft reflected wave crest) at intake, 24.4 ft (21 ft + 3.4 ft max reflected wave crest) at west side of MPS2 & 21 ft (insignificant wave effects) at the east side of MPS2 / 28.7 ft (21 ft + 7.7 ft	NB / B

Flood Scenario Parameter		FLEX Design Basis Flood Hazard MPS2 / MPS3	Reevaluated Flood Hazard MPS2 / MPS3	Bounded (B) or Not Bounded (NB) MPS2 / MPS3
		wave height + 5.3 ft runup) at seaward wall of intake structure & 23.8 ft (19.7 ft + 4.1 ft wave runup) at power block. See Note 2.	reflected wave crest) at MPS3 intake & Minimal at powerblock (Site grade protects against wave runup except at intake.) See Note 2.	
	3. Max Hydrodynamic/Debris Loading (psf)	N/A / N/A	Hydrodynamic loading - N/A / Debris Loading – Minimal See Note 3.	N/A
	4. Effects of Sediment Deposition/Erosion	N/A / N/A	Minimal / Minimal See Note 4.	N/A
	5. Concurrent Site Conditions	N/A / N/A	N/A / N/A See Note 5.	N/A
	6. Effects on Groundwater	N/A / N/A	Minimal / Minimal See Note 6.	N/A
Flood Event Duration	7. Warning Time (hours)	24 hours / N/A See Note 7.	24 hours / N/A Note 7.	NB
	8. Period of Site Preparation (hours)	24 hours / N/A See Note 8.	24 hours / N/A See Note 8.	NB
	9. Period of Inundation (hours)	N/A / N/A	5.5 hours / N/A See Note 9.	NB / N/A
	10. Period of Recession (hours)	N/A / N/A	1 hour / N/A See Note 10.	NB / N/A
Other	11. Plant Mode of Operations	Modes 1, 2, 3, 4, 5, 6 / Modes 1, 2, 3, 4, 5, 6 See Note 11.	Modes 1, 2, 3, 4, 5, 6 / Modes 1, 2, 3, 4, 5, 6 See Note 11.	B / B
	12. Other Factors	N/A / N/A	Minimal / Minimal See Note 12.	N/A / N/A

Additional notes, 'N/A' justifications, and explanations regarding the bounded/non-bounded determination.

1. Ref. 1, Sections 2.9.2.2 and 3.9 and Tables 3.0-1 and 3.0-2, and Ref. 2, Table 1, Millstone Power Station, Unit 2: Current Design Basis Flood Hazards for Use in MSA and Table 1, Millstone Power Station, Unit 3: Current Design Basis Flood Hazards for Use in MSA.
2. See Note 1.
3. Reevaluated combined effects with probabilistic storm surge flood hazard hydrostatic, hydrodynamic and debris loading analysis was determined for the MPS2 and MPS3 intake structures and for

Flood Scenario Parameter	FLEX Design Basis Flood Hazard MPS2 / MPS3	Reevaluated Flood Hazard MPS2 / MPS3	Bounded (B) or Not Bounded (NB) MPS2 / MPS3

various buildings throughout the MPS2 site. Loads due to non-breaking waves were calculated as hydrostatic and hydrodynamic loads. Debris impact loads act at the water surface elevation (Ref. 1, Sections 2.9.2.3, 3.9 and 4.1). The evaluation concluded that the affected structures can accommodate the loading.

4. Sediment deposition and erosion and sediment loading at plant grade are considered minimal associated effects as the protected area is impervious and does not contain natural sources of vegetation and debris.(Ref.1, Section 2.1.3)
5. Concurrent conditions are not considered in the formulation of the reevaluated combined effects with probabilistic storm surge flood hazard for the Millstone site. (Ref. 1, Section 2.9)
6. Groundwater, i.e. groundwater ingress, is considered a minimal associated effect, as the protected area is impervious. (Ref. 1, Section 2.1.3)
7. The MPS2 current and reevaluated combined effects with probabilistic storm surge flood hazard flood protection design basis are both based on the procedural flood protection actions of closing of the MPS2 flood gates and actions for other associated flood protection in anticipation of a forecasted storm center with sustained wind speeds greater than 60 mph expected to strike MPS2 within 12 hours, and/or in anticipation of a hurricane warning in a specified coastal area in 24 hours or less with winds of 74 mph and /or dangerously high tides and waves. (Ref. 4, Steps 3.3, 3.13, 3.15 and 3.19, and/or Step 4.2). Therefore, the MPS2 FLEX mitigating strategies take credit for a 24 hour flood warning time/period of site preparation to procedurally establish MPS2 flood protection for the reevaluated combined effects with probabilistic storm surge flood hazard. The MPS3 FLEX mitigating strategies do not define or take credit for any required actions during the warning time/period of site preparation for the current or the reevaluated combined effects with probabilistic storm surge flood hazard.
8. See Note 7.
9. The period of inundation is defined as the time from when the flood water arrives on the site to the time when the flood water begins to recede from the site. The reevaluated combined effects with probabilistic storm surge water level at the MPS2 Turbine Building rises from the pre-surge water level to the MPS2 site grade elevation of 14 feet MSL in approximately 1 hour, is at or above 14 feet MSL for approximately 5.5 hours with a peak of approximately 21 feet MSL approximately 2 hours after reaching 14 feet MSL, and recedes from 14 feet MSL to the pre-surge water level in approximately 1 hour. Therefore, the period of inundation for MPS2 is assumed to be the 5.5 hour period of time that the storm surge water levels are ≥ the MPS2 site grade elevation of 14 feet, MSL. MPS3 with its site grade elevation of 24 feet MSL is not inundated by the probabilistic storm surge.
10. The period of recession is defined as the time when the flood water begins to recede from the site to the time when flood water is completely receded from the site and the plant is safe and in a stable state that can be maintained indefinitely. As described in Note 9 above, the flood water recedes from the MPS2 site grade elevation of 14 feet MSL to the pre-surge water level in approximately one hour. Therefore, the period of recession for MPS2 is assumed to be one hour, the time period for the flood water to recede from the MPS2 site grade elevation of 14 feet, MSL to the pre-surge water level. MPS3 with its site grade elevation of 24 feet MSL is not inundated by the probabilistic storm surge. Therefore the period of recession is N/A for MPS3.
11. Impact of the current and the reevaluated combined effects with probabilistic storm surge flood hazards on FLEX mitigating strategies were both assessed for all modes of operation for MPS2 and MPS3.

Flood Scenario Parameter	FLEX Design Basis Flood Hazard MPS2 / MPS3	Reevaluated Flood Hazard MPS2 / MPS3	Bounded (B) or Not Bounded (NB) MPS2 / MPS3
12. Other pertinent factors, e.g., waterborne projectiles, are considered minimal for MPS2 and MPS3. (See Note 3 above) The combined effects with probabilistic storm surge transient wind speed at the MPS sites is greater than 25 mph for approximately 17 hours with a peak of approximately 103 mph occurring approximately coincidentally with the peak storm surge water level. The maximum wind speed is bounded by the design basis high wind speed. The wind speed transient correlates well with the storm surge water level transient. The storm surge wind speed is greater than 50 mph for approximately 8 hours, or approximately 4 hours before and 4 hours after the peak wind speed, which corresponds approximately with the storm surge peak water level of approximately 21 feet MSL at the MPS2 Turbine Building. Evaluation of the maximum reflected wave crest elevation of 24.4 ft MSL overtopping the MPS2 Turbine Building west wall determined that the potential volume of inundation from the wave overtopping would be contained within the condenser pit or one of several hold-up volumes.			

2.3 NEI 12-06, Rev. 2, Section G.4 – Evaluation of Mitigating Strategies for the Reevaluated LIP and Reevaluated Combined Effects with Probabilistic Storm Surge Flood Hazards

2.3.1 NEI 12-06, Rev. 2, Section G.4.1 - Assessment of Current FLEX Strategies

As discussed in Section 2.1, the reevaluated LIP flood hazard and the reevaluated combined effects with probabilistic storm surge flood hazard are the two reevaluated flood hazards requiring assessment for impact on the FLEX mitigating strategies.

The assessment performed by DNC concludes that the MPS2 and MPS3 EDGs and the MPS3 SBO diesel generator are flood protected from the reevaluated LIP flood hazard and the reevaluated combined effects with probabilistic storm surge flood hazard. Thus, the assessment concludes that an ELAP occurring in association with either of these flood hazards is not plausible and an assessment of impact on FLEX mitigating strategies is not required.

<u>MSA Conclusions from Assessment of the Impact of Reevaluated Flood Hazards on Current FLEX Mitigating Strategies</u>

1. The MSA concludes that the MPS2 and MPS3 EDGs and the MPS3 SBO diesel generator are flood protected from the reevaluated LIP flood hazard and the reevaluated combined effects with probabilistic storm surge flood hazard. Thus, an ELAP occurring in association with these reevaluated

flood hazards is not plausible and further assessment of impact of these reevaluated flood hazards on the FLEX mitigating strategies is not required by the MSA. Therefore, the current FLEX mitigating strategies can be deployed as designed during the unbounded reevaluated flood hazards and the MSA is considered complete.

2.3.2 NEI 12-06, Rev. 2, Section G.6.1 – Current FLEX Strategies are Acceptable without Modification

The conclusions of the assessment performed by DNC provide the basis for the MSA conclusion that the current FLEX mitigating strategies can be deployed as designed during the unbounded reevaluated flood hazards. Therefore, the current FLEX mitigating strategies are acceptable as designed and do not require modification.

The assessment performed by DNC also concludes that the validations of the FLEX mitigating strategy time sensitive actions and the non-time sensitive action to pre-deploy the BDB AFW pump(s) for the Modes 5 and 6 FLEX mitigating strategies remain valid for their performance during the reevaluated LIP flood hazard and the reevaluated combined effects with probabilistic storm surge flood hazard.

2.4 References

1. Dominion Nuclear Connecticut, Inc letter to NRC, "Millstone Power Station Units 2 and 3, Flood Hazard Reevaluation Report in Response to March 12, 2012 Information Request Regarding Flooding Aspects of Recommendation 2.1", Serial No. 15-106, dated March 12, 2015 (Serial No. 15-106)

2. NRC letter (Lauren Gibson) to Dominion Nuclear Connecticut, Inc. (David A. Heacock), "Millstone Power Station, Units 2 and 3 – Interim Staff Response to Reevaluated Flood Hazards Submitted in Response to 10CFR50.54(f) Information Request – Flood-Causing Mechanism Reevaluation (CAC Nos. MF6109 and MF6110)," dated December 21, 2016, (Serial No. 16-494)

3. Nuclear Energy Institute (NEI), Report NEI 12-06, Rev. 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide", dated December 2015.

4. Millstone Power Station Abnormal Operating Procedure, AOP 2560, "Storms, High Winds and High Tides", Millstone Unit 2.

5. Millstone Power Station Abnormal Operating Procedure, AOP 3569, "Severe Weather Conditions", Millstone Unit 3.