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

February 9, 2017

Mr. Robert Coffey
Site Vice President
NextEra Energy Point Beach, LLC
6610 Nuclear Road
Two Rivers, WI 54241-9516

SUBJECT: POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2– FLOOD HAZARD MITIGATION STRATEGIES ASSESSMENT (CAC NOS. MF7962 AND MF7963)

Dear Mr. Coffey:

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f) (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force report (ADAMS Accession No. ML111861807).

Enclosure 2 to the 50.54(f) letter requested that licensees reevaluate flood hazards for their sites using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses (ADAMS Accession No. ML12056A046). Concurrent with the reevaluation of flood hazards, licensees were required to develop and implement mitigating strategies in accordance with NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). In order to proceed with implementation of Order EA-12-049, licensees used the current licensing basis flood hazard or the most recent flood hazard information, which may not be based on present-day methodologies and guidance, in the development of their mitigating strategies.

By letter dated November 22, 2016 (ADAMS Accession No. ML16327A099), NextEra Energy Point Beach, LLC (the licensee) submitted the flooding mitigation strategies assessment (MSA) for Point Beach Nuclear Plant, Units 1 and 2 (Point Beach). The MSAs are intended to confirm that licensees have adequately addressed the reevaluated flooding hazards within their mitigating strategies for beyond-design-basis external events. The purpose of this letter is to provide the NRC's assessment of the Point Beach MSA.

As described in the enclosure to this letter, the NRC staff has concluded that the Point Beach MSA was performed consistent with the guidance described in Appendix G of Nuclear Energy Institute 12-06, Revision 2, as endorsed by Japan Lessons-Learned Division (JLD) interim staff guidance (ISG) JLD-ISG-2012-01, Revision 1, and that the licensee has demonstrated that the mitigation strategies are reasonably protected from reevaluated flood hazards conditions for beyond-design-basis external events. This closes out the NRC's efforts associated with CAC No. MF7962 and MF7963.

If you have any questions, please contact me at 301-415-1056 or at Lauren.Gibson@nrc.gov.

Sincerely,

Lauren Kate Gibson

Lauren K. Gibson, Project Manager
Hazards Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Enclosure:
Staff Assessment Related to the
Mitigating Strategies for Point Beach

Docket Nos. 50-266 and 50-301

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STAFF ASSESSMENT

RELATED TO THE MITIGATION STRATEGIES

FOR POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2,

AS A RESULT OF THE REEVALUATED FLOODING HAZARD NEAR-TERM

TASK FORCE RECOMMENDATION 2.1- FLOODING (CAC NOS. MF7962 AND MF7963)

1.0 INTRODUCTION

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f), (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force report (ADAMS Accession No. ML111861807).

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The NRC staff and industry recognized the difficulty in developing and implementing mitigating strategies before completing the reevaluation of flood hazards. The NRC staff described this issue and provided recommendations to the Commission on integrating these related activities in COMSECY-14-0037, "Integration of Mitigating Strategies for Beyond-Design-Basis External Events and the Reevaluation of Flood Hazards," dated November 21, 2014 (ADAMS Accession No. ML14309A256). The Commission issued a staff requirements memorandum on March 30, 2015 (ADAMS Accession No. ML15089A236), affirming that the Commission expects licensees for operating nuclear power plants to address the reevaluated flood hazards, which are considered beyond-design-basis external events, within their mitigating strategies.

Nuclear Energy Institute (NEI) 12-06, Revision 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" (ADAMS Accession No. ML16005A625), has been endorsed by the NRC as an appropriate methodology for licensees to perform assessments of the mitigating strategies against the reevaluated flood hazards developed in response to the March 12, 2012, 50.54(f) letter. The guidance in NEI 12-06, Revision 2, and Appendix G in particular, supports the proposed Mitigation of Beyond-Design-Basis Events rulemaking. The NRC's endorsement of NEI 12-06, including exceptions, clarifications, and additions, is described in NRC 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. ML15357A163). Therefore, Appendix G of NEI 12-06, Revision 2, describes acceptable methods for demonstrating that the reevaluated flooding hazard is addressed within the Point Beach Nuclear Power Plant, Units 1 and 2 (Point Beach) mitigating strategies for beyond-design-basis external events.

2.0 BACKGROUND

By letter dated December 10, 2015 (ADAMS Accession No. ML15321A063), the NRC issued an interim staff response (ISR) letter for Point Beach. The letter provided the reevaluated flood hazard that exceeded the current design basis (CDB) for Point Beach and were a suitable input for the mitigating strategies assessment (MSA). For Point Beach, the only mechanism listed as not bounded by the CDB in the ISR letter is local intense precipitation (LIP). By letter dated November 22, 2016 (ADAMS Accession No. ML16327A099), NextEra Energy Point Beach, LLC (NextEra, the licensee) submitted the Point Beach MSA for review by the NRC.

The ISR letter also stated that NRC staff would evaluate, as applicable, the flood event duration (FED) parameters and flood-related associated effects (AE) developed by the licensee during the NRC staff's review of the MSA. This is consistent with the guidance provided in Revision 2 of NEI 12-06. The licensee submitted the relevant information regarding the FED parameters and AE needed to complete the review in the MSA, as well as in the Point Beach Flood Hazard Reevaluation Report (FHRR) dated March 12, 2015 (ADAMS Accession No. ML15071A413), and by letter dated November 6, 2015 (ADAMS Accession No. ML15310A170).

3.0 TECHNICAL EVALUATION

3.1 Point Beach Current FLEX Strategies

The NRC staff evaluated the Point Beach strategies as developed and implemented under Order EA-12-049. This evaluation is documented in an NRC safety evaluation issued by letters dated September 23, 2016 (ADAMS Accession No. ML16241A000) and October 24, 2016 (ADAMS Accession No. ML16278A166). The safety evaluation concluded that Point Beach has developed guidance and proposed designs which, if implemented appropriately, will adequately address the requirements of Orders EA-12-049 and EA-12-051.

A brief summary of the licensee's FLEX strategies is as follows:

- Decay heat is removed by steaming to atmosphere from the steam generators (SGs) through the atmospheric dump valves or main steam safety valves, and makeup to the

SGs is initially provided by the turbine-driven auxiliary feedwater (TDAFW) pump taking suction from the condensate storage tank (CST).

- Prior to depletion of the CST, operators will transition the SG water supply from the TDAFW pump to the diesel driven fire pump, then to portable FLEX pumps using water from the service water pump bay in the circulating water pump house (CWPH).
- Reactor coolant system makeup and boration will be initiated within 12 hours of the onset of the extended loss of alternating current power (ELAP). Operators will provide reactor coolant makeup using portable FLEX high-pressure diesel-driven pumps to deliver water drawn from a FLEX connection on each refueling water storage tank drain line.
- For Phase 3, the equipment from the National SAFER Response Center (NSRC) will be used by approximately 3 days into the event to support the FLEX pumps already in operation for indefinite coping period.

The licensee concluded in the MSA that no changes to the FLEX strategies are warranted as a result of the reevaluated flood hazard, as described below.

3.1.1 Local Intense Precipitation

Section 2.1 of the MSA states that the reevaluated LIP event results in 12.8 inches of rain over a 1-hour period and the maximum flood height is 2.2 ft. higher than the CLB flood height near the CWPH. The licensee explained that the LIP event duration is 60 minutes; however, in order to fully determine the effects of the LIP event, the flooding analysis considered flooding and drainage effects for ten hours. The LIP floodwaters exceed the CLB flood at some doors that provide access to critical equipment, such as the auxiliary feedwater pump (AFP) room and the vital switchgear room. In addition, the area inside the north access gate to the site (south of the FLEX storage building) and certain areas along the deployment routes for Phase 2 and Phase 3 equipment have LIP floodwaters that are greater than 3 feet at its peak.

Section 2.3.1.1 of the MSA explains the assumptions considered by the licensee during its assessment, which include:

- The “B” train emergency diesel generators (EDGs) are assumed to be unavailable and the “A” train EDGs become inoperable as a result of the LIP flood, resulting in an ELAP event.
- When assessing local operator actions, the turbine building rollup doors are assumed to be blocked open 5 in., which conservatively results in the slowest rate of LIP flood water receding from the turbine building.
- The LIP event is not assumed concurrently with high lake levels, seismic event, or a tornado event.

3.1.2 FLEX Phase 1, Installed Equipment Assessment

Section 2.3.1.2 of the MSA identifies several local operator actions that may be restricted by floodwaters entering the turbine building. These local operator actions include entry into AFP room for direct current (dc) load shedding, opening AFP room doors to assure cooling, and entry into AFP room and vital switchgear room to establish alternate suction source for AFPs.

Entry into AFP Room for dc Load Shedding

The licensee's FLEX Support Guidelines (FSGs) direct local operator actions to ensure that dc load shedding is accomplished. This includes local operations actions in the AFP room and is expected to begin 1 hour from the onset of the ELAP event (the ELAP event itself occurs after the start of the LIP event). Although the flood level in the turbine building can rise to a peak depth exceeding 15 inches, which could challenge operator actions, the water will have receded to a depth of approximately 3 inches by the time the load shedding activities begin. Based on the reduced flood level of 3 inches, the staff finds it reasonable that operators can complete the necessary actions per the FSGs, including opening the necessary doors to gain access to the AFP room and performing actions for dc load shedding within the required time.

Opening AFP Room Doors to Assure Cooling

The licensee's FSGs direct the operators to monitor temperatures in critical areas and to provide additional cooling, including opening room doors as necessary. The TDAFW pumps, which are used during Phase 1 for core cooling through the SGs, are likely to heat up without proper ventilation. Therefore, operators are required to open the AFP room doors for ventilation after 2 hours. This is based on licensee calculations that assume that the turbine building is at its maximum CLB temperature of 115 degrees Fahrenheit at the onset of the event. As noted above, the flood level within the turbine building can rise to a peak depth exceeding 15 inches. Two hours after the TDAFW pumps start, which is over 3 hours after the LIP begins, the flood water within the turbine building will have receded to less than 2 inches. Furthermore, the staff notes that if the turbine building is at temperature less than the CLB maximum when the TDAFW pumps start, then additional time would be available before the doors would need to be opened and, during this time, the floodwaters would recede even further. Based on the reduced flood level of less than 2 inches, the staff finds it reasonable that operators can complete the actions per the FSGs to open the necessary doors to provide ventilation to the AFP room and ensure reliable operation of the TDAFW pumps during Phase 1.

Entry into AFP Room and Vital Switchgear Room to Establish Alternate Suction for AFPs

The licensee's FSGs direct that an alternate suction source be established for the TDAFW pumps, which requires entry into the AFP room and the vital switchgear room. Entering those room may be challenging during periods of peak LIP flooding in the turbine building. The timing for establishing the alternate suction source in the FSGs is based on the CST having a limited volume due to tornado missile damage. However, the NRC staff agrees with the licensee that tornado missiles do not need to be considered coincident with a LIP event; thus, a reduced CST volume from a damaged CST is not of concern. Based on the available CST volume during a LIP event, the licensee stated that approximately 46,000 gallons of water would be available to the suction of the TDAFW pumps, which would allow over 6 hours for the operators to take the critical switchover actions in the AFP room and the vital switchgear room. Based on the rate of water receding from the turbine building after a LIP event and the amount of CST volume available, the staff finds it reasonable that the operator can complete the necessary steps to establish an alternate suction source to the AFPs in accordance with FSGs prior to the depletion of the CST.

3.1.3 FLEX Phase 2, On-Site Equipment Deployment and Staging Assessment

Section 2.3.1.3 of the MSA states that Phase 2 FLEX equipment deployment and staging is directed by the FSGs and begins approximately 3 hours after the onset of the ELAP event. The licensee assessed the deployment and staging of FLEX equipment that may be impacted by the LIP flood, which includes FLEX equipment deployment routes from the FLEX storage building, staging and connection of the portable diesel generator (PDG), and the staging and connection of the portable diesel-driven SG injector pump (PDSG).

Equipment Deployment Routes from the FLEX Storage Building

The licensee explained that the primary deployment route enters the site at the north access gate and that the peak LIP flood heights in this area will reach approximately 3 feet. Since the ELAP event occurs after the start of the LIP event, the flood level will have receded to less than 6 inches at the time Phase 2 FLEX equipment would need to be deployed. During its onsite audit of the licensee's FLEX strategy, the NRC staff observed that FLEX towing vehicles and FLEX equipment, which are trailer-mounted and have large diameter wheels and tires that are capable of traversing over the receded floodwaters. Furthermore, the staff noted that the licensee's FSGs identify alternate deployment routes in which there are no significant floodwaters at the time of deployment and provide a suitable alternative. Based on the available towing vehicles and trailer-mounted FLEX equipment being capable of traversing over the receded floodwaters and the availability of diverse deployment paths, the staff finds it reasonable that the licensee can deploy portable Phase 2 FLEX equipment from the storage building without being challenged by the LIP floodwaters.

Staging and Connection of the PDG

The licensee stated that the primary staging area for the FLEX PDG is on the east side of the turbine building near either of the Unit 1 doors and that at the time of FLEX equipment deployment, flood waters in this area will have receded to less than 1 inch. Furthermore, the cabling can be laid on the turbine building floor as planned because the cabling reel contains 160 feet of cable length that does not contain splices or connections, rendering it safe to use even with low floodwater levels. As defense in depth, the licensee stated that there are two alternate staging and connection areas that are available, which include locations near the Unit 2 turbine building doors and outside the boiler room doors on the north side of the plant. Based on the FLEX PDG being trailer-mounted, minimal floodwaters around the staging area, and lack of splices and connections in the FLEX cables, the staff finds it reasonable that the licensee can safely stage the PDG and deploy FLEX cables to the necessary electrical FLEX connections following a LIP event.

Staging and Connection of the PDSG

The licensee stated that the primary staging location for the FLEX PDSG is north of the CWPH and at the time of FLEX equipment deployment, floodwaters in this area will have receded to approximately 3 inches. Although this amount of water should not prevent staging the PDSG, if water flow on the ground challenges pump connection or operation, the pump can be moved uphill away from the water flow near the CWPH. According to the licensee's hydraulic calculations, the PDSG was evaluated at low lake levels to ensure proper pump sizing and it was determined there is at least 4 feet of margin between the suction head available and required. Based on the available margin between the suction head available and the suction head required, the staff finds it reasonable that the PDSG can be located uphill to avoid the 3 inches of floodwaters close to the CWPH and still be capable of delivering the necessary flow and discharge pressure to maintain core cooling. As a defense-in-depth measure, the licensee explained that the operating procedure for the PDSG indicates that the pump is rated for 22 feet of suction lift and directs operator verification of flow rates without high vibration during pump operation, which aids in operator awareness of pump performance even at the relocated staging area.

3.1.4 FLEX Phase 3, Off-Site Equipment Deployment and Staging Assessment

Section 2.3.1.4 of the MSA states that Phase 3 deployment would begin no sooner than 24 hours after the onset of the ELAP event. The staff noted that, at that time, the floodwaters from the LIP event will have receded further than they were at the time that the deployment of the FLEX equipment begins during Phase 2, which was discussed above. The licensee confirmed that all Phase 3 equipment is designed to accommodate flood heights greater than those that will exist when they could need to be deployed following a LIP event. The staff finds it reasonable that delivery, deployment, and staging of Phase 3 FLEX equipment will not be impacted by the LIP event because at the time FLEX equipment is delivered by off-site resources, the floodwaters will have receded to a level that is low enough that deployment vehicles can traverse the site without being impeded by standing water.

3.2 Evaluation of Associated Effects

The staff reviewed information provided by NextEra regarding AE parameters for flood hazards not bounded by the CDB. The AE parameters related to water surface elevation (i.e., stillwater elevation with wind waves and runup effects) were previously reviewed by staff, and were transmitted to the licensee via the ISR letter dated December 10, 2015 (ADAMS Accession No. ML15321A063). The AE parameters not directly associated with water surface elevation are discussed below and are summarized in Table 3.2.2-1.

For the LIP event, the licensee provided hydrostatic and hydrodynamic loads in Table 4.15 of the FHRR. The licensee did not evaluate other AE parameters, such as debris loading; however, staff determined that these AE parameters are minimal because inundation depth is small and the velocities are low.

The staff confirmed these statements by reviewing the licensee-provided LIP FLO-2D model's input and output files. The staff found that the estimated inundation depths and flow velocities are acceptable and that the modeling is reasonable for use in the MSA. The staff agrees with the licensee's conclusion that the AE parameters for LIP are either minimal or have no impact to the plant facilities.

In summary, the NRC staff determined that the licensee's methods were appropriate, that the provided AE parameters are reasonable for use in the MSA, and that AE have no impact on FLEX strategies.

3.3 Evaluation of Flood Event Duration

The staff reviewed information provided by the licensee regarding the FED parameters needed to perform the MSA for flood hazards not bounded by the CDB. The FED parameters for the flood-causing mechanisms not bounded by the CDB are summarized in Table 3.2.1-1. The remainder of the flood-causing mechanisms are excluded from further analysis either because they are not plausible or they are bounded by the CDB/CLB.

For the LIP event, the licensee did not provide warning time. The LIP flooding event, which is driven by a 1-hr probable maximum precipitation, creates the maximum water elevations for different door locations across the power block listed in Table 4.2 in the FHRR. The licensee used the 2-dimensional numerical model described in the FHRR to determine these inundation duration parameters. The staff noted from the table and the hydrograph included in the FHRR, as well as the information provided in the MSA document, that the inundation period lasts for approximately 1 hour. Figure 4.9 in the FHRR and the information provided in the MSA, shows the average period of recession of about 4.25 hours. The staff confirmed that the licensee's reevaluation of the inundation periods for LIP and associated site drainage used present-day methodologies and regulatory guidance.

The staff reviewed the licensee's hydrologic and hydraulic models and resulting hydrographs as presented in FHRR and the MSA. In summary, the NRC staff agrees with the licensee's results regarding the FED parameters, and also finds that the licensee determined the FED parameters consistent with Appendix G of NEI 12-06, Revision 2. The NRC staff determined that the FED has no impact on FLEX strategies.

4.0 CONCLUSION

The NRC staff has reviewed the information provided in the Point Beach MSA related to the FLEX strategies, as evaluated against the reevaluated flooding hazard described in Section 2 of this staff assessment, and found that:

- The FLEX strategies are not affected by the impacts of the ISR flood levels (including impacts due to the environmental conditions created by the ISR flood levels) in such a way that the FLEX strategies cannot be implemented as currently developed.

- The deployment of the FLEX strategies is not affected by the impacts of the ISR flood levels.

- AE and FED parameters are reasonable and acceptable for use in the Point Beach MSA, and have been appropriately considered in the Point Beach MSA.

Therefore, the NRC staff concludes that the licensee has followed the guidance in NEI 12-06, Revision 2, and demonstrated the capability to deploy the original FLEX strategies, as designed, against a postulated beyond-design-basis event for LIP.

Table 3.2.1-1. Flood Event Durations for Flood-Causing Mechanisms Not Bounded by the CDB

Flood-Causing Mechanism	Time Available for Preparation for Flood Event	Duration of Inundation of Site (1)	Time for Water to Recede from Site
Local Intense Precipitation and Associated Drainage	Not Provided, But May Use NEI 15-05 (NEI, 2015)	approx. 1 hour[1]	approx. 4.25 hours[2]

Source: FHRR, letter dated November 6, 2015, and MSA (ADAMS Accession Nos. ML15071A413, ML15310A170, and ML16327A099, respectively)
Notes:
[1]Duration of inundation from the hydrograph presented in the FHRR (ADAMS Accession No. ML15071A413) [FHRR Figure 4.9 LIP TB Door 13 Water Depth Time Series – Scenario B].
[2]Time of recession from the MSA document (ADAMS Accession No. ML16327A099).

Table 3.2.2-1. Associated Effects Parameters not Directly Associated with Total Water Height for Flood-Causing Mechanisms not Bounded by the CDB.

	Flooding Mechanism
Associated Effects Parameter	**Local Intense Precipitation**
Hydrodynamic loading at plant grade	430.5 lb/ft at CWPH (includes 360.7 lb/ft hydrostatic and 69.9 lb/ft hydrodynamic)
Debris loading at plant grade	Minimal
Sediment loading at plant grade	Minimal
Sediment deposition and erosion	Minimal
Concurrent conditions, including adverse weather	Minimal
Groundwater ingress	Minimal
Other pertinent factors (e.g., waterborne projectiles)	Minimal

Source: FHRR (ADAMS Accession No. ML15071A413)

Notes:

(1) lb/ft stands for pounds per linear feet of structure in length.

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2– FLOOD HAZARD MITIGATION STRATEGIES ASSESSMENT DATED February 9, 2017

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