Permit Fact Sheet

1 General Information

Permit Number:	WI-0000957-09-0
Permittee Name:	NextEra Energy Point Beach LLC
Address:	6610 Nuclear Road
City/State/Zip:	Two Rivers, WI 54241
Discharge Location:	Shore of Lake Michigan
Receiving Water:	Lake Michigan
StreamFlow ($Q_{7,10}$):	N/A
Stream Classification:	Great Lakes, Cold Water Community

2 Facility Description

NextEra Energy Point Beach LLC is a nuclear-fueled steam electric power generating plant consisting of two nuclear powered steam supply units which drive two turbine generators rated at 630 megawatts each. An average flow of 920 million gallons per day of wastewater is discharged into Lake Michigan. It consists primarily of once through noncontact cooling water from generating units 1 and 2. Combined with the cooling water discharge are other wastewater sources including intake water screen backwash, miscellaneous equipment cooling, steam generator blowdown, primary coolant letdown, reverse osmosis reject water, floor drains, and fire protection water. Sanitary wastewater from the buildings is treated onsite and then combined with low volume wastewater effluent prior to discharge. Applicable categorical standards are applied at internal sample points. The wastewater sources listed above are combined with condenser cooling water and either discharged via Outfalls 001, 002, or both. The permit also includes an outfall for a deicing line for the water intake crib (Outfall 004).

2.1 Substantial Compliance Determination

After a desk top review of all electronic discharge monitoring reports, land application reports, compliance schedule items, and a site visit on 07/12/2023, this facility has been found to be in substantial compliance with their current permit.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	926 MGD, Data previously recorded under sample point 601, January 2018- December 2022	INTAKE: Lake Michigan water intake structure for unit 1 and unit 2 condenser cooling water, power plant water treatment system, fire protection, and service water. Intake is located 1750 feet offshore at a depth of approximately 22 ft. The intake flow rate is estimated by the number of pumps used, pump capacities, and pump run times on a given day. Temperature is continuously monitored in the forebay where intake water is combined, after the traveling screens and prior to use by the facility.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
001	460.7 MGD, January 2018-December 2022	EFFLUENT: Combined discharge of Unit 1 condenser cooling water, Unit 1 boiler blowdown, fire protection water, service water, low-volume wastewaters, and plant process water reverse osmosis reject to Lake Michigan. The permittee shall calculate the total flow rate based on number of pumps used, pump capacities, and pump run times on a given day. The permittee shall collect grab samples of combined discharge from Until 1 seal wall sample panel prior discharge to Lake Michigan. Continuous monitoring of temperature is measured from the outlet to the outfall structure. For WET testing, the permittee will set up a portable 24-hour flow proportional composite sampler.
002	465.4 MGD, January 2018-December 2022	EFFLUENT: Combined discharge of Unit 2 condenser cooling water, Unit 2 boiler blowdown, fire protection water, service, low-volume wastewaters, plant process water, reverse osmosis reject, plant process water microfiltration unit backwash meeting TSS limits, and traveling screen backwash to Lake Michigan. The permittee shall calculate the total flow rate based on number of pumps used, pump capacities, and pump run times on a given day. The permittee shall collect grab samples of the combined discharge from Unit 2 seal wall sample panel prior discharge to Lake Michigan. Continuous monitoring of temperature is measured from the outlet of the outfall structure. For WET testing, the permittee will set up a portable 24-hour flow proportional composite sampler.
004	18.4 MGD, January 2018-December 2022	EFFLUENT: Deicing line for the water intake crib in Lake Michigan. The discharge consists of reversing the flow of one of the water intake pipes to return warm water to the water intake crib located 1,750 ft offshore. The permittee shall estimate the flow rate based on pump operation and valve position.
005	68,500 gallons hauled to Manitowoc POTW in 2021	DOMESTIC SEWAGE SLUDGE: The permittee shall collect representative grab composite samples of the aerobically treated liquid sludge from the privately-owned domestic wastewater treatment works serving the power plant campus prior to being hauling off-site for disposal at another wastewater treatment facility. The permittee shall report the sludge test results on the Form 3400-49 'Waste Characteristics Report'. Limits listed in the permit only apply if the sludge is land applied by the permittee. The permittee shall report the total annual amount of sludge hauled to another facility on the Form 3400-52 'Other Methods of Disposal or Distribution Report' following each year whether or not the sludge is hauled to another facility.
010	N/A	AEL COMPLIANCE: Report total heat discharged from Outfalls 001 and 002.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
101	Total of 0.04 million gallons reported January 2018- December 2022	INPLANT: Low volume wastewater consisting of the combined discharge of condensation, floor drain, and sump water discharged from old water treatment room, previously used for waste neutralization system. The flow rate from demineralizer regeneration neutralization tank is estimated by the volume level in the tank and discharge time prior to being discharged via Outfall 001 or Outfall 002. The permittee shall monitor the flow rate and total flow via the continuous flow meter (FI-4161) when discharge occurs (1-2 times per year). The permittee shall collect grab samples from a sump prior to being discharged to either Outfall 001 or 002.
102	0.11 MGD, January 2018- December 2022	INPLANT: Unit 1 steam generator blowdown. The permittee shall monitor the flow rate via the coplanar differential pressure continuous flow meter on the pipe prior to being discharged via Outfall 001 or Outfall 002. The permittee shall collect grab samples of Unit 1 steam generator blowdown from a sampling port on the pipe prior being discharged.
103	0.10 MGD, January 2018- December 2022	INPLANT: Unit 2 steam generator blowdown. The permittee shall monitor the flow rate via the coplanar differential pressure continuous flow meter on the pipe prior to being discharged via Outfall 001 or Outfall 002. The permittee shall collect grab samples of Unit 2 steam generator blowdown from a sampling port on the pipe prior being discharged.
104	0.005 MGD, January 2018- December 2022	INPLANT: Sewage treatment plant effluent prior to combining with the low volume wastewater effluent and condenser cooling water discharge. Flow shall be monitored by an ultrasonic meter in the effluent channel as it passes through a V-notched weir after the final clarifier. Composite samples are monitored via 24-hr flow proportional sampler located in west blower room, drawing samples from the effluent channel prior the ultrasonic meter, V-notched Weir and being combined with low-volume wastewater. Grab samples are collected for pH from the effluent channel.
105	0.12 MGD, January 2018- December 2022	INPLANT: Low volume wastewater (wastewater effluent) consisting of the combined discharge of treated sanitary wastewater effluent, turbine hall sumps and floor drains, facade sumps, treated power plant water treatment system microfiltration backwash from iron/carbon filters, heating steam condensate, and potable water treatment system reverse osmosis reject. Wastewater is sampled prior to combining with condenser cooling water and discharged to either Outfall 001 or 002. The permittee shall monitor the flow rate via continuous vortex flow meter. The permittee shall collect composite samples via 24-hr flow proportional composite sampling device drawing samples from the pipe after the filters and prior to a

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
		vortex flow meter and discharge. The permittee shall collect grab samples by drawing water from the composite sampler.
106	0.1 MGD, January 2018- December 2022	INPLANT: Plant process water reverse osmosis reject wastewater. The permittee shall monitor the flow rate via the continuous magmeter flow meter on the pipe prior to being discharged to either Outfall 001 or 002. The permittee shall collect grab samples from Unit 2 sample panel prior to being discharge via either outfall.
107	Zero flow reported, January 2018- December 2022	INPLANT: Microfiltration unit backwash from the power plant's make-up water treatment system. Direct discharge to Outfall 002 when TSS limits can be met. When in-line turbidimeter indicates exceedance of TSS limits, the backwash is routed to vacuum fabric filters for treatment and discharged from Sampling Point 105. The permittee shall monitor the flow rate via the continuous magmeter flow meter on the pipe prior to being discharged via Outfall 002. The permittee shall collect grab samples from the backwash waste well of the microfiltration unit backwash prior to being discharged to Lake Michigan via Outfall 002.
108	N/A	FIELD BLANK: In-plant Sampling Point 111 is included in the permit to satisfy the need for a field blank when mercury monitoring is conducted. The permittee shall collect the field blank at the same time and location as the mercury effluent sample.
109	New Sample Point	INPLANT: Unit 1 Condenser Cooling Water. The permittee shall calculate the flow rate based on number of pumps used, pump capacities, and pump run times on a given day.
110	New Sample Point	INPLANT: Unit 2 Condenser Cooling Water. The permittee shall calculate the flow rate based on number of pumps used, pump capacities, and pump run times on a given day.
111	New Sample Point	INPLANT: Fire Protection Water and Service Water. The permittee shall calculate the total flow rate based on number of pumps used, pump capacities, and pump run times on a given day.

3 Influent – Cooling Water Intake Structure - Proposed Monitoring

3.1 Sample Point Number: 701- Water Intake

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Estimated	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Intake Water Used Exclusively For Cooling		% Flow	Annual	Calculated	
Temperature Maximum		deg F	Daily	Continuous	
Temperature Average		deg F	Daily	Calculated	

3.1.1 Changes from Previous Permit

Influent sample point 701 replaces sample point 601 used in prior permit issuances.

3.1.2 Explanation of Limits and Monitoring Requirements

The cooling water intake is conditionally approved as BTA (Best Technology Available) for minimizing adverse environmental impacts in accordance with the requirements in s. 283.31(6), Wis. Stats., and section 316(b) of the Clean Water Act, as described in Appendix A, Cooling Water Intake Structure Best Technology Available Determination (CWIS BTA). Conditions of this approval include the requirements of Schedule 5.1. The facility's chosen method of compliance for impingement is system of technologies.

See Appendix A for an evaluation of candidate technologies for entrainment BTA and a demonstration that the intake structure will satisfy s. NR 111.12(1)(a)2, Wis. Adm. Code, as impingement mortality BTA. Further description of the intake is provided in that appendix as well.

Floating debris and accumulated trash collected on the intake structure and screens shall be removed and disposed of in a manner to prevent any pollutant from the material from entering the waters of the State pursuant to s. NR 205.07 (3) (a), Wis. Adm. Code.

S. NR 111.14(4), Wis. Adm. Code, requires monthly visual or remote inspections of intake structures, but allows for alternative procedures in the case of offshore intakes. Alternative procedures for the permitted intake have been outlined in section 1.3.2 of the permit.

The permittee is required to submit an annual certification statement and report, pursuant to s. NR 111.15(1)(c), Wis. Adm. Code.

This permit does not authorize take of threatened or endangered species. Section NR 111.16(4)(a), Wis. Adm. Code, requires the inclusion of this provision in all permits subject to 316(b) requirements. Contact the state Natural Heritage Inventory (NHI) staff with inquiries regarding incidental take of state-listed threatened and endangered species and the US Fish and Wildlife Service with inquiries regarding incidental take of federally-listed threatened and endangered species.

Temperature data collected at sample point 701 will be used to determine compliance with heat limits at outfalls 002 and 001.

4 In-plant - Proposed Monitoring and Limitations

4.1 Sample Point Number: 101- Low Volume Wastewater; 106- Plant Process Water RO Reject, and 107- Microfiltration Unit Backwash

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
Suspended Solids, Total	Daily Max	100 mg/L	Monthly	Grab	
Suspended Solids, Total	Monthly Avg	30 mg/L	Monthly	Grab	
Oil & Grease (Hexane)	Daily Max	20 mg/L	Annual	Grab	
Oil & Grease (Hexane)	Monthly Avg	15 mg/L	Annual	Grab	
pH Field	Daily Min	6.0 su	Weekly	Grab	
pH Field	Daily Max	9.0 su	Weekly	Grab	

4.1.1 Changes from Previous Permit:

Flow rate reporting has been increased from monthly to daily with a sample type of "continuous" to align with the facility's use of continuous flow meters at the listed sample points.

The department has added pH field monitoring and limits to align the categorical limits contained in ch. NR 290, Wis. Adm. Code.

4.1.2 Explanation of Limits and Monitoring Requirements

Suspended Solids, Oil and Grease, and pH- Low volume wastewater sources are subject to the categorical limits contained in ch. NR 290, Wis. Adm. Code, Steam Electric Power Generating. These technology-based limits apply to the effluent at the sampling point prior to combining with the condenser cooling water.

4.2 Sample Point Number: 102- Blowdown Unit 1; 103- Blowdown Unit 2

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
Suspended Solids, Total	Daily Max	100 mg/L	Monthly	Grab	
Suspended Solids, Total	Monthly Avg	30 mg/L	Monthly	Grab	
Oil & Grease (Hexane)	Daily Max	20 mg/L	Annual	Grab	
Oil & Grease (Hexane)	Monthly Avg	15 mg/L	Annual	Grab	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
pH Field		su	Weekly	Grab	

4.2.1 Changes from Previous Permit:

Flow rate reporting has been increased from monthly to daily with a sample type of "continuous" to align with the facility's use of continuous flow meters at the listed sample points.

4.2.2 Explanation of Limits and Monitoring Requirements

Suspended Solids, Oil and Grease, and pH- Low volume wastewater sources are subject to the categorical limits contained in ch. NR 290, Wis. Adm. Code, Steam Electric Power Generating. These technology-based limits apply to the effluent at the sampling point prior to combining with the condenser cooling water. Categorical limits for pH have not been applied to this sample point as these two waste streams are regulated by EPRI and NRC to have a pH >9.5. Limits for pH will apply to outfalls 001 and 002, ensuring final effluent meets all required limits.

4.3 Sample Point Number: 104- STP Effluent

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD_5, Total	Weekly Avg	45 mg/L	Weekly	24-Hr Flow Prop Comp	
BOD_5, Total	Monthly Avg	30 mg/L	Weekly	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	Weekly	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	Weekly	24-Hr Flow Prop Comp	
pH Field	Daily Min	6.0 su	Weekly	Grab	
pH Field	Daily Max	9.0 su	Weekly	Grab	

4.3.1 Changes from Previous Permit:

Flow rate reporting has been increased from monthly to daily with a sample type of "continuous" to align with the facility's use of continuous flow meters at sample point 104. Sample types for composite samples have been updated from "24-hr composite" to "24-hr flow proportional composite" to align with the type of samplers currently in use at the facility.

The department added pH field effluent limitations to align with the secondary treatment standards listed in s. NR 201.05(1), Wis. Adm. Code.

4.3.2 Explanation of Limits and Monitoring Requirements

The department classifies the small on-site sanitary wastewater treatment system as privately owned domestic sewage treatment works which is subject to secondary treatment standards similar to a typical municipal wastewater treatment plant listed in ch. NR 210, Wis. Adm. Code. The facility discharges to Lake Michigan which is classified as a fish and aquatic life water as listed s. NR 102.04(3), Wis. Adm. Code. Therefore, the secondary treatment standards listed in s. NR 210.05(1), Wis. Adm. Code apply to the discharge from the on-site sanitary wastewater treatment system. These technology-based limits apply to the effluent at an internal sampling point prior to combining with the condenser cooling water pursuant to s. NR 205.065(2), Wis. Adm. Code.

4.4 Sample Point Number: 105- Low Volume Wastewater Effluent

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
Suspended Solids, Total	Daily Max	100 mg/L	Monthly	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	Monthly	24-Hr Flow Prop Comp	
Oil & Grease (Hexane)	Daily Max	20 mg/L	Annual	Grab	
Oil & Grease (Hexane)	Monthly Avg	15 mg/L	Annual	Grab	
pH Field	Daily Min	6.0 su	Weekly	Grab	
pH Field	Daily Max	9.0 su	Weekly	Grab	

4.4.1 Changes from Previous Permit:

Flow rate reporting has been increased from monthly to daily with a sample type of "continuous" to align with the facility's use of continuous flow meters at the listed sample points.

The department has added pH field monitoring and limits to align the categorical limits contained in ch. NR 290, Wis. Adm. Code.

4.4.2 Explanation of Limits and Monitoring Requirements

Suspended Solids, Oil and Grease, and pH- Low volume wastewater sources are subject to the categorical limits contained in ch. NR 290, Wis. Adm. Code, Steam Electric Power Generating. These technology-based limits apply to the effluent at the sampling point prior to combining with the condenser cooling water.

4.5 Sample Point Number: 108- Mercury Field Blank

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	Annual	Blank	

4.5.1 Changes from Previous Permit:

Mercury field blank added.

4.5.2 Explanation of Limits and Monitoring Requirements

Mercury monitoring is included in the proposed permit pursuant to s. NR 106.145, Wis. Adm. Code. Required field blanks for Mercury monitoring per ss. NR 106.145(9) and (10), Wis. Adm. Code, requirements. The permittee shall collect a mercury field blank for each set of mercury samples (a set of samples may include a combination of influent, effluent or other samples all collected on the same day). The permittee shall report results of field blanks to the department on the facility's eDMR.

4.6 Sample Point Number: 109- Unit 1 Condenser Cooling Water; 110- Unit 2 Condenser Cooling Water, and 111- Fire Protection and Service

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Estimated	

4.6.1 Changes from Previous Permit:

New sampling points added to document flows through areas of the facility not previously accounted for, and to ensure that an accurate measurement of the total flow rate is determined through Outfalls 001 and 002

5 Surface Water - Proposed Monitoring and Limitations

5.1 Sample Point Number: 001- Condenser Cooling Water; 002- Condenser Cooling Water

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Calculated	
pH Field	Daily Min	6.0 su	Weekly	Grab	
pH Field	Daily Max	9.0 su	Weekly	Grab	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Temperature Maximum		deg F	Daily	Continuous	
Temperature Average		deg F	Daily	Calculated	
Heat		MBTU/hr	Daily	Calculated	See Temperature Limitations section in permit.
Halogen, Total Residual as Cl2	Daily Max	38 ug/L	Daily	Grab	See Halogens Reporting section in permit.
Halogen, Total Residual as Cl2	Monthly Avg	38 ug/L	Daily	Calculated	See Halogens Reporting section in permit.
Additive – Water Treatment - Specify		mg/L	Daily	Grab	
Phosphorus, Total	Monthly Avg	0.8 mg/L	Monthly	Grab	
Mercury, Total Recoverable		ug/L	Annual	Grab	
PFOS		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
PFOA		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
Acute WET		TUa	See Listed Qtr(s)	24-Hr Comp	See permit section 3.2.1.10. Sample concurrently with any chemical-specific toxic substances.
Chronic WET		rTUc	See Listed Qtr(s)	24-Hr Comp	See permit section 3.2.1.10. Sample concurrently with any chemical-specific toxic substances.

5.1.1 Changes from Previous Permit

The sample type for flow rate has been updated from “total daily” to calculated to align with the practices currently taking place at the facility to determine flow rates. A monthly average halogen limit of 38 ug/L has been added to align with expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code. A monthly average phosphorus limit of 0.8 mg/L has been added.

Monthly monitoring for PFOS and PFOA is included in the permit in accordance with s. NR 106.98(2)(d), Wis. Adm. Code.

5.1.2 Explanation of Limits and Monitoring Requirements

Refer to the Water Quality Based Effluent Limitations (WQBEL) memo prepared by Rachel Fritz, Water Resources Engineer, and dated 6/4/2021 for a detailed discussion of all water quality based effluent limits.

Temperature, Heat- Thermal Rules went into effect 10/1/2010 and are detailed in ch. NR 102, Wis. Adm. Code, Water Quality Standards for Temperature, and ch. NR 106, Wis. Adm. Code, Effluent Limits for Temperature.

Discharges that are a source of heat, such as a power plant's condenser cooling water, are subject to temperature limits to protect aquatic life. The effluent temperature is being monitored, but the discharge is subject to a limit related to the heat output from the power plant measured in millions of BTUs (British thermal units) per hour, as an alternative effluent limit to regulate temperature. Refer to Sampling Point 010 where the heat limit is included for the combined discharges from both Outfall 001 and 002.

Halogens- See WQBEL memo dated 6/4/2021 for analysis of total residual halogens.

Phosphorus- Phosphorus rules became effective December 1, 2010, per NR 217, Wis. Adm. Code, that required the permittee to comply with WQBELs for total phosphorous. For the reasons explained in the April 30, 2012 paper entitled 'Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin', WDNR has determined that it is impracticable to express the phosphorus WQBEL for the permittee as a maximum daily or weekly value. As such, the effluent limit for phosphorus is expressed as a monthly average. This effluent limit is set equal to the level that is currently attainable for outfalls 001 and 002.

Subchapter II of Chapter NR 217, Wis. Adm. Code, requires a 12-month rolling average TBEL of 1.0 mg/L for industrial facilities that discharge greater than 60 pounds of Total Phosphorus per month. This requirement has been satisfied through the more restrictive WQBEL of 0.8 mg/L.

Mercury- The 30-day P_{99} of available data for the facility (1.00 ng/L) is less than the most stringent WQBEL of 1.3 ng/L. As such, no WQBEL for mercury is required in the reissued permit. Annual mercury monitoring is included in the permit, consistent with other discharges to waters of the Great Lakes.

PFOS and PFOA – NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. At the first reissuance of a WPDES permit after August 1, 2022, the new rule requires WPDES permits for industrial dischargers to be evaluated on a case-by-case basis to determine if monitoring is required pursuant to s. NR 106.98(2)(d), Wis. Adm. Code. The department evaluated the need for PFOS and PFOA monitoring taking into consideration industry type and other potential sources of PFOS or PFOA. Based on information available at the time the proposed permit was drafted, it was identified that the industrial discharger category may be a potential source of PFOS/PFOA. In addition, previous PFOS sample results were within 1/5 of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code. Therefore, monthly monitoring is included. The initial determination of need sampling shall be conducted for up to two years in order to determine if the permitted discharge has the reasonable potential to cause or contribute to an exceedance of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

Whole Effluent Toxicity (WET)- Whole effluent toxicity (WET) testing requirements and limits (if applicable) are determined in accordance with ss. NR 106.08 and NR 106.09 Wis. Adm. Code, as revised August 2016. See the current version of the Whole Effluent Toxicity Program Guidance Document and checklist and WET information, guidance and test methods at https://dnr.wisconsin.gov/topic/Wastewater/WET.html. WET testing will be required for both outfalls during the quarters listed in the permit.

5.2 Sample Point Number: 004- Intake De-icing

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Per Occurrence	Estimated	

5.2.1 Changes from Previous Permit

No changes made.

5.2.2 Explanation of Limits and Monitoring Requirements

Estimated flow monitoring provides information on when the deicing line is used.

5.3 Sampling Point (Outfall) 010 - Heat Discharged

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Heat	Weekly Avg	8,273 MBTU/hr	Daily	Calculated	

5.3.1 Changes from Previous Permit

Outfall 010 has been added to the permit for reporting combined heat discharged via outfalls 001 and 002.

5.3.2 Explanation of Limits and Monitoring Requirements

Outfall 010 has been in use during the current permit term to report combined heat discharged and to determine compliance with the alternative effluent limit for heat but was not described in the current permit. This outfall has been added to the permit to better document the practices currently taking place for tracking heat discharged. See attached AEL Approval Letter for additional details.

The AEL is included in the permit in place of the following temperature limits:

	Calculated Effluent Limit	
	Weekly Average Effluent Limitation	**Daily Maximum Effluent Limitation**
	(°F)	(°F)
Jan	**44**	**71**
Feb	**48**	**71**
Mar	**53**	**71**
Apr	**59**	**71**

May	**65**	**72**
June	**70**	**73**
July	**72**	**74**
Aug	**70**	**74**
Sept	**64**	**74**
Oct	**55**	**73**
Nov	**47**	**71**
Dec	**44**	**70**

6 Land Application - Proposed Monitoring and Limitations

6.1 Sample Point Number: 005- Hauled Sludge

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Annual	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
PFOA + PFOS		µg/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

6.1.1 Changes from Previous Permit:

Sample Point 005 was deactivated for the previous permit issuance as PBNP ceased land applying sludge. Outfall 005 has been added back into the permit so the facility can report amount of sludge hauled to another facility via Form 3400-52 'Other Methods of Disposal or Distribution Report' following each year that the sludge is hauled. Limits listed in the permit only apply if the facility land applies the sludge. Annual PFAS monitoring has been included in the permit.

6.1.2 Explanation of Limits and Monitoring Requirements

Chapter NR 204, Wis. Adm. Code, regulates the management and disposal of domestic sewage sludge. The sludge generated at the on-site wastewater treatment system is considered domestic sewage sludge and therefore is regulated under ch. NR 204, Wis. Adm. Code. Section NR 204.06(8), Wis. Adm. Code, requires in the event a generator of sludge gives the sludge to another person for further treatment or storage, the generator shall give the person receiving the sludge all information needed to comply with the requirements of ch. NR 204, Wis. Adm. Code. Therefore, the department requires that the sludge be sampled at least for total solids, arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc to give the person receiving the sludge all information needed to comply with the requirements of ch. NR 204, Wis. Adm. Code. The annual frequency of the sludge monitoring is based the facility producing less than 320 dry tons of sludge per year pursuant to s. NR 204.06(2)(c)3., Wis. Adm. Code.

PFAS- The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA is currently developing a risk assessment to determine future land application rates and expects to release this risk assessment by the end of 2024. In the interim, the department has developed the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS".

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department's implementation of EPA's recommendations. To quantitate this risk, PFAS sampling has been included in the proposed WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9., Wis. Adm. Code.

7 Schedules

7.1 Impingement Technology Performance Optimization Study

Required Action	Due Date
Impingement Technology Performance Optimization Study Plan: If the permittee has chosen to comply with the Impingement Mortality Standard specified in NR 111.12 (1)(a)(6) (system of technologies), the permittee shall submit a study plan for the Impingement Technology Performance	09/30/2026

Optimization Study. The study shall be designed to meet all requirements outlined in NR 111.41(5)(b), Wis. Adm. Code.	
Commence Impingement Reduction Verification Sampling: The permittee shall commence the study in accordance with the approved study plans.	12/31/2026
Optimization Study Progress Report: The permittee shall submit a progress report to the department outlining which portions of the study have been completed and data that has been collected thus far.	12/31/2027
Final Report : The permittee shall submit the final Impingement Technology Performance Optimization Study to the department. The final report shall meet all requirements outlined in NR 111.41(5)(b), Wis. Adm. Code.	12/31/2028

7.1.1 Explanation of Schedule

Impingement Technology Performance Optimization study required for approval of CWIS.

7.2 Water Intake Requirements

The permittee shall submit annual certification statements as specified by Section 1.3.3.2, Annual Certification Statement and Report, in accordance with the following schedule.

Required Action	Due Date
Annual Certification Statements and Reports: Submit an annual certification statement and report on the water intake structures. The annual certification shall include a summary of maintenance and operation of water intake structure technologies, a summary of visual or remote inspections conducted, and a summary of any substantial modifications to the operation of any units that will impact cooling water withdrawals or operation of the water intake structure. The first annual certification statement and report is to be submitted by the Due Date.	01/31/2025
Annual Certification Statement #2: Submit a second annual certification statement as defined above.	01/31/2026
Annual Certification Statement #3: Submit a third annual certification statement as defined above.	01/31/2027
Annual Certification Statement #4: Submit a fourth annual certification statement as defined above.	01/31/2028
Annual Certification Statements After Expiration: In the event that this permit is not reissued on time, the permittee shall continue to submit annual certification statements each year by the date specified in Section 1.3.3.2.	

7.2.1 Explanation of schedule

Schedule has been added to assist with tracking of reports required by permit section 1.3.3.2.

7.3 PFOS/PFOA Minimization Plan Determination of Need

Required Action	Due Date
Report on Effluent Discharge: Submit a report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations. This analysis should also include a comparison to the applicable narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results.	06/30/2025
Report on Effluent Discharge and Evaluation of Need: Submit a final report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations of data collected over the last 24 months. The report shall also provide a comparison on the likelihood of the facility needing to develop a PFOS/PFOA minimization plan. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results. The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan. If the Department determines a PFOS/PFOA minimization plan is needed based on a reasonable potential evaluation, the permittee will be required to develop a minimization plan for Department approval no later than 90 days after written notification was sent from the Department. The Department will modify or revoke and reissue the permit to include PFOS/PFOA minimization plan reporting requirements along with a schedule of compliance to meet WQBELs. Effluent monitoring of PFOS and PFOA shall continue as specified in the permit until the modified permit is issued. If, however, the Department determines there is no reasonable potential for the facility to discharge PFOS or PFOA above the narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code, no further action is required and effluent monitoring of PFOS and PFOA shall continue as specified in the permit.	06/30/2026

7.3.1 Explanation of Schedule

As stated above, NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. S. NR 106.98, Wis. Adm. Code, specifies steps to generate data in order to determine the need for reducing PFOS and PFOA in the discharge. Data generated per the effluent monitoring requirements will be used to determine the need for developing a PFOS/PFOA minimization plan. As part of the schedule, the permittee is required to submit two annual Reports on Effluent Discharge.

If the department determines that a minimization plan is needed, the permit will be modified or revoked/reissued to include additional requirements.

8 Other Comments:

None

9 Attachments:

Water Quality-Based Effluent Limitations for the NextEra Energy Point Beach LLC WPDES Permit No. WI-0000957-09-0, June 4, 2021, Rachel Fritz, Water Resources Engineer

Cooling Water Intake Structure Best Technology Available Determination for NextEra- Point Beach Nuclear Power Plant, July 19, 2023, Amanda Perdzock, Water Resources Specialist

Approval of the alternative effluent temperature limit for NextEra Energy Point Beach LLC (WI-0000957), February 22, 2024, Emma Lorenzen, Wastewater Engineer

10 Proposed Expiration Date:

June 30, 2029

11 Justification Of Any Waivers From Permit Application Requirements

No waivers granted for permit application requirements.

Prepared By:

Amanda Perdzock, Wastewater Specialist

Date: March 26, 2024

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: June 4, 2021 (updated March 16, 2024)

TO: Jason Knutson – WY/3

FROM: Wade Strickland – WY/3

SUBJECT: Water Quality-Based Effluent Limitations for the NextEra Energy Point Beach LLC WPDES Permit No. WI-0000957-09-0

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using Chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from NextEra Energy Point Beach LLC in Manitowoc County. This industrial facility discharges to Lake Michigan, located in the East Twin River-Frontal Lake Michigan Watershed in the Twin-Door-Kewaunee Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis:

Outfalls 001 and 002 (Condenser Cooling Water)

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1
pH	9.0 s.u.	6.0 s.u.			
Temperature					1
Heat			8,273 MBTU/hr		2
Residual Halogens	38 µg/L			**38 µg/L**	3
EVAC Additive	0.071 mg/L				4
Phosphorus				0.8 mg/L	5
Acute WET					6, 7
Chronic WET					6, 7

Footnotes:

1. Monitoring only.
2. The heat limit in the current permit is based on a temperature alternative effluent limits study. Re-approval of the AEL study and applicable heat limits is outside the scope of this memo.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7) are included in bold.
4. The additive usage limit is expressed as amine equivalent in the current permit. In order to maintain the ability to use this product in the reissued permit, this limit needs to be re-calculated using updated secondary value calculation procedures. This limit will be re-evaluated in a separate memo.
5. This is an interim limit based on a level that is currently attainable for the discharges from Outfalls 001 and 002. Water quality-based effluent limits may apply when a near shore or whole lake model is approved by the Department.
6. Annual acute and chronic monitoring is recommended in the reissued permit. The Instream Waste Concentration (IWC) to assess chronic test results is 9.1%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 30%, 10%, 3% & 1% and the dilution water used in WET tests conducted on Outfalls 001 or 002 shall be a grab sample collected from the receiving water out of the influence of the discharge.

7. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).

The permit also includes categorical and BPJ limits at the internal sampling points for individual waste streams which are not addressed in this memo.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (3) – Narrative, Map and Thermal Table

Updated By: *Diane Figiel* Date: 03/16/2024

Diane Figiel,
Water Resources Engineer

E-cc: Dave Gerdman, Wastewater Engineer – NER/Green Bay
Diane Figiel, Water Resources Engineer – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
NextEra Energy Point Beach LLC

WPDES Permit No. WI-0000957-09-0

Prepared by: Rachel Fritz

PART 1 – BACKGROUND INFORMATION

Facility Description:
NextEra Energy Point Beach LLC is a nuclear-fueled steam electric power generating plant consisting of two nuclear powered steam supply units which drive two turbine generators rated at 630 megawatts each. An average flow of 920 million gallons per day of wastewater is discharged into Lake Michigan. It consists primarily of once through noncontact cooling water from generating units 1 and 2. Combined with the cooling water discharge are other wastewater sources including intake water screen backwash, miscellaneous equipment cooling, steam generator blowdown, primary coolant letdown, reverse osmosis reject water, floor drains, fire protection water, and sanitary wastewater effluent.

Applicable categorical standards are applied at an internal sample point. The wastewater sources listed above are combined with condenser cooling water and discharged via Outfalls 001 and 002. The permit also includes an outfall for a deicing line for the water intake crib (Outfall 004).

Attachment #2 is a map of the area showing the approximate location of Outfalls 001 and 002.

Existing Permit Limitations: The current permit, which expires on June 30, 2021, includes the following effluent limitations and monitoring requirements. The permit also includes categorical and BPJ limits at the internal sampling points for individual waste streams.

Outfalls 001 and 002 (Condenser Cooling Water)

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1
pH	9.0 s.u.	6.0 s.u.			
Temperature					1
Heat			8,273 MBTU/hr		
Residual Halogens	38 µg/L				
EVAC Additive	0.071 mg/L				2
Phosphorus					
Acute WET					1
Chronic WET					1

Footnotes:
1. Monitoring only
2. The additive usage limit is expressed as amine equivalent.

Receiving Water Information:

- Name: Lake Michigan
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Coldwater fish community, Public water supply.
- Flow: A ten-to-one dilution ratio will be used for calculating effluent limitations based on chronic or long-term impacts, in accordance with s. NR 106.06(4)(b)2, Wis. Adm. Code, because the receiving water does not exhibit a unidirectional flow at the point of discharge.
- Hardness = 157 mg/L as $CaCO_3$. This value represents the geometric mean of WET testing data from 2007 to 2019.
- Source of background concentration data: Background data for arsenic, mercury, and chloride used in this evaluation are from intake data from WPL-Edgewater near Sheboygan. Metals data for cadmium, chromium, copper, lead, and zinc are from the guidance document *Calculating Water Quality-Based Effluent Limitations for Surface Water Discharges.* The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations.
- Multiple dischargers: None
- Impaired water status: Not applicable

Effluent Information:

- Flow Rates: The effluent flow data from April 2016 to March 2021 are summarized in the table below. Statistics on the combined discharges are based on the sum of daily reported flow rates. Outfalls 001 and 002 discharge from the same sources nearby each other. Since the mixing zones from both discharges overlap, the max annual average flow rate of the combined discharges of 950.2 MGD is used in limit calculations.

Effluent Flow Rates (MGD) Data from April 2016 to March 2021			
	Outfall 001	Outfall 002	Combined Discharges
Peak Daily	581.0	590.4	1104.4
Peak Weekly	581.0	590.4	1104.4
Peak Monthly	559.7	578.3	1104.4
Overall Average	474.0	480.5	923.2
Max Annual Average	483.3	500.1	950.2

- Hardness = 138 mg/L as $CaCO_3$. This value represents the geometric mean of permit application data and WET testing data from 2007 to 2019.
- Acute dilution factor used in accordance with s. NR 106.06 (3) (c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source: Intake from Lake Michigan. A negligible amount of the source water (~0.001%) comes from a well onsite.
- Additives: Two biocides, 17 water quality conditioners, and two process additives are used at the facility which may be present in the discharge.
- Effluent characterization: This facility is categorized as an industrial discharger, so the permit application required effluent sample analyses for all the "priority pollutants" except for the Dioxins and Furans as specified in s. NR 200.065, Table 1, Wis. Adm. Code.

The discharges from Outfalls 001 and 002 originate from the same sources and their effluent concentrations expected to be identical. The permit application included data from Outfall 002 only.

Data from Outfalls 001 and 002 are considered representative of both outfalls and used interchangeably in this memo.

	Copper µg/L
09/01/2020	12
09/04/2020	4.3
09/09/2020	<3.5
09/17/2020	3.6
Mean	5.0

	Mercury ng/L
1-day P_{99}	3.35
4-day P_{99}	1.84
30-day P_{99}	1.00
Mean	0.646
Std	0.699
Sample size	15
Range	<0.14 - 2.5

"<" means that the pollutant was not detected at the indicated level of detection. The mean concentration was calculated using zero in place of the non-detected results.

Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.".

The following table presents the average concentrations and loadings at Outfalls 001 and 002 from April 2016 to March 2021 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6):

	Outfall 001	Outfall 002
Chlorine	<20 µg/L*	<20 µg/L*
Total Halogens	0.04 µg/L*	0.18 µg/L*
pH field	8.19 s.u.	8.20 s.u.
Phosphorus	0.084 mg/L*	0.084 mg/L*
Temperature	71°F	72°F
Heat	3677 MBTU/hr	3252 MBTU/hr

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)

2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P_{99}) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

The following tables list the calculated water quality-based effluent limitations for this discharge along with the results of effluent sampling for all the detected substances. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L) and mercury (ng/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER DILUTION = 10:1 Mixing (Limit=2×ATC)

SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Chlorine		19.0	38.1	7.61	-		
Arsenic		340	679.6	135.9	<4.2		
Cadmium	138	6.3	12.6	2.5	<0.97		
Chromium	138	2342	4683.0	937	<4.4		
Copper	138	21.0	41.9	8.4	5.0		12.0
Lead	138	146	291.1	58.2	<2.6		
Mercury (ng/L)		830	830			3.35	2.5
Nickel	138	615	1229.1	246	<3.0		
Zinc	138	159	318.2	63.6	7.9		
Chloride (mg/L)		757	1514.0	303	12.4		

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER DILUTION = 10:1 Mixing, as specified in s. NR 106.06 (4) (b) 2, Wis. Adm. Code

SUBSTANCE	REF. HARD. mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Chlorine		7.28		80.08	16.02	-	
Arsenic		148.0	1.0	1618	323.6	<4.2	
Cadmium	157	3.51	0.0085	38.53	7.7	<0.97	
Chromium	157	124.76	0.49	1367	273.5	<4.4	
Copper	157	15.23	0.44	163.1	32.63	5.0	
Lead	157	43.31	0.052	475.9	95.2	<2.6	
Mercury (ng/L)		440	0.48	440			1.84
Nickel	157	76.46	0.00	841	168.2	<3.0	
Zinc	157	178.62	0.39	1961	392.2	7.9	
Chloride (mg/L)		395	15.60	4189	837.8	12.4	

Monthly Average Limits based on Wildlife Criteria (WC)
RECEIVING WATER DILUTION = 10:1 Mixing, as specified in s. NR 106.06 (4) (b) 2, Wis. Adm. Code

SUBSTANCE	WC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Mercury (ng/L)	1.3	0.48	1.30	-	-	1.00

Monthly Average Limits based on Human Threshold Criteria (HTC)
RECEIVING WATER DILUTION = 10:1 Mixing, as specified in s. NR 106.06 (4) (b) 2, Wis. Adm. Code

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	4.4	0.01	48	9.7	<0.97
Chromium (+3)	100	0.49	1095	219	<4.4
Lead	10	0.05	109	21.9	<2.6
Mercury	1.5	0.48	1.5	0.30	0.27
Nickel	100	0.00	1100	220	<3.0

Monthly Average Limits based on Human Cancer Criteria (HCC)
RECEIVING WATER DILUTION = 10:1 Mixing, as specified in s. NR 106.06 (4) (b) 2, Wis. Adm. Code

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	0.2	1.00	0.2	0.04	<4.2

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8), Wis. Adm. Code, requires the evaluation of the cumulative cancer risk. Because no effluent limits are needed based on HCC, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are required for total halogens.

Total Residual Halogens – Because chlorine and bromine are added at the facility for zebra mussel control, effluent limitations are recommended to assure proper removal. Specifically, a daily maximum limit of 38 µg/L (38.06, rounded to two significant figures) is required. Due to revisions to s. NR 106.07(2), Wis. Adm. Code, mass limitations are no longer required. Weekly average limitations are not needed based on reasonable potential as the daily maximum limitations will provide adequate protection of the resource.

Revisions to chs. NR 106 and 205, Wis. Adm. Code align Wisconsin's water quality-based effluent limits with 40 CFR 122.45(d), which requires WPDES permits for industrial discharges contain daily maximum and monthly average limitations, whenever practicable and necessary to protect water quality. NextEra is an industrial discharger and therefore a monthly average total halogens limit is necessary in addition to the daily max limit.

The methods for calculating limitations for industrial discharges to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(4), Wis. Adm. Code, as follows:

> Whenever a daily maximum limitation is determined necessary to protect water quality, a monthly average limitation shall also be included in the permit and set equal to the daily maximum limit unless a more restrictive limit is already determined necessary to protect water quality.

Therefore, the **total halogens limit of 38 µg/L should be expressed in the permit as both a daily max and monthly average limit**.

Mercury – The WQBEL for total recoverable mercury is typically set equal to the most stringent criterion of 1.3 ng/L, according to s. NR 106.06 (6), Wis. Adm. Code, following the requirement to discontinue mixing zones for biological compounds of concern in the Great Lakes (s. NR 106.06(2)(br)).

A total of 15 effluent sampling results for Outfalls 001 and 002 are available from May 2004 to September 2020 for total recoverable mercury. The average concentration was 0.646 ng/L, and the maximum was 2.5 ng/L. Because the 30-day P_{99} of available data (1.00 ng/L) is less than the most stringent WQBEL of 1.3 ng/L, **no WQBEL for mercury is required in the reissued permit. A minimum of annual mercury monitoring is recommended for permit reissuance, consistent with other discharges to waters of the Great Lakes.**

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. Given the fact that NextEra does not currently have ammonia nitrogen limits the need for limits is evaluated at this time.

Four samples for ammonia nitrogen were taken April 2016 to March 2021, and the results were as follows:

Sample Date	Ammonia Nitrogen mg/L
	Outfall 002
09/01/2020	0.13
09/04/2020	<0.10
09/09/2020	0.12
09/17/2020	<0.10

These effluent results are well below the lowest ammonia limits that would be calculated. Therefore, **no ammonia limits or additional monitoring are recommended** in the reissued permit.

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

On May 1, 2020, revisions to chs. NR 102 and NR 210, Wis. Adm. Code became effective which replace fecal coliform limits with new *Escherichia coli* (*E. coli*) limits for protection of recreational uses. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

1. The geometric mean of *E. coli* bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

Secondary treated sanitary wastewater (Sampling Point 104) is discharged with the other wastewaters at Outfalls 001 and 002. The treatment system does not include disinfection. The permit includes categorical BOD and TSS limits for sanitary wastewater at the internal sampling point, but no bacteria limits.

The sanitary wastewater makes up a very small percentage of the total discharge. The sanitary effluent is 0.0053 MGD with a total flow from Outfalls 001 and 002 of 950.2, for a discharge ratio of 1:179,000. Fecal coliform levels in secondary treated effluent are about 10^5-10^6 MPN/100 mL according to *Design of Water Resource Recovery Facilities*, MOP 8, Sixth Edition. Using these estimates, the discharged fecal coliform levels from Outfalls 001 and 002 would range from <1 to 6 MPN/100 mL. Since the *E. coli* population is a subset of the fecal coliform population, *E. coli* levels are expected to close to or lower than these estimates. The estimated discharge concentrations are well below the applicable *E. coli* criteria listed above. Therefore, these limits are expected to be consistently met by the discharge without disinfection. **No limits or monitoring for bacteria at Sampling Point 104 are recommended** in the reissued permit.

PART 5 – PHOSPHORUS

Technology Based Phosphorus Limit
Subchapter II of Chapter NR 217, Wis. Adm. Code, requires industrial facilities that discharge greater than 60 pounds of Total Phosphorus per month to comply with 12-month rolling average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because NextEra does not currently have an existing technology-based limit, the need for this limit in the reissued permit is evaluated. The data from Outfalls 001 and 002 demonstrates that the annual monthly average phosphorus loading is greater than 60 lbs/month, which is the threshold for industrial facilities in accordance to s. NR 217.04(1)(a)2, Wis. Adm. Code, and therefore **a technology-based limit is required**.

Attachment #1

Month	Monthly Avg. mg/L	Total Flow MG/month	Total Phosphorus lb./mo.
April 2020	0.017	30348.1	4303
May 2020	0.041	34236.4	11707
June 2020	0.0415	33132	11467
August 2020	0.0335	34236.4	9565
September 2020	0.0315	33132	8704
October 2020	0.0285	21766.2	5174
November 2020	0.032	32704.1	8728
December 2020	0.0365	27133.2	8260
January 2021	0.0285	21607	5136
February 2021	0.049	19516	7975
March 2021	0.016	21607	2883
Average =			7627

Total P (lbs/month) = Monthly average (mg/L) × total flow (MG/month) × 8.34 (lbs/gallon)
Where total flow is the sum of the actual (not design) flow (in MGD) for that month

In addition, the need for a WQBEL for phosphorus must be considered.

Water Quality-Based Effluent Limits (WQBEL)
Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

Section NR 102.06(5)(b), Wis. Adm. Code, specifies that a total phosphorus criterion of 7 µg/L (0.007 mg/L) applies for the open and nearshore water of Lake Michigan. For direct discharges to Lake Michigan such as NextEra, s. NR 217.13(4), Wis. Adm. Code, states that the Department shall set effluent limits consistent with nearshore or whole lake models approved by the Department. At this time there is no model available. According to phosphorus implementation guidance, an interim limit should be set at a level that's achievable and that makes progress toward phosphorus reductions without the investment of temporary treatment or a compliance schedule to meet the interim limit.

Effluent Data
The following table summarizes effluent total phosphorus monitoring data from April 2016 to March 2021.

	Phosphorus mg/L	
	Outfall 001	**Outfall 002**
1-day P_{99}	1.1	1.2
4-day P_{99}	0.62	0.64
30-day P_{99}	0.29	0.30
Mean	0.15	0.16
Std	0.25	0.26
Sample size	34	33
Range	0.016 - 0.79	0.016 - 0.79

Interim Limit

The interim limit should reflect a concentration that the facility is able to meet without investing in additional "temporary" treatment, but also should prevent backsliding from current conditions. Therefore, **it is recommended that the interim limit be set equal to 0.8 mg/L for permit reissuance.** A limit set equal to the 4-day P_{99} of 0.63 mg/L, typically used to set interim limits, would result in only 82% compliance based on the last five years of monitoring data. A limit of 0.8 mg/L represents the lowest level the discharge consistently attains.

PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off the actual daily combined flow rates from Outfalls 001 and 002 reported from April 2016 to March 2021.

The table below summarizes the maximum temperatures for Outfalls 001 and 002 reported during monitoring from April 2016 to March 2021.

Month	Representative Highest Monthly Effluent Temperature Outfall 001		Representative Highest Monthly Effluent Temperature Outfall 002		Calculated Effluent Limit Combined Outfall 001+002	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	77	79	76	77	**44**	**71**
FEB	77	79	76	78	**48**	**71**
MAR	78	79	76	78	**53**	**71**
APR	76	80	74	76	**59**	**71**
MAY	74	82	71	80	**65**	**72**
JUN	82	84	78	81	**70**	**73**
JUL	89	93	85	88	**72**	**74**
AUG	92	95	89	92	**70**	**74**
SEP	86	87	83	85	**64**	**74**
OCT	83	84	81	83	**55**	**73**
NOV	71	78	75	81	**47**	**71**
DEC	77	78	75	76	**44**	**70**

Reasonable Potential
Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
  (a) The highest recorded representative daily maximum effluent temperature
  (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub−lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
  (a) The highest weekly average effluent temperature for the month.
  (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. Based on this analysis, there is reasonable potential to exceed the calculated daily maximum and weekly average temperature limits year-round.

In place of temperature limits, the current permit includes a heat limit of 8,273 MBTU/hr as a weekly average based on an alternative effluent limit (AEL) study under s. NR 106, Subchapter VI, Wis. Adm. Code, and in accordance with 283.17 Wis. Stats. The original AEL study submitted by the permittee was approved August 29, 2012 with conditions that additional data be submitted with the next permit application to continue to justify the AEL. **Review of any updated information on the AEL study and its continued approval is beyond the scope of this WQBEL memo**. Therefore, **no recommendation related to the AEL request is provided in this memo. No changes to the effluent temperature monitoring requirements are recommended.**

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the WET Program Guidance Document (October 29, 2019).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09 (2) (b), Wis. Adm Code.

- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the

receiving water, WET tests must produce a statistically valid IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09 (3) (b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 9.1% shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

The IWC is 9.1% based on dilution of 10 parts lake water to 1-part effluent, as specified in s. NR 106.06 (4) (b) 2, Wis. Adm. Code, or a factor of 1 in 11 to calculate the IWC.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfalls 001 and 002 shall be a grab sample collected from the receiving water location, out of the influence of the mixing zone. The specific receiving water location must be specified in the WPDES permit.

- Shown below is a tabulation of all available WET data for Outfalls 001 and 002. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08 (3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

WET Data History

Date Test Initiated	Outfall Number	Acute Results LC_{50} % (% survival in 100% effluent)				Chronic Results IC_{25} %				Footnotes or Comments
		C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Pass or Fail?	Use in RP?	
09/13/2005	001	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
06/05/2007	002	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
03/24/2009	002	>100	>100	Pass	No	>100	>100	Pass	No	1
01/26/2010	001	>100	>100	Pass	No	93	>100	Pass	No	1
05/01/2012	001	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
08/22/2017	001	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
05/16/2019	001	>100	>100	Pass	Yes	98.7	>100	Pass	Yes	

Footnotes:

1. *Tests done by S-F Analytical, July 2008 – March 2011.* The DNR has reason to believe that WET tests completed by SF Analytical Labs from July 2008 through March 31, 2011 were not performed using proper test methods. Therefore, WET data from this lab during this period has been disqualified and was not included in the analysis.

- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The

fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

Acute Reasonable Potential = [(TUa effluent) (B)(AMZ)]
Chronic Reasonable Potential = [(TUc effluent) (B)(IWC)]

According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC_{50}, IC_{25} or $IC_{50} \geq 100\%$).

Acute Reasonable Potential = $0 < 1.0$, reasonable potential is not shown, and a limit is not required.

Chronic Reasonable Potential = [(TUc effluent) (B)(IWC)]

TUc (maximum) $100/IC_{25}$	**B** (multiplication factor from s. NR 106.08(5)(c), Wis. Adm. Code, Table 4)	IWC
100/98.7 = 1.01	6.2 Based on 1 detects	9.1%

[(TUc effluent) (B)(IWC)] = $0.57 < 1.0$

Therefore, no reasonable potential is shown chronic for WET limits using the procedures in s. NR 106.08(6), Wis. Adm. Code, and representative data from 2005 to 2019.

The WET Checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other related permit conditions. The Checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The Checklist steps the user through a series of questions, assesses points based on the potential for effluent toxicity, and suggests monitoring frequencies based on points accumulated during the Checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. A summary of the WET Checklist analysis completed for this permittee is shown in the table below. Staff recommendations based on best professional judgment are provided below the summary table. For guidance related to reasonable potential and the WET Checklist, see Chapter 1.3 of the WET Guidance Document: http://dnr.wi.gov/topic/wastewater/WETguidance.html.

Attachment #1

WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 9.1%. **0 Points**
Historical Data	5 tests used to calculate RP. No tests failed. **0 Points**	5 tests used to calculate RP. No tests failed. **0 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	Full Fish and Aquatic Life **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Reasonable potential for zero substances based on ATC; Cu, Hg, Zn, and chloride detected. Additional Compounds of Concern: none **3 Points**	Reasonable potential for zero substances based on CTC; Cu, Hg, Zn, and chloride detected. Additional Compounds of Concern: none **3 Points**
Additives	2 Biocides (6 pts) and 16 Water Quality Conditioners added. (14 pts. since total points not to exceed 20) P treatment chemical other than Ferric Chloride (FeCl), Ferrous Sulfate ($FeSO_4$), or alum used: No **20 Points**	2 Biocides (6 pts) and 11 Water Quality Conditioners (11 pts) used more than once per 4 days. **17 Points**
Discharge Category	Steam electric power generating **0 Points**	Same as Acute. **0 Points**
Wastewater Treatment	Secondary Treatment for sanitary wastewater **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**28 Points**	**25 Points**
Recommended Monitoring Frequency (from Checklist):	3 tests during permit term (year 1, 3, 5, etc.)	3 tests during permit term (year 1, 3, 5, etc.)
Limit Required?	No	No
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2019), based on the WET checklist points alone, three acute and three chronic WET tests would be recommended in the reissued permit.

- However, **annual acute and chronic monitoring is recommended** in the reissued permit because NextEra Point Beach is a Primary Industry and this minimum monitoring frequency is required by 40 CFR 122.21(j). Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).

Attachment #1

PART 8 – ADDITIVE REVIEW

Unlike the metals and toxic substances evaluated in Part 2, most additives have not undergone the amount of toxicity testing needed to calculate water quality criteria. Instead, in cases where the minimum data requirements necessary to calculate a WQC are not met, a secondary value can be used to regulate the substance, according to s. NR 105.05, Wis. Adm. Code. Whenever an additive is discharged directly into a surface water without receiving treatment or an additive is used in the treatment process and is not expected to be removed before discharge, a review of the additive is needed. Secondary values should be derived according to s. NR 105.05, Wis. Adm. Code. Guidance related to conducting an additive review can be found in *Water Quality Review Procedures for Additives* (2019) http://dnr.wi.gov/topic/wastewater/Guidance.html.

The following additives may be present in the discharges from Outfalls 001 and 002. Secondary acute values (SAV) and secondary chronic values (SCV) are calculated based on the available ecotoxicity data on each product. If permit limits were determined to be necessary, acute limits would be set equal to the SAV and chronic limits would be set equal to 11 times the SCV (10:1 dilution for lake dischargers).

Additive Name	Chemical Provider	Purpose of Additive including where added	Intermittent or Continuous Feed	Estimated Effluent Concentration mg/L	SAV mg/L[1]	SCV mg/L[1]
Sodium Hypochlorite 12.5%[2]	Hydrite	Biocide, Service Water System	Continuous	0.84	-	-
Sodium Bisulfite 38%[2]	Hydrite	Dechlorination, Service Water System	Continuous	0.79	-	-
Sodium Bromide	Nalco	Chlorine enhancer, biodispersant, Service Water System	Continuous	0.037	-	-
Sodium Hydroxide 50%[2]	Olin	pH control, Sewage Treatment Plant	Continuous	0.0032	-	-
Cat-Floc 8108 Plus	Nalco	flocculent, Sewage Treatment Plant	Continuous	0.00079	0.0823	0.0046
Scav-ox 35% Hydrazine Solution	Arch Chemicals	oxygen scavenger, Secondary Water	Continuous	0.014	0.0623	0.0035
Scav-ox II	Arch Chemicals	oxygen scavenger, Secondary Water	Intermittent	0.014	0.0623	0.0035
Pre-tect PT7000 Ethanolamine	Nalco	pH control, Secondary Water	Continuous	0.013	5.00	0.278
Carbohydrazide	Sigma-Aldrich	Refueling outage use - corrosion inhibitor	Intermittent	0.011	7.38	0.41
Optisperse PWR6600 Polyacrylic Acid	Suez WTS	Refueling outage use - iron transport	Intermittent	0.00063	57.08	3.17

Attachment #1

Additive Name	Chemical Provider	Purpose of Additive including where added	Intermittent or Continuous Feed	Estimated Effluent Concentration mg/L	SAV mg/L[1]	SCV mg/L[1]
Boric Acid	EMD Millipore	Control reactivity in the reactor coolant system	Continuous	0.14	6.08	0.338
Lithium Hydroxide	Ceradyne Inc	pH control, reactor coolant system	Continuous	0.00082	2.33	0.129
Ammonium hydroxide	Avantor performanc e Materials	Refueling outage use - pH control, Secondary Water	Intermittent	0.00079	-	-
Hypersperse MDC775	GE Betz	Anti-scalant, Water Treatment	Continuous	0.00095	307.75	17.1
CAIROX Potassium permanganate (1.57% solution strength)	Carus	Iron Removal, Potable Water	Intermittent	0.0021	0.0181	0.001
CL-50 sodium phosphate (2.9% solution strength)	Nalco	Corrosion Inhibitor, Potable Water	Intermittent	0.0032	76.92	4.27
PermaTreat PC-1611T (10% solution)	Nalco	Anti-scalant, Potable Water	Intermittent	0.0021	150	8.33
PermaCare PC-7410 Sodium Hypochlorite (1.8-3.6% solution strength) [2]	Nalco	Biocide, Potable Water	Intermittent	0.0021	-	-
Citric Acid 50%	Avantor Performanc e Materials	Prevent scale, Water Treatment	Intermittent	0.0021	70.05	3.89
Sulfuric acid[2]	Norfalco Inc	Prevent scale, Water Treatment	Intermittent	0.0016	-	-
3D Trasar 3DT121	Nalco	Silt dispersant, Service Water System	Continuous	0.047	215.38	11.97
Nalsperse 73551	Nalco	Biodetergent, Service Water System	Intermittent	0.021	76.92	4.72

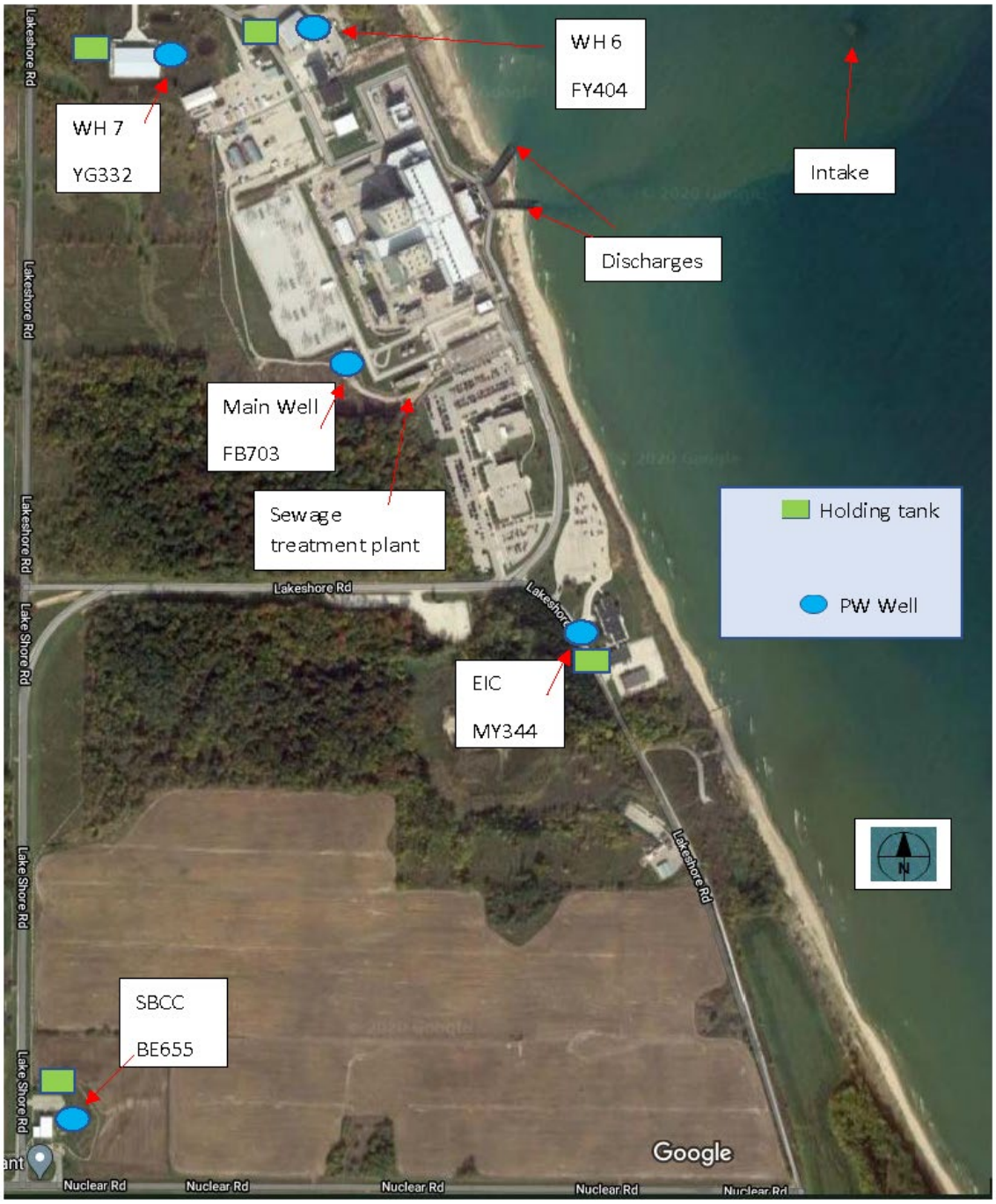
1. Calculated based on toxicity data provided
2. Evaluation are not necessary for additives that have active ingredients consisting only of chlorine, caustic soda (sodium hydroxide), hypochlorite, sulfuric acid, hydrochloric acid, and sodium bisulfite

A secondary value is not needed for ammonium hydroxide, since the presence of this substance would be regulated through ammonia limits if necessary. Secondary values are not calculated for the sodium hypochlorite and sodium bromide additives because these substances will be regulated by the total halogens limit in the permit.

The maximum possible effluent concentrations of the remaining additives listed above are all lower than the calculated limits based on the SAV and SCV for protection of aquatic life. Therefore, these additives are approved at the listed usage rates.

The permit also includes a limit for EVAC for zebra mussel control product in amine equivalent. The limit was calculated using outdated secondary value calculation procedures. This product has not been used at the facility for over five years but the permittee prefers to maintain the option to use it if necessary. In order to maintain the ability to use this product in the reissued permit, this limit needs to be re-calculated using updated secondary value calculation procedures. This limit will be re-evaluated in a separate memo when the permittee submits the required information.

Attachment #2



Temperature limits for receiving waters without unidirectional flow

(calculation using default ambient temperature data)

Facility: NextEra Point Beach

Outfall(s): Outfalls 001 and 002

Date Prepared: 04/29/2021

Design Flow (Qe): 950.2 MGD

Lake Type: Lake Michigan waters - Nort

Discharge Type: Great Lakes shore discharge

Maximum area of mixing zone allowed (coefficient "A"): 3,125,000 ft^2

Month	Water Quality Criteria			Representative Highest Effluent Flow Rate (Qe)		B	e^{-a} (for SL-WQBEL)	e^{-a} (for A-WQBEL)	Representative Highest Monthly Effluent Temperature		**Calculated Effluent Limit**	
	Ta (default)	Sub-Lethal WQC	Acute WQC	7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)				Weekly Average	Daily Maximum	**Weekly Average Effluent Limitation**	**Daily Maximum Effluent Limitation**
	(°F)	(°F)	(°F)	(MGD)	(MGD)				(°F)	(°F)	(°F)	(°F)
JAN	34	43	69	697.00	697.00	0.405	0.940	0.940	76	78	**44**	**71**
FEB	33	47	69	697.00	697.00	0.405	0.940	0.940	76	78	**48**	**71**
MAR	35	52	69	734.69	903.40	0.405	0.943	0.953	77	78	**53**	**71**
APR	39	58	70	1104.40	1104.40	0.405	0.962	0.962	75	78	**59**	**71**
MAY	44	64	71	1104.40	1104.40	0.405	0.962	0.962	72	81	**65**	**72**
JUN	48	69	72	1104.40	1104.40	0.405	0.962	0.962	80	82	**70**	**73**
JUL	53	71	73	1104.40	1104.40	0.405	0.962	0.962	87	90	**72**	**74**
AUG	56	69	73	1104.40	1104.40	0.405	0.962	0.962	90	94	**70**	**74**
SEP	53	64	73	1104.40	1104.40	0.405	0.962	0.962	84	86	**64**	**74**
OCT	48	55	72	1100.80	1104.40	0.405	0.961	0.962	82	83	**55**	**73**
NOV	42	47	70	1104.40	1104.40	0.405	0.962	0.962	73	76	**47**	**71**
DEC	36	44	69	1104.40	1104.40	0.405	0.962	0.962	76	77	**44**	**70**

Wisconsin Department of Natural Resources

Cooling Water Intake Structure Best Technology Available Determination

NextEra Energy - Point Beach Nuclear Power Plant

Amanda Perdzock- Wastewater Specialist

July 19, 2023

Executive Summary

In conformity with Section 316(b) of the Clean Water Act, the location, design, construction, and capacity of cooling water intake structures should reflect the best technology available (BTA) for minimizing adverse environmental impacts. The department has made a Best Technology Available (BTA) determination for one cooling water intake structure (CWIS) utilized by NextEra Energy's Point Beach Nuclear Plant (PBNP) in accordance with ch. NR 111, Wis. Adm. Code. The BTA for the CWIS is based on the required information submitted for a facility that withdraws greater than 2 MGD Design Intake Flow (DIF) and uses at least 25% of the total water withdrawn for cooling purposes. PBNP is considered an existing facility for purposes of the rule because construction of the facility commenced prior to January 17, 2002 (s. NR 111.02(3)(a), Wis. Adm. Code). The department has concluded that existing entrainment reduction measures at PBNP, including an offshore intake location, intake crib, seasonally deployed high-frequency audio deterrent system (ADS), and flow reductions during winter months, are the best technologies available for minimizing adverse environmental impact related to entrainment performance. At this time, however, the department lacks necessary documentation to make a determination on impingement reductions measures at this time. Approval of existing impingement reduction measures as best technology available for minimizing adverse environmental impact is conditional until the necessary information, as described below, is submitted and reviewed by the department. Review findings may result in the department changing its determination for impingement reductions.

In order for the department to approve a system of technologies as BTA for impingement reduction, an applicant must submit an impingement technology performance optimization study as described in NR 111.41(5)(b). Results of such as study were not submitted by PBNP with application materials, and so, a schedule to perform such a study has been included in the facility's permit. Approval of the CWIS as BTA for impingement mortality reductions is contingent on the submittal of the described study. The study must also demonstrate that the three systems currently utilized by the facility meet the impingement mortality standard of s. NR 111.12(1)(a)6., Wis. Adm. Code, systems of technologies. The department has determined that no additional requirements of s. NR 111.12 are required.

The department must establish BTA standards for entrainment reduction for the intake on a site-specific basis (s. NR 111.13, Wis. Adm. Code). "These standards shall reflect the department's determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in subs. (2) and (3)." (s. NR 111.13, Wis. Adm. Code). After consideration of the factors specified in s. NR 111.13(2) and (3), Wis. Adm. Code, the department has concluded that the CWIS is considered the best technology available to achieve the maximum reduction in entrainment.

The BTA determination will be reviewed at the next permit reissuance and at subsequent reissuances in accordance with ch. NR 111, Wis. Adm. Code, as applicable. In subsequent permit reissuance applications, the permittee shall provide all the information required in s. NR 111.40(2)(b), Wis. Adm.

Code, unless a request to reduce the information required has been submitted by the permittee and accepted by the department, as allowed by s. NR 111.42(1)(a), Wis. Adm. Code.

Intake Structure Description

Point Beach Nuclear Plant is located on the western shore of Lake Michigan near Two Rivers, in Manitowoc County, Wisconsin. The plant began commercial operation in 1970 with two steam generating reactor units and a combined rated capacity of 1,246 megawatts (MW) that has since been uprated to 1,263.5 MW.

Once-through cooling water is withdrawn from Lake Michigan through an intake crib located approximately 1,750 feet offshore and discharged into Lake Michigan via a pair of outfalls consisting of flumes that discharge approximately 60 feet offshore both north and south of the intake (Figure 1-2). The intake crib is at a depth of about 22 feet and consists of two rings (110-foot diameter and 60-foot diameter) of steel piles driven into the lakebed and filled with limestone blocks. Water is drawn through the limestone blocks and through plastic mesh grating on top of the crib into 30-inch galvanized steel, concrete encased pipes. The pipes are buried beneath the lakebed and lead to the pumphouse.

The intake structure is equipped with vertical bar racks (3/8-inch by 4-inch, with 2¼-inch spacing on center) in the forebay and eight traveling water screens (3/8-inch mesh, 11-foot wide panels) at the pumphouse. The screens are washed with an 80-pounds per square inch (psi) screen wash that discharges to the lake via a return trough. Debris is captured by a basket and disposed of offsite. The total design intake flow (DIF) of the facility is 1,108 million gallons per day (MGD).

Intake Structure Crib Location: 44°17'0.42"N, 87°31'44.45"W
Pumphouse Location: 44°16'53.13"N, 87°32'7.09"W

Intake Velocity Calculation

For the design and configuration of the CWIS and four pump operation (1,108 MGD DIF), the calculated through-screen velocity (v) is:

$$v = (total\ pump\ rate\ MGD) \times (1{,}000{,}000) \times \left(\frac{1\ day}{24\ hours}\right) \times \left(\frac{1\ hour}{60\ min}\right) \times \left(\frac{1\ min}{60\ sec}\right) \times \left(\frac{0.1337\ ft^3}{gal}\right) \times \left(\frac{1}{total\ open\ area\ of\ intake}\right)$$

$$v = (1{,}108) \times (1{,}000{,}000) \times \left(\frac{1}{24}\right) \times \left(\frac{1}{60}\right) \times \left(\frac{1}{60}\right) \times (0.1337) \times \left(\frac{1}{864.6}\right)$$

$$v = 2.0\ ^{ft}/_{sec}$$

Where:

$total\ open\ area\ of\ intake = 8\ screens \times open\ area\ of\ individual\ screen$

$total\ open\ area\ of\ intake = 8 \times overall\ screen\ area \times screen\ open\ area$
$total\ open\ area\ of\ intake = 8 \times 10\ ft\ (width) \times 19.3\ ft\ (low\ water\ depth) \times 0.56$
$total\ open\ area\ of\ intake = 864.6\ ft^2$
Screen open area based on screen mesh openings of 0.375 in × 0.375 in

S. NR111.41, Wis. Adm. Code Application Materials Submitted

As part of the WPDES Permit Application, PBNP was required to submit information required under s. NR 111.41(1) through (12). PBNP provided the information required under s. NR 111.41(1) through (12). Most of the relevant application materials were included in a report titled "Clean Water Act §316(b) Compliance Submittal 40 CFR 122.21(r)(2) through (13)", dated December, 2020 and produced by Environmental Consulting & Technology, Inc. The rest of the required information was included with the WPDES Permit Application dated 12/18/2020.

In accordance with s. NR 111.11(1)(a), PBNP is subject to the best technology available (BTA) standards for impingement mortality reduction under s. NR 111.12 and entrainment mortality reduction under s. NR 111.13, including any measures to protect federally-listed threatened and endangered species and designated critical habitat established under s. NR 111.14(7). A discussion on the BTA standards for impingement mortality is provided first followed by entrainment.

BTA Standards for Impingement Mortality

In accordance with s. NR 111.12(1)(a), PBNP must comply with one of the alternatives in sub.1. through 7. except as provided in sub. (b)1. or 2., when approved by the department. In addition, a facility may also be subject to the requirements of s. NR 111.12(2), Wis. Adm. Code if the department requires such additional measures. The facility has chosen a system of technologies for compliance with the impingement mortality BTA standard (s. NR 111.12(1)6., Wis. Adm. Code). The facility analyzed this compliance option using the current system of measures which includes PBNP's offshore intake location, seasonal flow reduction during winter, and seasonal use of a high frequency acoustic deterrent system (ADS). The facility did not, however, provide an impingement technology performance optimization study as specified in s. NR111.41(5). As such, additional information must be submitted before the Department can approve this system of technologies as BTA for impingement mortality.

As the basis for the department's determination, the owner or operator of the facility shall demonstrate that the system of technologies has been optimized to minimize impingement mortality of all species except those designated as fragile or nuisance. In addition, the department's decision will be informed by comparing the impingement mortality performance data under s. NR 111.41(5) to a performance standard of no more than 24 percent impingement mortality, including latent mortality and excluding fragile and nuisance species. According to s. NR 111.11(3)(a), after issuance of a final permit establishing the

entrainment requirements under s. NR 111.13, the owner or operator of an existing facility shall comply with the impingement mortality and entrainment standards as soon as practicable, based on a schedule of requirements established by the department.

Based on this information, the department approves the CWIS as BTA for impingement mortality with the condition that an impingement technology performance optimization study, as described at NR 111.41(5)(b), is performed, following the system of measures compliance approach for impingement mortality. The site-specific impingement technology performance optimization study must include:

- Documentation that the operation of the system of technologies has been optimized to minimize impingement mortality. This should include identification of parameters that can be varied and optimized and an identification of optimal settings.
- Identification of an impingement mortality rate that represents a "optimized" operation of the system
- A minimum of 2 years of biological data measuring the reduction in impingement mortality achieved by the system
- A description of any sampling or data collection approach used in measuring the rate of impingement, impingement mortality, or flow reductions.
- Documentation on how each system element contributes to the overall system performance. Any element or parameter that is changed while determining the optimal way to operate the system must be tracked and reported.

A schedule has been included within the facility's permit with a timeline for the submittal of the study. If an alternate method of compliance is selected at the facility, the department may modify the permit to included additional requirements.

BTA Standards for Entrainment

The permittee proposes that the design and operation of the intake meets the BTA standards for entrainment mortality reduction. The department has evaluated this proposal under s. NR 111.13 and recommends the approval of this proposal. Below is a written explanation of the proposed entrainment determination as required by s. NR 111.13(1).

For entrainment control, the regulations expressly call for the permitting agency to make a site-specific determination of which technologies and/or practices satisfy the BTA standard for each individual facility (s. NR 111.13, Wis. Adm. Code). The BTA "shall reflect the department's determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in subs. (2) and (3)." The regulations also give the department the discretion to reject an otherwise available technology as the BTA for entrainment if the social costs are not justified by the social benefits or if there are other unacceptable adverse factors that cannot be mitigated (s. NR 111.13(4)).

The proposed determination must be based on consideration of any additional information required by the department and the factors listed in s. NR 111.13(2)(a). The weight given to each factor is within the department's discretion based upon the circumstances of each facility. In addition, the proposed determination may be based on consideration of the factors listed in s. NR 111.13(3).

In accordance with s. NR 111.13(2), the following factors must be considered:

1. Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base);
2. Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;
3. Land availability inasmuch as it relates to the feasibility of entrainment technology;
4. Remaining useful plant life; and
5. Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

In accordance with s. NR 111.13(3), the following factors may be considered in determining a site-specific BTA:

1. Entrainment impacts on the waterbody;
2. Thermal discharge impacts;
3. Credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014;
4. Impacts on the reliability of energy delivery within the immediate area;
5. Impacts on water consumption; and
6. Availability of process water, gray water, wastewater, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water.

In the preamble to the 316(b) Rule (79 Fed. Reg. 48300 at 48303), USEPA indicated the following:

> *The entrainment provision reflects EPA's assessment that there is no single technology basis that is BTA for entrainment at existing facilities, but instead a number of factors that are best accounted for on a site-specific basis. Site-specific decision making may lead to a determination by the NPDES permitting authority that entrainment requirements should be based on variable speed pumps, water reuse, fine mesh screens, a closed-cycle recirculating system, or some combination of technologies that constitutes BTA for the individual site. The site-specific decision-making may also lead to no additional technologies being required.*

Candidate entrainment control technologies are provided in s. NR 111.41(13), including a closed cycle recirculation system, fine mesh screens with a mesh size of 2 mm or smaller, and water reuse or alternate sources of cooling water, and variable speed pumps (i.e., variable frequency drive pumps).

Entrainment Performance Evaluation

For entrainment control, the regulations expressly call for the permitting agency to make a site-specific determination of which technologies and/or practices satisfy the BTA standard for each individual facility. The BTA must reflect the department's determination of the maximum reduction in entrainment warranted after consideration of the relevant factors. The regulations also give the department the discretion to reject an otherwise available technology as the BTA for entrainment if the social costs are not justified by the social benefits or if there are other unacceptable adverse factors that cannot be mitigated.

Two entrainment studies were submitted to the department. A one-year entrainment characterization study was conducted in the intake forebay weekly from mid-April through September 2006, along with concurrent ambient sampling in the lake adjacent to PBNP. PBNP submitted an explanation of how this historical data remained relevant and representative of current conditions at the facility in their 2017 entrainment characterization work plan. WDNR approved of use of this data to fulfill part of the two-year data requirement under the Final Rule, but required additional data to be collected. A second year of entrainment sampling was conducted during 2017.

Entrainment sampling was conducted in the intake forebay weekly from mid-April through September 2006. A total of 37 ichthyoplankton taxa/life stage groups were encountered in the concurrent entrainment and ambient samples, of which 19 occurred in the entrainment samples. The most abundant ichthyoplankton taxa in the entrainment samples were rainbow smelt (62 percent of total individuals counted), followed by alewife type eggs (18.1 percent), unidentified eggs (4.7 percent), juvenile alewife (3.2 percent), unidentified stickleback (2.4 percent) and unidentified Coregoninae (1.6 percent). All other taxa/life stage groups accounted for less than 1.0 percent of the ichthyoplankton occurring in the entrainment samples. Two "shellfish" species were included in the entrainment samples: scuds (Gammarus sp.) and one Hyalella Azteca individual. Overall, entrainment was dominated by Gammarus sp.

Entrainment sampling collected during the 2017 study included 72 ichthyoplankton specimens in six taxa, primarily rainbow smelt, burbot, and alewife. Invertebrates again dominated overall entrainment samples, with nearly 100% of the sample comprised of taxa in the Gammaridae family (Echinogammarus ischnus and Gammarus sp.). Smaller proportions of Mysidae were also present in the invertebrate collections, primarily Hemimysis anomala. Table 1 compares annualized entrainment rates for fish and invertebrates between the two study periods based on weekly extrapolations using measured flow rates.

Table 1: Ranking of Dominant Entrained Taxa in the 2006 and 2017 Entrainment Taxa

	2006 (Phase II)		2017		Total	
	No./yr Estimate*	%	No./yr Estimate*	%	No./2 yr Estimate*	%
Ichthyoplankton						
Rainbow smelt	5,663,806	53%	4,273,710	43%	9,937,516	48%
Alewife	3,418,449	32%	1,141,218	11%	4,559,667	22%
Burbot	243,137	2%	2,663,186	26%	2,906,323	14%
Unidentified	451,516	4%	970,347	10%	1,421,863	7%
Round goby			713,006	7%	713,006	3%
Clupeidae	64,740	1%	291,625	3%	356,365	2%
Stickleback	192,288	2%			192,288	1%
Sculpin	129,437	1%			129,437	1%
Cyprinidae	128,826	1%			128,826	1%
Slimy Sculpin	128,775	1%			128,775	1%
Coregoninae	125,676	1%			125,676	1%
Common carp	64,740	1%			64,740	0%
Catostomidae	63,786	1%			63,786	0%
Lepomis	63,786	1%			63,786	0%
Invertebrates ("Shellfish")						
Gammarus sp.	4,057,474,137	100%	1,307,295,469	28%	5,364,769,606	61%
Echinogammarus ischnus			3,349,193,628	72%	3,349,193,628	38%
Hemimysis anomala			12,863,458	0%	12,863,458	0%
Gammaridae			2,189,783	0%	2,189,783	0%
Mysis diluviana			141,929	0%	141,929	0%
Hyalella azteca	62,838	0%	62,838	0%		
** Based on weekly extrapolations using actual pumping rates*						

Evaluation of Other Candidate Entrainment Control Technologies

PBNP provided evaluations of the five candidate entrainment control technologies outlined in s. NR 111.41(13),Wis. Adm. Code, with submitted application materials: fine-mesh traveling water screens, fixed wedgewire screens, alternative water sources, closed-cycle cooling, and variable speed pumps. The department evaluated these candidate entrainment control technologies, along with the potential use of aquatic filter barriers in order to make a final BTA determination in the following section of this report.

TECHNOLOGY: Mechanical Draft Cooling Towers (closed-cycle recirculating system)

Mechanical draft cooling towers (MDCT) are large facilities often associated with power generating stations. These structures use large flows of water through the towers along with a mechanical fan to

create differential pressure between the tower interior and exterior, inducing a draft through the tower, and exhausting at the top the tower as a warm vapor plume. These systems require a large footprint, a significant amount of energy, and a large cooling water flow to operate. MDCTs can be in a rectilinear arrangement or in a circular arrangement. MDCTs can achieve the heat loss needed for PBNP's cooling needs and can be considered a potential technology to decrease entrainment.

1.1. FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

A closed cycle system would potentially reduce entrainment. This is because entrainment reductions are directly proportional to flow reductions. As discussed in the 316(b) Rule Preamble, mechanical draft cooling towers operating in freshwater sources can achieve flow reductions of 97.5 percent (based on a cycle of concentration of 3.0). 79 Fed. Reg. 48300 at 48338. Therefore, USEPA estimates that freshwater cooling towers, compared to once-through cooling systems, reduce impingement mortality and entrainment by 97.5 percent.[1]

1.2. FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

Installation of mechanical draft cooling towers would result in increased air emissions, and a new emission source. This increase in emissions is associated with two separate factors: (1) particulate emissions from the cooling towers used in the hypothetical conversion to closed-cycle recirculating cooling system (CCRS) at PBNP, and (2) loss of generation capacity associated with parasitic loads and loss of efficiency and the resulting need to replace that power with other generator(s). While any tower would likely utilize plume abatement technology, the towers would produce visibility reduction due to fogging, ice formation on surfaces downwind from the cells, and visual pollution as perceived by receptors adjacent to PBNP.

It is expected that the parasitic load created by the addition of the tower fans and pump station would increase the load on the PBNP electric generators, thus increasing fuel consumption and increasing gas combustion emissions associated with increased output and the need to draw power from other plants that utilize fossil-fuels. During the plant outage required for the retrofit, fossil-fueled non-baseload plants would be utilized to fulfill customer needs for energy, producing additional emissions of carbon dioxide, sulfer oxides, nitrogen oxides, and particular matter.

1.3. FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

[1] USEPA. Technical Development Document for the Final Section 316(b) Existing Facilities Rule. EPA-821-R-14-002. May 2014.

The availability of space for infrastructure was considered in the assessment of entrainment BTA. While some space constraints at the Plant and in the surrounding areas may limit the potential locations for additional equipment, a location was identified for a potential cooling tower retrofit that would have the least impact on the existing operations. While such a retrofit is believed to be feasible, the complexity of existing infrastructure at the site results in higher estimated installation costs, which affect the estimated social costs.

1.4. FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

The remaining life of the generating units and the potential entrainment technologies impacts both social costs and benefits (as affected by O&M costs, duration of changes in plant output, fisheries benefits). Under the current operating license, PBNP Unit 1 is permitted to operate through October of 2030 and Unit 2 to operate through March of 2033. NextEra notes that some nuclear operating licenses are being renewed to allow for longer periods of operation (e.g., 80 years rather than the originally planned 60 years). Given this industry trend, NextEra believes that it is prudent to anticipate for the purposes of the CWA 316(b) assessment that the operating license of PBNP could similarly be extended by another 20 years. Therefore, in assessing both social costs and social benefits, it was assumed that Unit 1 will remain operational through October of 2050 and Unit 2 will remain operational through March of 2053.

1.5. FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

NextEra has developed peer-reviewed estimates of both social costs and social benefits consistent with the requirements. The estimation of social benefits included both use benefits (i.e., potential changes in C/R fishing stocks and their attending economic effects), as well as nonuse benefits. The monetized social costs and social benefits associated with the candidate entrainment reduction measures has been summarized in Table 2.

Table 2: Net Benefits of Entrainment Reduction Technologies at PBNP

Regulatory Standard Addressed	Compliance Alternative	Total Social Cost*	Total Social Benefits ($)†‡	Net Benefits
Entrainment	Fine mesh screens	$212.5M	$0.19M	-$212.31M
	Closed-cycle cooling retrofit	$714.9M	$0.35M	-$714.55M

*Social costs and social benefits are presented in 2020 dollars using a 3-percent discount rate. Expression of social costs and benefits consider a 7-percent discount rate is presented in Sections 10 and 11.
†Entrainment benefits are based on the higher of the two years' entrainment benefits for each technology.
‡Entrainment benefits include nonuse benefits.
Source: ECT, 2020.

1.6. FACTOR s. NR 111.13(3)(a), Wis. Adm. Code: Entrainment impacts on the waterbody.

These were discussed and considered in the section titled Entrainment Performance Evaluation above.

1.7. FACTOR s. NR 111.13(3)(b), Wis. Adm. Code: Thermal discharge impacts.

The cooling tower would reduce thermal discharge impacts. However, the facility has been in compliance with applicable effluent heat limitations which are protective of surface water quality. The department does not consider this a significant factor.

1.8. Summary/Conclusion.

Mechanical Draft Cooling Tower would potentially reduce entrainment due to decreased flows. However, other unacceptable adverse factors that cannot be mitigated make this technology unavailable at PBNP. The following factors contribute to making this technology infeasible:

- Increase in particulate emissions (which would likely require a minor source air permit),
- Increased energy usage,
- Increased chemical usage
- Net social costs outweigh social benefits.

For all of these reasons, the department has rejected additional mechanical draft cooling towers as an option for PBNP.

TECHNOLOGY: Fine Mesh Screen (Mesh Size ≤2mm)

Two fine mesh screen (FMS) technologies were reviewed for this BTA determination: 1) narrow-slot wedgewire screens; and 2) use of fine mesh on modified traveling water screens (FM MTWS). Both technologies work to exclude entrainable organisms from cooling water, however, do not ensure an organism's survival. Application of FMS without expanding the screen area reduces open area available for water passage, increasing through-screen velocity, and raising the potential for unacceptable head loss across the screen and related adverse hydraulic effects within the CWIS, cooling systems and service water systems. FMS are also likely to be subject to increased rates of debris retention and biofouling, both of which would contribute to hydraulic, station reliability and safety concerns. PBNP analyzed several screen scenarios to determine impacts on system head losses and whether the configurations would be safe to operate in relation to internal operating procedures for Forebay and Pump Bay Level Alarm Setpoints. The inability to meet nuclear safety requirements during all expected water levels and operating conditions limits the feasibility of several FMS options at PBNP (Table 3) and make wedgewire screens unfeasible.

Table 3: Estimated Pump Bay Water Levels with 2.0 mm MTWS

Conditions	Head Loss (ft)	Pump Bay Water Elevation (ft)
Normal Operations (2 intake pipes and 4 CW pumps Operating)		
Existing Conditions – Clean Screens	-4.3	-9.2
Existing Conditions with 50% Screen Blockage	-4.7	-9.6

2 mm Overlay on MTWS	-4.6	-9.4
2 mm Overlay on MTWS with 50% Screen Blockage	-6.1	-11.0[1]
Expanded Intake with FMS	-4.7	-9.6
Expanded Intake with FMS with 50% Screen Blockage	-5.6	-10.5
Worse Case Operations (1 intake pipe and 2 CW pumps, 1 per unit)		
Existing Conditions – Clean Screens	-6.0	-10.9
Existing Conditions with 50% Screen Blockage	-6.5	-11.4[1]
2 mm Overlay on MTWS	-6.3	-11.2[1]
2 mm Overlay on MTWS with 50% Screen Blockage	-8.2	-13.0[2]
Expanded Intake with FMS	-6.5	-11.3[1]
Expanded Intake with FMS with 50% Screen Blockage	-7.5	-12.4[2]

1. Yellow Cells are below the Low Level Alarm
2. Red Cells are below the Low Low Level Alarm and are in violation of PBF-2124

2.1. FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

For any entrainment reductions to be seen, a screen with a mesh size of <2.0 mm should be used, as nearly 100% of eggs still pass through a 2.0mm mesh screen.[2] Fine mesh traveling screens alone do not reduce entrainment, since even small organisms (those than fit through a 3/8" mesh) that are impinged on fine mesh are still defined as "entrained" and safe removal of such organisms is required to reduce entrainment. Survival of organisms removed from fine mesh screens is still relatively low, so this typically may be a practical option only when combined with safe removal mechanisms or other entrainment reduction options, or as a last resort for entrainment reduction. One study showed that mortality of eggs retained on fine mesh and subsequently removed ranged from 20-30%. Mortality of larvae retained on fine mesh and subsequently removed was typically greater than 80%.[3] (Note: these mortality rates may vary depending on species entrained.)

The addition of FMS at PBNP is assumed to reduce entrainment based on the rate of live return of those organisms excluded by the FMS. Therefore, to determine the benefits of the addition of FMS at PBNP, exclusion efficiencies and survival off the screens were applied to the estimated

[2] "Technical Development Document for the Final Section 316(b) Existing Facilities Rule," 6-47
[3] "Technical Development Document for the Final Section 316(b) Existing Facilities Rule," 6-47

entrainment numbers. PBNP estimates the annual reduction in entrainment to be 22.5-29 percent if PBNP were to be retrofit with FMS.

2.2. FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

FM MTWSs would require approximately 1,372 MWh per year to operate the new screens and associated spray wash pumps. Operation of the existing screens and spraywash is expected to require approximately 6.5 MWh per year. The increase in energy use to operate the fine-mesh MTWS would result in a corresponding increase in combustion emissions offsite. In addition, offsite non-baseload facilities would need to makeup generation lost at PBNP when its two units need retrofit/tie-in downtime.

Installation of FMS would require construction and dredging activities within Lake Michigan. These construction activities would trigger the need for federal, state, and local permits. The organism return discharge would be considered a new outfall and would need to be permitted accordingly under the NPDES program.

2.3. FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

The FM MTWS arrangement presented by PBNP would include an expanded 170 ft by 210 ft screen house with eight through-flow screens with 0.5 mm mesh and 10-ft wide baskets. This scenario would also include an access road, work deck, emergency bypass gates, warm water recirculation valves, trash racks with rakes, a lifting crane to install and remove the FMS and new screen wash pumps. Sufficient space exists for necessary structures, however, the construction plan for this scenario would result in a 7 to 14-month long construction related shutdown, which would not be viable at PBNP.

2.4. FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

See 1.4 above.

2.5. FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

PBNP provided cost estimates associated with the implementation of FM MTWS (Table 4).

Table 4: Compliance Cost Summary for an Expanded Intake with New FMS with 2.9 ft/s Through-screen Velocity and an Organism Return

	Costs	**Years Incurred**
Total Indirect Project Costs (2020$)	$16,787,000	2022-2024
Total Direct Project Costs (2020$)	$148,456,000	2025-2027

Total Capital Costs (2020$)	**$165,243,000**	
Construction Shutdown	7 months	2027
Incremental Annual Costs[1]		
Annual Labor and Equipment	$272,000	2027-Retirement
Regular Service and Overhauls	$505,000	2027-Retirement
Annual Energy (MWh)	1,301	2027-Retirement

2.6. FACTOR s. NR 111.13(3)(a), Wis. Adm. Code: Entrainment impacts on the waterbody. These were discussed and considered in the section titled Entrainment Performance Evaluation above.

2.7. FACTOR s. NR 111.13(3)(b), Wis. Adm. Code: Thermal discharge impacts. Addition of FMS would not affect the thermal loading; therefore, there would be no change in the thermal discharge.

2.8. Summary/Conclusion.
Wedgewire screens were determined to be infeasible for PBNP due to reductions in head that would violate safety standards at the facility. The proposed plans for FM MTWS at PBNP would involve a minimum seven-month shutdown of the plant for construction of a system that would only provide minor reductions to current entrainment levels. For these reasons, the department has rejected FMS as an option for entrainment mortality reduction at PBNP.

TECHNOLOGY: Water Reuse or Alternate Sources of Cooling Water

Lake Michigan supplies most of the water used at PBNP. The majority is withdrawn for cooling purposes with a very small portion used for steam generation after treatment as well as for fire protection. The only other source of water at the Plant is groundwater withdrawn from wells for potable water and the sanitation system. No municipal water is used at PBNP.

On-site water use primarily consists of circulating water, service/process water, and screen backwash water. Water reuse on site would include reusing water from existing Plant uses in support of condenser cooling water. Intake screen backwash water is not suitable for reuse, as it

is intended to remove debris from the screens. Potable water uses must be kept available for Plant personnel use. Process water must be kept available, as it is essential to make demineralized water for steam system makeup and secondarily for washing operations and fire protection.

As water from the CWIS is already used for the cooling water system and other auxiliary equipment cooling purposes and potable and process waters are kept for personnel use, the only viable source of water reuse on the site is from the well water used for circulating water pump seal cooling water. When this flowrate is compared to the design circulating water flow, the quantity of water is less than one percent of the design circulating water flow. As a result, reuse of this water is not considered a candidate for further evaluation.

During winter months, each unit shuts down one of its two circulating water pumps, and routes a maximum of 234,000 gpm of condenser discharge (warm) water to the intake crib to control ice and frazil ice. Warm water recirculation and reduced pumping results in 20 percent flow reduction on an annual basis. No further water reuse options are available at PBNP.

The only potential grey water source for the facility would be the onsite sewage treatment plant. This plant discharges less than one percent of the plant's DIF, and thus is not feasible as an alternate source of supplemental cooling water.

3.1. FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

PBNP provided estimates of entrainment reductions if the CWIS were shut down completely (Table 5). This scenario would reflect a 100% reduction in entrainment at the facility. It should be noted, however, that water reuse and an alternative source do not have to supply all of the required water for reductions in entrainment to occur. Since entrainment reductions are directly related to the reduction of flow at a facility, any reduction in flow would reduce the levels of entrainment occurring at the intake structure.

Table 5: Annual Benefit as Reduction in Entrainment (Number) Resulting If PBNP Were to Shut Down the Cooling Water Intake.

Type	Entrainment Sample Year (Number of Organisms no longer Entrained)	
	1	2
Fish	8,350,048	9,896,328
Shellfish	4,183,762,410	4,663,281,971

Total	4,192,112,458	4,673,178,299

3.2. FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

If the use of an alternate water source (whether groundwater or reclaimed water) were viable, then energy consumption would increase owing to additional pumping, and emissions would increase correspondingly. Depending on PBNP's dependence on the alternate water source and fraction of water provided by the alternate source, the reliability of PBNP operations could also be compromised. If the facility were not able to meet necessary cooling needs, or needed to shut down operations due to insufficient cooling and safety concerns, other fossil fuel-burning plants in the region would need to be utilized to meet regional energy demands.

3.3. FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

Land availability is not a limiting factor when evaluating the feasibility of water reuse and alternative sources of water at PBNP.

3.4. FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

See 1.4 above.

3.5. FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

Information on benefits and costs is not of sufficient rigor to make a decision, however, it is assumed that the cost to install the necessary wells/pipeline/other equipment would be significantly higher than the benefits that would be provided.

3.6. FACTOR s. NR 111.13(3)(a), Wis. Adm. Code: Entrainment impacts on the waterbody.

These were discussed and considered in the section titled Entrainment Performance Evaluation above.

3.7. FACTOR s. NR 111.13(3)(b), Wis. Adm. Code: Thermal discharge impacts.

Potential thermal discharge impacts would depend on the source of cooling water used.

3.8. Summary/Conclusion.

No viable water reuse options or alternative sources of water exist for PBNP, and these options have been rejected by the Department.

TECHNOLOGY: Variable Speed Pumps

Variable speed pumps (VSPs) could allow the operator to increase or decrease the pumping rate

(within the pump's capacity) based on the Unit 1 and Unit 2 condenser cooling water requirements to meet various operating or regulatory goals. The intention is to pump only the amount of water needed to adequately condense steam associated with the steam turbine's electric load thereby reducing the water withdrawal rate while meeting regulatory thermal criteria.

PBNP is a nuclear power plant that operates at full capacity and has little opportunity to reduce flow beyond what is already achieved during Plant outages, from warm water recirculation for deicing, or idling circulating water pumps when possible in winter conditions. There is no additional appreciable opportunity to reduce flow using VSPs while retaining plant reliability and maintaining a margin of safety appropriate for a nuclear power plant.

When not in an outage condition, PBNP operates at or near 100 percent of rated capacities on a daily basis. During the non-outage months, the average capacity utilization rates for both units was at or near 100 percent. Therefore, while facilities with fluctuating generation may be able to reduce water use during reduced generation periods, PBNP is baseloaded, has experienced very few fluctuations in generation, and does not expect to experience them in the future. PBNP already takes advantage of low inlet water temperatures during winter months and shuts down a pump and recirculates warm water when it is possible to do so and still meet facility cooling needs. PBNP has no opportunity for further flow reduction using VSPs.

4.1. FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

The facility currently only pumps the amount of water needed to adequately condense steam associated with the steam turbine's electric load thereby reducing the water withdrawal rate while meeting regulatory thermal criteria. No additional entrainment reductions would be provided by adding VSPs to facility intake pumps.

4.2. FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

There would be no additional or new emissions associated with the installation VFPs.

4.3. FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

VSDs must be housed in a dust-, humidity- and temperature-controlled environment. A separate building would need to be constructed adjacent to the existing CWIS and as close as possible to the circulating pump motors, to house these drives; and the new building would need its own heating, ventilation and air-conditioning system to provide the necessary controlled environment.

The PBNP Protected Area is fully built-up and the existing intake structure is surrounded by underground piping and utilities; there is no space to construct a new building close enough to the existing pumps to house VSPs.

4.4. FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

See 1.4 above.

4.5. FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

No quantified or qualitative social benefits would be provided by the addition of VSPs at PBNP.

4.6. FACTOR s. NR 111.13(3)(a), Wis. Adm. Code: Entrainment impacts on the waterbody.

These were discussed and considered in the section titled Entrainment Performance Evaluation above.

4.7. FACTOR s. NR 111.13(3)(b), Wis. Adm. Code: Thermal discharge impacts.

VFDs increase discharge temperature because BTU loading remains constant while flow is decreased. It also may reduce the amount of mixing at the outfall. However, the facility has consistently been in compliance with applicable effluent temperature limitations which are protective of surface water quality and therefore the department does not consider this a significant factor.

4.8. Summary/Conclusion.

It is impractical and potentially infeasible to install or operate VSPs at PBNP for the following reasons:

• Minimal flow reduction potential due to high utilization rate (nearly 100 percent).
• Lack of space to house the drives and controls.

TECHNOLOGY: Wells or Ranney Collectors

PBNP has five existing onsite groundwater wells that supply water to the Plant for potable, sanitary and fire protection purposes. The main well has a pump capacity of 65 gpm and draws from the Silurian aquifer at a depth of 257 ft. A well at the north gate, which was installed during original construction of the plant, provides limited domestic water to a storage building. Two wells with 20-gpm pumps were installed at the site boundary control center and the lakeside training complex during 1983, however the well at the lakeside training complex is currently inactive. A well that was constructed at the Energy Information Center in 1998 has a maximum withdrawal rate of 0.6 gpm. Six previous onsite residences each previously had wells with pumping capacities of 10 gpm, however five of the residences have since been removed and their wells abandoned. The well for the remaining residence is used periodically by Plant security. The main well, site boundary control center well, and Energy Information Center well combined give PBNP a groundwater pumping capacity of 85.6 gpm (0.12 MGD), which is less than one percent of the Plant's DIF. All onsite groundwater wells together provide only a small fraction of potable

water for the facility. Therefore, groundwater from existing onsite wells is not considered a viable option for further evaluation for circulating water.

A Ranney well consists of a caisson driven into the ground and aquifer, and adjacent to a surface waterbody. Water may seep into the caisson through the main body or via additional lateral well screens built out radially into the aquifer. The aquifer and the water in the caisson is expected to be fed by the surface waterbody. The facility would pump water out of the caisson; given the close proximity between the caisson and the surface water, the facility would effectively be withdrawing from the surface waterbody. Sand and gravel in the aquifer would 'filter' the water and disperse the induced velocity, effectively preventing impingement and entrainment. When several critical conditions are met, Ranney wells can be an effective impingement and entrainment reduction option for withdrawing between approximately 10 and 50,000 gpm. However, the geologic conditions in Manitowoc County near Lake Michigan are not conducive to a Ranney well that can meet an appreciable portion of PBNP's water needs.

5.1. FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

Elimination of the surface water intake would eliminate entrainment, and the 316(b) regulations would no longer apply to the facility.

5.2. FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

There would be no additional or new emissions associated with entrainment technologies as the surface water intake would be eliminated.

5.3. FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

The land available for high capacity wells does not yield discharge at a rate that would sufficiently meet facility cooling water needs.

5.4. FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

See 1.4 above.

5.5. FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

Information on benefits and costs is not of sufficient rigor to make a decision.

5.6. FACTOR s. NR 111.13(3)(a), Wis. Adm. Code: Entrainment impacts on the waterbody.

These were discussed and considered in the section titled Entrainment Performance Evaluation above.

5.7. FACTOR s. NR 111.13(3)(b), Wis. Adm. Code: Thermal discharge impacts.

Groundwater may be cooler than surface water, lowering the temperature of the cooling water effluent.

5.8. Summary/Conclusion.

Due to the high volumes of water needed to meet cooling needs at the facility, wells and Ranney collectors have been rejected as a viable technology for entrainment mortality reduction at PBNP.

TECHNOLOGY: Aquatic Filter Barrier (AFB)

An aquatic filter barrier (AFB) is a semipermeable curtain that spans from the waterbody floor to surface and typically surrounds an intake structure in a semi-circular arc. It is permeable to water but retains ichthyoplankton, effectively reducing entrainment and impingement. Typical AFBs are a fabric with a pore size of 0.15mm, but some AFBs also have small perforations (0.5-2.0mm) in order to allow flow.[4] Most AFB systems have a two-layer fabric and employ an air burst system between fabric layers that cleans off any impinged organisms with one to three cleaning cycles (125 psi for 10 seconds). Headloss from AFB systems varies depending on debris blockage but is typically around 0-0.2 feet (0.1 ft headloss at 75% blockage, 0.2 ft headloss at 90% blockage).[5] AFBs typically operate with a flow-through velocity of 0.007-0.01fps (3-5gpm/sq ft), although those with pores can operate under higher flow-through velocities.[6]

The use of AFB to reduce entrainment was not considered by PBNP due to safety risks and concerns over wave action within Lake Michigan dislodging anchors, causing any barrier to block the intake. Such a blockage could lead to catastrophic failures within the facility if the intake were prevented from providing adequate flows to meet cooling needs.

6.1. FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

AFBs can be deployed seasonally during the primary period of reproduction, allowing them to be removed during winter to prevent ice damage.

The reduction of entrainment by AFBs is dependent upon the size of the perforations in the AFB and the width of eggs and larvae present in the waterbody. AFBs with no perforations effectively exclude all entrainable organisms. A study suggests that AFBs with 0.5mm perforations typically exclude on the order of 90-100% of eggs and larvae (under a flow-through velocity of 0.2 fps), unless species with

[4] "Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule," *U.S. Environmental Protection Agency* (February 12, 2004): 1-97.

[5] *Laboratory Evaluations of an Aquatic Filter Barrier (AFB) for Protecting Early Life Stages of Fish,* EPRI, Palo Alto, CA: 2002. 1005534.

[6] "Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule," 1-97

smaller egg and larval stages, such as the rainbow smelt, striped bass, etc. are present. Entrainment is generally higher for AFBs with larger perforation sizes or higher flow-through velocities.[7]
Short-term retention of eggs or larvae on an AFB does not appear to significantly affect mortality rates. Tears in the AFB may increase entrainment, so regular monitoring during AFB deployment is essential.

6.2. FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

There is no expected effect on particulate emissions or other pollutants associated with AFB.

6.3. FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

AFBs function best when located along the axis of a river because the ambient current of the river effectively carries away backwashed organisms. Backwashing of faces of the AFB that are positioned perpendicular to the river's flow is not especially effective. This is because these areas are surrounded by either stagnant water or eddies, allowing the backwashed material to be re-impinged. This can affect the design flow-through velocity and required size of the AFB.[8]
AFBs can impact the navigability of waterways, as they extend out into the waterbody. Large AFBs may be infeasible for this reason.

6.4. FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

See 1.4 above.

6.5. FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

For a non-perforated AFB, held in place by a floating boom and anchor points, operating with a flow-through velocity of 0.007-0.01 fps, and employing an air burst system, EPA projects the following costs (in 2002 dollars)[9]:

[7] *Laboratory Evaluations of an Aquatic Filter Barrier (AFB) for Protecting Early Life Stages of Fish,* EPRI, Palo Alto, CA: 2002. 1005534.
[8] *Laboratory Evaluations of an Aquatic Filter Barrier (AFB) for Protecting Early Life Stages of Fish,* EPRI, Palo Alto, CA: 2002. 1005534.
[9] "Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule,"1-97

Capital Costs for Aquatic Filter Barrier Provided by Vendor

	Floating Boom		
Flow	Capital Cost (2002 Dollars)		
gpm	Low	High	Average
10,000	$545,000	$980,900	$762,900
104,000	$1,961,800	$2,724,800	$2,343,300
347,000	$6,212,500	$8,501,300	$7,356,900

Estimated AFB Annual O&M Costs

Flow	O&M	O&M	O&M
gpm	Low	High	Average
10,000	$109,000	$327,000	$218,000
104,000	$163,500	$327,000	$245,200
347,000	$545,000	$762,900	$653,900

6.6. FACTOR s. NR 111.13(3)(a), Wis. Adm. Code: Entrainment impacts on the waterbody. These were discussed and considered in the section titled Entrainment Performance Evaluation above. AFBs isolate and restrict the function of a portion of the local habitat/ecosystem. However, they also reduce entrainment and impingement, providing a benefit to the local ecosystem. This is a tradeoff that must be evaluated by the regional fisheries management biologist. One option is to use an AFB with perforations to decrease the required surface area of the AFB, while allowing some additional amount of entrainment.[10]

6.7. FACTOR s. NR 111.13(3)(b), Wis. Adm. Code: Thermal discharge impacts.
There is no expected effect on thermal loads associated with AFB.

6.8. Summary/Conclusion.
Due to high wave action at the offshore intake site and the associated safety concerns discussed above, AFB has been rejected as a viable technology for entrainment mortality reduction at PBNP

Entrainment BTA Decision

Mechanical Draft Cooling Towers are rejected as an option for PBNP primarily due to the lack of a perceived benefit in terms of flow reductions (and subsequent entrainment reductions) compared to the extreme costs of retrofitting a closed-circuit cooling water system. A 2mm fine screen option was rejected in this evaluation as reductions in entrainment mortality would be minimal when compared to existing entrainment rates and the high costs of implementation.

One other option that was considered as part of this evaluation was changing source water from Lake Michigan to either groundwater, the use of Ranney Wells, or reuse of another nearby permittee's effluent. The aquifer does not yield enough water to meet potable and additional cooling water needs, and so wells are not considered a viable option for PBNP. For the option of reusing a nearby permittee's effluent, there are no facilities nearby which seem to be viable options, given the amount of water that PBNP would need for their cooling water.

[10] "Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule,"1-97

After consideration of the factors specified in s. NR 111.13, the department has concluded that PBNP's CWIS, with its offshore intake location, intake crib, seasonally deployed high-frequency audio deterrent system (ADS), and flow reductions during winter months are considered the best technology available to achieve the maximum reduction in entrainment at PBNP.

Summary

1. The department has made a Best Technology Available (BTA) determination for one cooling water intake structure (CWIS) located at Point Beach Nuclear Plant (PBNP) in accordance with ch. NR 111, Wis. Adm. Code a. The department has concluded that the existing CWIS is the best technology available for minimizing adverse environmental impact. This conclusion is conditional on the facility submitting an impingement technology performance optimization study as outlined in the facility's permit.
2. The permittee proposes to comply with a BTA impingement standard in s. NR 111.12, Wis. Adm. Code, through a compliance schedule specified in the issued WPDES permit.
3. After consideration of the factors listed in s. NR 111.13, Wis. Adm. Code, the department has concluded that existing CWIS, with its offshore intake location, intake crib, seasonally deployed high-frequency audio deterrent system (ADS), and flow reductions during winter months, is considered the best technology available to achieve the maximum reduction in entrainment.
4. BTA determinations will be reviewed at the next reissuance and at subsequent reissuances in accordance with ch. NR 111, Wis. Adm. Code. In subsequent permit reissuance applications, the permittee shall provide all the information required in s. NR 111.4(2)(b), Wis. Adm. Code unless a request to reduce the information required has been submitted by the permittee and accepted by the department, as allowed by s. NR 111.42(1)(a).
5. The BTA includes requirements for monitoring and inspection of the CWIS and other requirements and terms; please see the permit for those requirements.

CORRESPONDENCE / MEMORANDUM State of Wisconsin

DATE: February 22, 2024
TO: Permit File
FROM: Emma Lorenzen - CO

SUBJECT: Approval of the alternative effluent temperature limit for NextEra Energy Point Beach LLC (WI-0000957)

NextEra Energy Point Beach Nuclear Plant (PBNP) is an existing facility pursuant to s. NR 106.71(3), Wis. Adm. Code, and discharges heat and other pollutants to Lake Michigan in Two Rivers, Wisconsin. In order to protect fish and aquatic life in Lake Michigan, temperature limits were calculated for PBNP pursuant to ch. NR 106 Subchapter V, Wis. Adm. Code. This evaluation, using the protocols specified in Subchapter V, determined that PBNP has reasonable potential to contribute to exceedances of both acute and sub-lethal thermal water quality standards in all months of the year, necessitating inclusion of temperature limits in the permit. In accordance with ch. NR 106 -Subchapter VI, 40 CFR Part 125, and Section 316(a) of the federal Clean Water Act, PBNP requested alternative effluent limitations (AEL) for temperature based on a demonstration that the calculated effluent temperature limits are more stringent than necessary to protect fish and aquatic life. This request was first granted in 2012 but must be reapplied for with each application for WPDES permit reissuance.

An application was received to renew the AEL with the permit reissuance. This demonstration titled "Point Beach Nuclear Plant Request for Renewal of the Alternative Effluent Limitation for Temperature" was prepared by PBNP and submitted to the Department of Natural Resources on March 28, 2022. This report goes through the permit requirements for updating information to continue the AEL that was granted on August 29, 2012. Department biologists reviewed the report and provided their concurrence with the continuation of the AEL on December 8, 2023 in an email.

In order to demonstrate no appreciable harm to the balanced, indigenous community or to the list of representative important species, this report reviewed thermal loading, compared the biological sampling results from the cooling water intake entrainment study from 2017 to the 2006 entrainment study, reviewed relevant literature on the lakewide fishery to contextualize the biological changes observed in the intake entrainment studies between 2006 and 2017, and reviewed three additional Representative Important Species (RIS) that the department requested be added to the list.

In the publication, *Review of Water Quality Standards, Permit Limitations, and Variances for Thermal Discharges at Power Plants*, the Environmental Protection Agency (EPA) provides three potential criteria for AEL renewal when conditions are static. These are:

1. There have been (and will be) no changes to thermal discharges from the facility or to plant operating conditions.
2. There are no changes to facility discharges that could interact with the permittee's thermal discharges.
3. There are no changes (to permittee's knowledge) to the biotic community of the receiving water body.

In the report, PBNP clearly demonstrated that the first two criteria were met. For the third criterion, since the initial AEL approval there have been changes to the biotic community of Lake Michigan. However, the report evaluates the changes that have been observed. Most of the changes that have occurred are due to invasive species, and while the proportions and total numbers of specific fish species observed were different in the entrainment studies between 2006 and 2017, these changes followed the lake wide trends in fish population and therefore are not expected to be the result of the thermal discharge from PBNP.

The three RIS species requested to be evaluated were rainbow trout, chinook salmon, and coho salmon. These are non-native cold water fish that are frequently sought for sport fishing. None of these fish are normally located in the vicinity of PBNP. At times, portions of the PBNP plume may exceed upper lethal temperatures and avoidance temperatures for these additional species. However, all of these species are able to detect and avoid these temperatures, and, as a result, any impacts to the populations are expected to be minimal. The remaining RIS were not re-evaluated since discharge conditions had not changed since the initial approval.

In conclusion, the department agrees that a discharge of 8,273 MBTU/hr continues to be protective of a balanced indigenous community of shellfish, fish and wildlife in and on Lake Michigan and that no additional or revised temperature limit is needed. This decision will be re-evaluated by the department upon the next permit reissuance if the permittee again requests an AEL. Additional data should be submitted with the next permit application to continue to justify an AEL to the department, and the permittee should reach out to department staff in advance of an application to discuss data needs and potential revisions to the RIS list for the next demonstration.

If there are any questions or comments, please contact Emma Lorenzen at (608)-400-2765 or at Emma.Lorenzen@wisconsin.gov.