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United States Nuclear Regulatory Commission

Protecting People and the Environment

NUREG-1437
Supplement 23
Second Renewal

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 23
Second Renewal

Regarding Subsequent License Renewal for Point Beach Nuclear Plant Units 1 and 2

Draft Report for Comment

Office of Nuclear Material Safety and Safeguards

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Regarding Subsequent License Renewal for Point Beach Nuclear Plant Units 1 and 2

Draft Report for Comment

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Proposed Action Issuance of subsequent renewed facility operating licenses DPR-24 and DPR-27 for Point Beach Nuclear Plant, Units 1 and 2 (Point Beach), in Two Rivers, WI

Type of Statement Draft Supplemental Environmental Impact Statement

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COVER SHEET

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ABSTRACT

The U.S. Nuclear Regulatory Commission staff prepared this supplemental environmental impact statement (SEIS) as part of its environmental review of NextEra Energy Point Beach, LLC's (NextEra) application to renew the operating licenses for Point Beach Nuclear Plant, Units 1 and 2 (Point Beach) for an additional 20 years. This SEIS includes the NRC staff's evaluation of the environmental impacts of the license renewal and alternatives to license renewal. Alternatives considered include: (1) a new nuclear alternative (a small modular reactor facility located at the Point Beach site); (2) a natural gas alternative (a natural gas combined-cycle facility located at the Point Beach site); (3) a combination alternative consisting of small modular reactor, solar photovoltaic, and onshore wind facilities; and (4) the no-action alternative. The NRC staff's preliminary recommendation is that the adverse environmental impacts of license renewal for Point Beach are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. The NRC staff based its recommendation on the following:

- the analysis and findings in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
- the environmental report submitted by NextEra
- the NRC staff's consultation with Federal, State, Tribal, and local governmental agencies
- the NRC staff's independent environmental review
- the NRC staff's consideration of public comments received during scoping period

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EXECUTIVE SUMMARY

Background

By letter dated November 16, 2020, NextEra Energy Point Beach, LLC (NextEra, the applicant, the licensee) submitted to the U. S. Nuclear Regulatory Commission (NRC, the Commission) an application requesting subsequent renewal of the Point Beach Nuclear Plant, Units 1 and 2 (Point Beach), renewed facility operating licenses (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML20329A292). The Point Beach Unit 1 current renewed facility operating license (DPR-24) expires at midnight on October 5, 2030, and the Point Beach Unit 2 current renewed facility operating license (DPR-27) expires at midnight on March 8, 2033. In its application, NextEra requests a license renewal period of 20 years beyond the dates when the current renewed facility operating licenses expire (i.e., to 2050 for Point Beach Unit 1, and to 2053 for Point Beach Unit 2).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 51.20(b)(2), the renewal of a power reactor operating license requires preparation of an environmental impact statement (EIS) or a supplement to an existing EIS. In addition, 10 CFR 51.95(c), "Operating license renewal stage," states that, in connection with the renewal of an operating license, the NRC staff shall prepare an EIS, which is a supplement to the Commission's NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*.

Once the NRC officially accepted NextEra's application, the NRC staff began the environmental review process as described in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." The environmental review begins by the NRC publishing in the *Federal Register* a notice of intent to prepare a supplemental environmental impact statement (SEIS) and to conduct scoping for the nuclear power plant. To prepare the Point Beach SEIS, the NRC staff performed the following:

- conducted a public scoping meeting on February 17, 2021
- conducted an environmental and severe accident mitigation alternatives audit during the week of April 5, 2021
- reviewed NextEra's environmental report (ER) and compared it to NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (the GEIS)
- consulted with Federal, State, Tribal, and local governmental agencies
- conducted a review of the issues following the guidance set forth in NUREG-1555, Supplement 1, Revision 1, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Supplement 1: Operating License Renewal*, Final Report
- considered public comments received during the scoping period

Proposed Action

NextEra initiated the proposed Federal action (issuance of subsequent renewed facility operating licenses for Point Beach) by submitting an application. The existing Point Beach renewed facility operating licenses expire at midnight on October 5, 2030, for Unit 1 (DPR-24) and March 8, 2033, for Unit 2 (DPR-27). The NRC's Federal action is to decide whether to issue subsequent renewed licenses authorizing an additional 20 years of operation. If the NRC issues the subsequent renewed licenses, Point Beach Units 1 and 2 would be authorized to operate until 2050 and 2053, respectively.

Purpose and Need for Actions

The purpose and need for the proposed action (i.e., issuance of subsequent renewed facility operating licenses for Point Beach) is to provide an option that allows for power generation capability beyond the term of the current nuclear power plant renewed operating licenses to meet future system generating needs. Energy-planning decisionmakers such as the licensee, States, utility operators, and, where authorized, Federal agencies (other than the NRC) may determine these future system generating needs. The Atomic Energy Act of 1954, as amended, and the National Environmental Policy Act of 1969, as amended, require the NRC to perform a safety review and an environmental review of the proposed action. The above definition of purpose and need reflects the NRC's recognition that, unless there are findings in the NRC's safety review or findings in the NRC's environmental analysis that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions as to whether a particular nuclear power plant should continue to operate.

Environmental Impacts of License Renewal

This SEIS evaluates the potential environmental impacts of the proposed action and reasonable alternatives to that action. The NRC designates the environmental impacts from the proposed action and reasonable alternatives as SMALL, MODERATE, or LARGE. NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (the GEIS) evaluates 78 environmental issues related to plant operation and classifies each issue as either a Category 1 issue (generic to all or a distinct subset of nuclear power plants) or a Category 2 issue (specific to individual power plants). Category 1 issues are those that meet all of the following criteria:

- The environmental impacts associated with the issue apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal.
- Mitigation of adverse impacts associated with the issue is considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For Category 1 issues, no additional site-specific analysis is required in this SEIS unless new and significant information is identified. Chapter 4 of this SEIS presents the process for identifying new and significant information.

Category 2 issues are site-specific issues that do not meet one or more of the criteria for Category 1 issues; therefore, a SEIS must include additional site-specific review for these non-generic issues.

NextEra and the NRC staff identified no information that is both new and significant related to Category 1 issues that has the potential to affect the conclusions in the GEIS. This conclusion is supported by the NRC staff's review of NextEra's ER and other documentation relevant to the applicant's activities, the public scoping process, and the findings from the NRC staff's site audits. Therefore, the NRC staff relied upon the conclusions of the GEIS for all Category 1 issues applicable to Point Beach.

In this SEIS, the NRC staff evaluated Category 2 issues applicable to Point Beach, as well as cumulative impacts, and considered new information regarding severe accident mitigation alternatives (SAMAs). Table ES-1 summarizes the Category 2 issues relevant to Point Beach and the NRC staff's findings related to those issues. If the NRC staff determined that there were no Category 2 issues applicable for a particular resource area, then the findings of the GEIS, as documented in Appendix B to Subpart A, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant," of 10 CFR Part 51, are incorporated for that resource area.

Table ES-1 Summary of NRC Conclusions Relating to Site-Specific Impacts of License Renewal at Point Beach

Resource Area	Relevant Category 2 Issues	Impacts
Groundwater Resources	Radionuclides released to groundwater	SMALL
Terrestrial Resources	Effects on terrestrial resources (non-cooling system impacts)	SMALL
Aquatic Resources	Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	SMALL
	Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	SMALL
Special Status Species and Habitats	Threatened, endangered, and protected species and essential fish habitat	May affect but is not likely to adversely affect the northern long-eared bat or piping plover. No effect on essential fish habitat.
Historic and Cultural Resources	Historic and cultural resources	Would not adversely affect known historic properties
Human Health	Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river)	SMALL
	Electric shock hazards	SMALL
	Chronic effects of electromagnetic fields	Uncertain impact
Environmental Justice	Minority and low-income populations	No disproportionately high and adverse human health and environmental effects on minority and low-income populations
Cumulative Impacts	Cumulative Impacts	See SEIS Section 3.16
Postulated Accidents	Severe accidents (SAMAs)	See SEIS Appendix F

Alternatives

As part of its environmental review, the NRC is required to consider alternatives to license renewal and evaluate the environmental impacts associated with each alternative. These alternatives can include other methods of power generation (replacement power alternatives), as well as simply not renewing the Point Beach licenses (the no-action alternative).

In total, the NRC staff initially considered 16 replacement power alternatives but later dismissed 13 of these because of technical, resource availability, or commercial limitations that currently exist and that the NRC staff believes are likely to still exist when the current Point Beach licenses expire. This left three potentially feasible and commercially viable replacement power alternatives which, in addition to the no-action alternative, the staff evaluates in depth in this report:

- new nuclear alternative:
  - a new nuclear facility (a small modular reactor facility) located at the Point Beach site
- natural gas combined-cycle alternative:
  - a new natural gas combined-cycle facility located at the Point Beach site
- combination alternative:
  - consisting of small modular reactor, solar photovoltaic, and onshore wind facilities

These are the 13 additional replacement power alternatives that the NRC staff considered but ultimately dismissed:

- solar power
- wind power
- biomass power
- demand-side management
- hydroelectric power
- geothermal power
- wave and ocean energy
- municipal solid waste-fired power
- petroleum-fired power
- coal-fired power
- fuel cells
- purchased power
- delayed retirement of other power generating facilities

The NRC staff evaluated each potentially feasible and commercially viable replacement power alternative and the no-action alternative using the same resource areas that it used in evaluating impacts from license renewal. The NRC staff also evaluated any new and significant information that could alter the conclusions of the SAMA analysis that was performed previously in connection with the initial license renewal of Point Beach in 2005.

Recommendation

The NRC staff's preliminary recommendation is that the adverse environmental impacts of subsequent license renewal for Point Beach are not so great that preserving the option of subsequent license renewal for energy-planning decisionmakers would be unreasonable. The NRC staff based its recommendation on the following:

- the analysis and findings in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
- the environmental report submitted by NextEra
- the NRC staff's consultation with Federal, State, Tribal, and local governmental agencies
- the NRC staff's independent environmental review
- the NRC staff's consideration of public comments received during the scoping period

ABBREVIATIONS AND ACRONYMS

$	$ dollar(s) (U.S.)
§	Section
°C	degrees Celsius
°F	degrees Fahrenheit
AADT	average annual daily traffic
ac	acre(s)
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act of 1954
ALARA	as low as is reasonably achievable
ALWR	advanced light water reactor
ANS	American Nuclear Society
APE	area of potential effect
AQCR	air quality control region
ASME	American Society of Mechanical Engineers
BGEPA	Bald and Golden Eagle Protection Act
BLS	Bureau of Labor Statistics
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
BTA	best technology available
Btu	British thermal unit
BTU/ft^3	British thermal unit(s) per cubic foot
BWR	boiling-water reactor
CAA	Clean Air Act
CCB	Center for Conservation Biology
CDC	Centers for Disease Control and Prevention
CDF	core damage frequency
CEQ	Council on Environmental Quality

CFR	*Code of Federal Regulations*
cfs	cubic feet per second
CLB	current licensing basis/bases
CO	carbon monoxide
CO_2	carbon dioxide
CO2e	carbon dioxide equivalent
COL	combined license
CVCS	chemical and volume control system
CWA	Clean Water Act (Federal Water Pollution Control Act)
CZMA	Coastal Zone Management Act
db	decibels
dBA	A-weighted decibels
DCH	designated critical habitat
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DRT	diesel range organics
DSEIS	draft supplemental environmental impact statement
DSM	demand-side management
EA Engineering	EA Engineering, Science, and Technology
ECHO	EPA's Enforcement and Compliance History Online
ECT	Environmental Consulting & Technology, Inc.
EFH	essential fish habitat
EIA	Energy Information Administration
EIS	environmental impact statement
EMF	electromagnetic field
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPU	extended power uprate
ER	environmental report
ERC	Energy Recovery Council
ESA	Endangered Species Act

ESP	early site permit
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FES	final environmental statement
fps	feet per second
FR	*Federal Register*
FRN	*Federal Register* notice
FSEIS	final supplemental environmental impact statement
ft	feet
ft^3	cubic feet
FWS	U.S. Fish and Wildlife Service
g/KWh	grams per kilowatt-hour
gal	gallons
GEIS	NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
GHG	greenhouse gas
gpd	gallons per day
gpm	gallons per minute
gpy	gallons per year
GRO	gasoline range organics
GT	gigaton(s)
GWh	gigawatt hour
GWP	global warming potential
ha	hectare(s)
HTD	hard-to-detect
IEA	International Energy Agency
in.	inches
IPE	individual plant examination
IPEEE	individual plant examination of external events
ISFSI	independent spent fuel storage installation
IUCN	International Union for Conservation of Nature

km	kilometer(s)
kV	kilovolt
kW	kilowatt(s)
kWh/m^2/day	kilowatt-hour per square meter per day
L	liters
lb	pound(s)
lb/ga	pounds per gallon
lb/MBtu	pounds per million British thermal units
LDN	day-night sound intensity level
Leq	sound intensity level
LERF	large early release frequency
LLRW	low-level radioactive waste
LN	statistical sound level
Lpd	liters per day
Lpm	liters per minute
LR	license renewal
LRA	license renewal application
m	meters
m/s	meter(s) per second
m^3	cubic meter(s)
m^{3}d	cubic meters per day
MACCS2	MELCOR Accident Consequences Code System 2
MATS	Mercury and Air Toxics Standards
MB	maximum benefit
MBTA	Migratory Bird Treaty Act
MBtu	million British thermal units
MDC	minimum detectable concertation
MELCOR	Computer code providing practical analytical tool for evaluating severe accident behavior
mg	million gallons
mgd	million gallons per day
mgy	million gallons per year

mi	mile(s)
mLd	million liters per day
mm	millimeters
MMPA	Marine Mammal Protection Act
mph	miles per hour
mrad	milliradiation absorbed dose, millirad
mrem	millirem
MSL	mean sea level
mSv	millisievert
MSW	municipal solid waste
MTWS	modified traveling water screens
MUR	measurement uncertainty recapture
MW	megawatt(s)
MWd/MTU	megawatt day(s) per metric ton uranium
MWe	megawatt(s) electric
MWh	megawatt hour(s)
MWt	megawatt(s) thermal
NA	not available / not applicable
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information
NCES	National Center for Education Statistics
NRCS	Natural Resources Conservation Service
NCSL	National Conference of State Legislatures
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NETL	National Energy Technology Laboratory
NextEra	NextEra Energy Point Beach, LLC
NGCC	natural gas combined-cycle
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service

NMSA	National Marine Sanctuaries Act
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NRR	Nuclear Reactor Regulation, Office of (NRC)
NWI	National Wetlands Inventory
O_3	ozone
ODCM	Offsite Dose Calculation Manual
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PAM	primary amebic meningoencephalitis
Pb	lead
PBF	physical or biological feature(s)
PCB	polychlorinated biphenyl
PCE	primary constituent elements
pCi/l	picocuries per liter
PL	public law
PM	particulate matter
PM_{10}	PM less than or equal to 10 microns
$PM_{2.5}$	PM less than or equal to 2.5 microns
Point Beach	Point Beach Nuclear Plant, Units 1 and 2, or PBNP
ppm	parts per million
PRA	probabilistic risk assessment
PSD	Prevention of Significant Deterioration
PV	photovoltaic
PWR	pressurized-water reactor
PYSL	post-yolk sac larvae

RAI	request for additional information
RCP	representative concentration pathway
rem	roentgen equivalent man
RCRA	Resource Conservation and Recovery Act
REMP	radiological environmental monitoring program
RG	Regulatory Guide
RIS	Regulatory Issue Summary
ROI	region of influence
ROP	Reactor Oversight Process
SAMA	severe accident mitigation alternative
SCPC	supercritical pulverized coal
SEIS	supplemental environmental impact statement
SER	safety evaluation report
SHPO	State historic preservation office
SIP	State Implementation Plan
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SMR	small modular reactor
SNF	spent nuclear fuel
SO_2	sulfur dioxide
SOARCA	State-of-the-Art Reactor Consequence Analysis
SSD	subsurface drainage system
Sv	sievert(s)
SWPP	Stormwater Pollution Prevention Plan
TS	technical specification
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture

USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VOC	volatile organic compound
WCMP	Wisconsin Coastal Management Program
WDHS	Wisconsin Department of Health Services
WDNR	Wisconsin Department of Natural Resources
WEPCO	Wisconsin Electric Power Company
WI	Wisconsin
WPDES	Wisconsin Pollutant Discharge Elimination System
YSL	yolk sac larvae

1 INTRODUCTION AND GENERAL DISCUSSION

The U.S. Nuclear Regulatory Commission's (NRC, the Commission) environmental protection regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," implement the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.). This Act is commonly referred to as NEPA. The regulations at 10 CFR Part 51 require the NRC to prepare an environmental impact statement (EIS) before deciding whether to issue an operating license or a renewed operating license for a nuclear power plant.

The Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.) (AEA), specifies that licenses for commercial power reactors can be granted for up to 40 years. The initial 40-year licensing period was based on economic and antitrust considerations rather than on technical limitations of the nuclear facility. NRC regulations permit these licenses to be renewed beyond the initial 40-year term for an additional period, limited to 20-year increments per renewal. The renewed license issuance is based on the results of the NRC staff's aging management reviews that the facility can continue to operate safely during the proposed period of extended operation (10 CFR 54.29, "Standards for issuance of a renewed license"). There are no limitations in the AEA or the NRC's regulations restricting the number of times a license may be renewed. The decision to seek a renewed license rests entirely with nuclear power facility owners and typically is based on the facility's economic viability and the investment necessary to continue to meet NRC safety and environmental requirements.

1.1 Proposed Federal Action

NextEra Energy Point Beach, LLC (NextEra, the applicant, the licensee) initiated the proposed Federal action by submitting an application for subsequent license renewal for Point Beach Nuclear Plant, Units 1 and 2 (Point Beach, PBNP) (NextEra 2020a). The current Point Beach renewed facility operating licenses expire at midnight on October 5, 2030, for Unit 1 (DPR-24), and at midnight on March 8, 2033, for Unit 2 (DPR-27). The NRC's Federal action is to decide whether to renew the licenses for an additional 20 years.

1.2 Purpose and Need for the Proposed Federal Action

The purpose and need for the proposed Federal action (issuance of subsequent renewed facility operating licenses for Point Beach) is to provide an option that allows for power generation capability beyond the term of the current renewed facility operating licenses to meet future system generating needs. Such needs may be determined by energy-planning decisionmakers such as the licensee, State regulators, utility owners, and Federal agencies other than the NRC. This definition of purpose and need reflects the NRC's recognition that, unless there are findings in the NRC's safety review (required by the AEA) or findings in the NRC's environmental analysis (required by NEPA) that would lead the NRC to reject a subsequent license renewal application, the NRC does not have a role in energy-planning decisions as to whether a particular nuclear power plant should continue to operate.

1.3 Major Environmental Review Milestones

NextEra submitted an environmental report (ER) as an appendix to its subsequent license renewal application on November 16, 2020 (NextEra 2020b). After reviewing the subsequent license renewal application and ER, as supplemented, the NRC staff accepted the application for a detailed technical review on January 15, 2021 (NRC 2021a), and published a *Federal Register* notice of acceptability for docketing and opportunity for hearing (86 FR 6684). On January 26, 2021, the NRC published a notice in the *Federal Register* (86 FR 7747) informing the public of the staff's intent to conduct an environmental scoping process, thereby beginning a 30-day scoping comment period. The NRC staff held a public scoping meeting on February 17, 2021, in the form of a webinar. In August 2021, the NRC issued its Environmental Impact Statement Scoping Process Summary Report for Point Beach (ADAMS Accession No. ML21194A166) (NRC 2021b), which includes the comments received during the scoping process and the NRC staff's responses to those comments (see Appendix A.1 of this document).

The NRC staff conducted a remote environmental and severe accident mitigation alternatives (SAMAs) audit of Point Beach during the week of March 5, 2021, to independently verify information in NextEra's ER. In a letter dated May 11, 2021, the staff summarized the audit and listed the attendees (ADAMS Accession No. ML21124A031) (NRC 2021c). During the audit, the NRC staff held meetings with plant personnel and reviewed site-specific documentation and photos.

Upon completion of the scoping period, site audits, and review of NextEra's ER and related documents, the NRC staff compiled its findings into this draft supplemental environmental impact statement (SEIS). The NRC staff will make this draft SEIS available for a public comment period of 45 days. Based on the information gathered and received during the public comment period, the NRC staff will revise the draft SEIS and will then publish the final SEIS. Figure 1-1 shows the major milestones of the environmental review portion of the NRC's license renewal application review process.

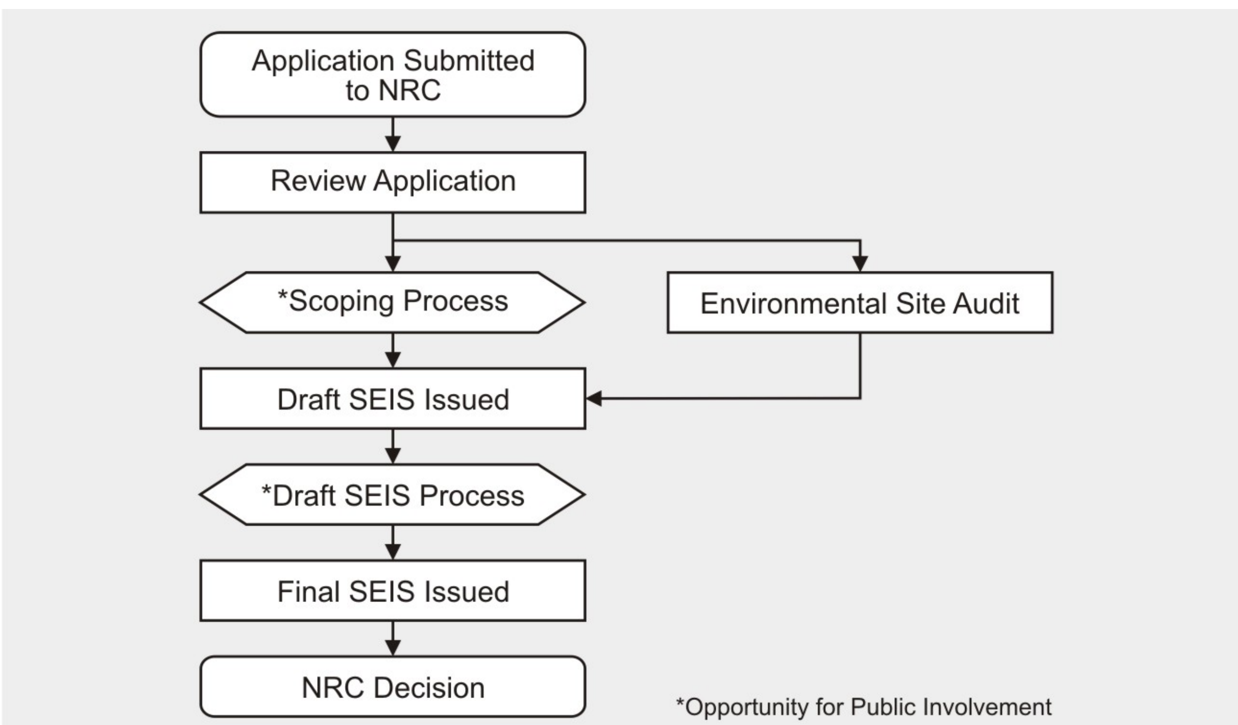


Figure 1-1 Environmental Review Process

The NRC has established a license renewal process that NRC staff and license renewal applicants can complete in a reasonable period of time and that includes clear requirements to assure safe plant operation for up to an additional 20 years of plant life, pursuant to 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants.” This process consists of separate safety and environmental reviews, which the NRC staff conducts simultaneously and documents in two reports: (1) the safety evaluation report (SER) documents the safety review and (2) the SEIS documents the environmental review (Figure 1-1). Both reports factor into the NRC’s decision to issue or deny a renewed license.

1.4 Generic Environmental Impact Statement

To improve the efficiency of its license renewal review process, the NRC staff performed a generic assessment of the environmental impacts associated with license renewal. NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants* (GEIS) (NRC 1996, 1999, 2013a), documents the results of the NRC’s systematic approach to evaluating the environmental consequences of renewing the licenses of individual nuclear power plants and operating them for an additional 20 years. In the GEIS, the staff analyzed in detail and resolved those environmental issues that could be resolved generically. The NRC issued the GEIS in 1996 (NRC 1996), Addendum 1 to the GEIS in 1999 (NRC 1999), and Revision 1 to the GEIS in 2013 (NRC 2013a). Unless otherwise noted, all references to the GEIS include the original 1996 GEIS, Addendum 1, and the 2013 revision. The conclusions in the GEIS are codified in Appendix B to Subpart A of 10 CFR Part 51, “Environmental Effect of Renewing the Operating License of a Nuclear Power Plant.”

The GEIS establishes separate environmental impact issues for the NRC staff to independently evaluate. Appendix B to Subpart A of 10 CFR Part 51 provides a summary of the staff’s findings in the GEIS. For each environmental issue addressed in the GEIS, the NRC staff does the following:

- describes the activity that affects the environment
- identifies the population or resource that is affected
- assesses the nature and magnitude of the impact on the affected population or resource
- characterizes the significance of both beneficial and adverse effects
- determines whether the results of the analysis apply to all plants
- considers whether additional mitigation measures would be warranted for impacts that would have the same significance level for all plants

The NRC established its standard of significance for impacts using the Council on Environmental Quality terminology for “significant.” Significance indicates the importance of likely environmental impacts and is determined by considering two variables: context and intensity. Context is the geographic, biophysical, and social context in which the effects will occur. Intensity refers to the severity of the impact in whatever context it occurs. Accordingly, the NRC established three levels of significance for potential impacts—SMALL, MODERATE, and LARGE—as defined below.

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

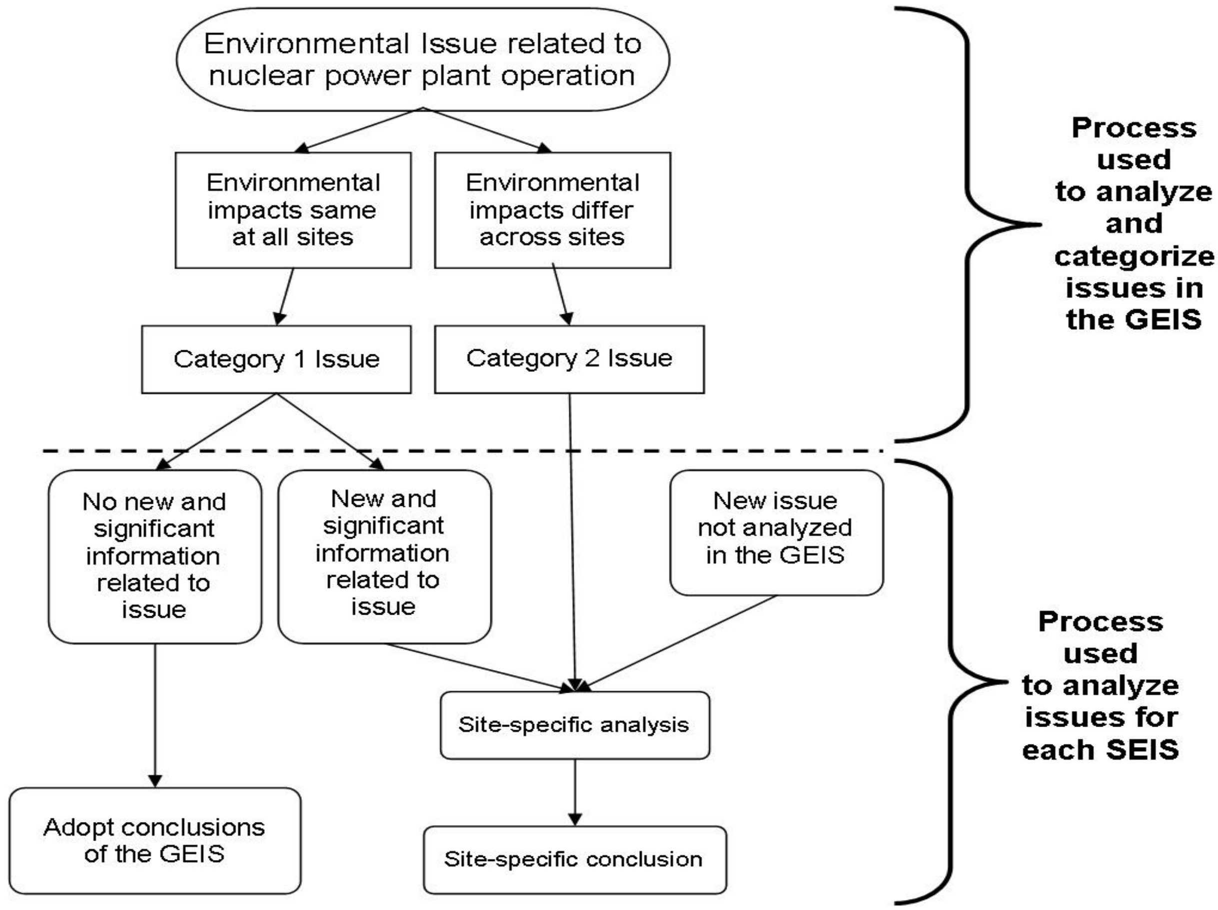
LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The GEIS determines whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are assigned a Category 1 (generic to all or a distinct subset of plants) or Category 2 (site-specific to certain plants only) designation. As established in the GEIS, Category 1 issues are those that meet the following three criteria:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants that have a specific type of cooling system or other specified plant or site characteristics.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For generic issues (Category 1), the SEIS requires no additional site-specific evaluation unless new and significant information has been identified. Chapter 3 describes the process for identifying new and significant information for site-specific analysis. Site-specific issues (Category 2) are those that do not meet one or more of the three criteria of Category 1 issues; therefore, the SEIS requires additional site-specific review for these issues.

The GEIS, Revision 1, evaluates 78 environmental issues, provides generically applicable findings for numerous issues (subject to the consideration of any new and significant information on a site-specific basis), and concludes that a site-specific analysis is required for 17 of the 78 issues. Figure 1-2 illustrates the license renewal environmental review process. The results of that site-specific review are documented in the SEIS.



In the GEIS, the NRC evaluated 78 issues.
A site-specific analysis is required for 17 of those 78 issues.

Figure 1-2 Environmental Issues Evaluated for License Renewal

1.5 Supplemental Environmental Impact Statement

This draft SEIS presents the NRC staff's analysis of the environmental effects of the continued operation of Point Beach through the subsequent license renewal period, alternatives to subsequent license renewal, and mitigation measures for minimizing adverse environmental impacts. Chapter 3, "Affected Environment, Environmental Consequences, and Mitigating Actions," contains an analysis and comparison of the potential environmental impacts from subsequent license renewal and alternatives to subsequent license renewal. Chapter 4, "Conclusion," presents the NRC's preliminary recommendation on whether the environmental impacts of subsequent license renewal are so great that preserving the option of subsequent license renewal would be unreasonable. The NRC staff will make its recommendation to the Commission regarding the environmental impacts of Point Beach subsequent license renewal in the final SEIS, after considering comments received on the draft SEIS during the public comment period.

In preparing the Point Beach draft SEIS, the NRC staff carried out the following activities:

- reviewed the information provided in NextEra's ER
- consulted with Federal, State, Tribal, and local governmental agencies

- conducted an independent review of the issues, including the environmental and SAMA site audit
- considered public comments received during the environmental scoping process

New and significant information. To merit additional review, information must be both new and significant and it must bear on the proposed action or its impacts. New information can come from many sources, including the applicant, the NRC, other agencies, or public comments. If new information reveals a new issue, the staff will first analyze the issue to determine whether it is within the scope of the license renewal environmental evaluation. If the staff determines that the new issue bears on the proposed action, the staff will then determine the significance of the issue for the plant and analyze the issue in the SEIS.

1.6 Decisions To Be Supported by the SEIS

This SEIS supports the NRC's decision on whether to renew the operating licenses for Point Beach for an additional 20 years. The regulation at 10 CFR 51.103(a)(5) specifies the NRC's decision standard as follows:

> In making a final decision on a license renewal action pursuant to [10 CFR] Part 54…, the Commission shall determine whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

There are many factors that the NRC takes into consideration when deciding whether to renew the operating license of a nuclear power plant. The analyses of environmental impacts in this SEIS will provide the NRC's decisionmakers (the Commission) with important environmental information for consideration in deciding whether to issue subsequent renewed licenses for Point Beach.

1.7 Cooperating Agencies

During the scoping process, the NRC staff did not identify any Federal, State, or local governmental agencies as cooperating agencies for this SEIS.

1.8 Consultations

The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA); the Magnuson–Stevens Fishery Conservation and Management Act of 1996, as amended (16 U.S.C. 1801 et seq.) (MSA); and the National Historic Preservation Act of 1966, as amended (54 U.S.C. 300101 et seq.) (NHPA), require Federal agencies to consult with applicable State and Federal agencies and organizations before taking an action that may affect endangered species, fisheries, or historic and archaeological resources, respectively. See Appendix C for a list of the agencies and groups with which the NRC staff consulted.

1.9 Correspondence

During the review, the NRC staff contacted the Federal, State, regional, local, and Tribal agencies listed in Appendix C. Appendix C chronologically lists all the correspondence that the NRC staff sent and received associated with the ESA, the MSA, and the NHPA. Appendix D chronologically lists all other correspondence.

1.10 Status of Compliance

NextEra is responsible for complying with all NRC regulations and other applicable Federal, State, and local requirements. Appendix F, "Laws, Regulations, and Other Requirements," of the GEIS, Revision 1, describes some of the major applicable Federal statutes. Numerous permits and licenses are issued by Federal, State, and local authorities for activities at Point Beach. Appendix B of this SEIS contains further information from the Point Beach application about NextEra's status of compliance.

1.11 Related State and Federal Activities

The staff reviewed the possibility that activities of other Federal agencies might impact the renewal of the operating licenses for Point Beach. Any such activities could result in cumulative environmental impacts and the possible need for the Federal agency to become a cooperating agency for preparing this SEIS. The NRC staff determined that there are no Federal projects that would make it necessary for another Federal agency to become a cooperating agency in the preparation of this SEIS (10 CFR 51.10(b)(2)). Table E-1 in Appendix E includes the Federal facilities in the vicinity of Point Beach.

Section 102(2)(C) of NEPA requires the NRC to consult with and obtain comments from any Federal agency or designated authority that has jurisdiction by law or special expertise with respect to any environmental impact involved in the subject matter of the SEIS. For example, during the preparation of the SEIS, the NRC consulted with the State Historic Preservation Officer, among others. Appendix C provides a complete list of consultation correspondence.

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The NRC's implementation of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.) (NEPA), requires the NRC to consider potential alternatives to issuing a renewed operating license as well as the environmental impacts of these alternatives. Comparing the environmental impacts of license renewal to those of the alternatives allows the NRC to determine whether the environmental impacts of license renewal are so great that it would be unreasonable for the agency to preserve the option of license renewal for energy-planning decisionmakers (Title 10 of the *Code of Federal Regulations* (10 CFR) 51.95(c)(4)). Ultimately, decisionmakers such as the licensee, State, or non-NRC Federal officials will decide whether to operate the plant for an additional 20 years (if the NRC renews the license) or shut down the plant and choose an alternative power generation source. Economic and environmental considerations play important roles in the decisions of these non-NRC, energy-planning decisionmakers.

In general, the NRC's responsibility is to ensure the safe operation of nuclear power facilities, not to formulate energy policy, promote nuclear power, or encourage or discourage the development of alternative power generation sources. The NRC does not engage in energy-planning decisions, and it makes no judgement as to which energy alternatives evaluated in the supplemental environmental impact statement (SEIS) would be the best or most-likely alternative to be selected in any given case.

This chapter provides: (1) a description of the Point Beach Nuclear Plant, Units 1 and 2 (Point Beach) plant and its operation, (2) a description of the proposed action (NRC subsequent renewal of the renewed facility operating licenses for Point Beach), (3) an in-depth evaluation of reasonable alternatives to the proposed action (including the no-action alternative), and (4) a brief description of the alternatives to the proposed action that the NRC staff considered but ultimately eliminated from in-depth evaluation.

2.1 Description of Nuclear Power Plant Facility and Operation

The physical presence of Point Beach buildings and facilities, as well as the plant's operations, are integral to creating the environment that currently exists at and around the site. This section describes certain nuclear power plant operating systems and certain plant infrastructure, operations, and maintenance.

2.1.1 External Appearance and Setting

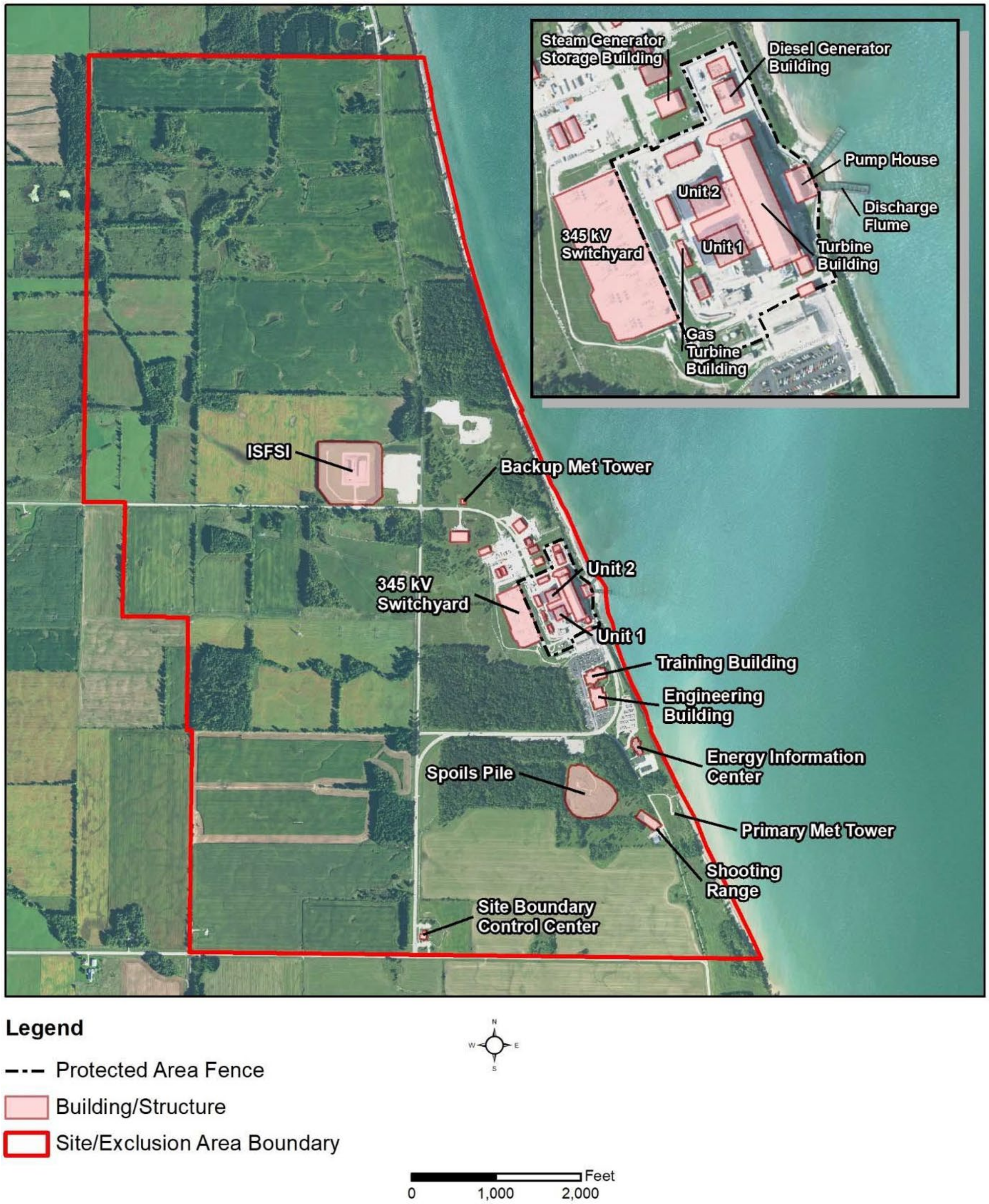
Point Beach is located in northeastern Manitowoc County, WI, approximately 29 miles (mi) (47 kilometers (km)) southeast of Green Bay, the largest population center in the region, and 90 mi (145 km) north-northeast of Milwaukee on the western shore of Lake Michigan (Figure 2-1). The town of Two Creeks is located approximately 2 mi northwest of Point Beach. The immediate vicinity around Point Beach includes portions of both Manitowoc and Kewaunee counties. The Kewaunee Power Station is located approximately 5 mi (8 km) north of Point Beach in Kewaunee County and is currently undergoing decommissioning (NextEra 2020b).

As shown in Figure 2-2, the principal Point Beach plant structures are the reactor containment buildings for Units 1 and 2, the auxiliary building, pumphouse, turbine building, emergency diesel generator building, independent spent fuel storage installation (ISFSI), meteorology towers, and 345-kV switchyard (NextEra 2020b).

1 Land surrounding Point Beach is characterized as rural residential intermixed with woodlands, wetlands, and open spaces, as well as the open waters of Lake Michigan (NextEra 2020b).

4 Source: NextEra 2020b

5 **Figure 2-1 Point Beach 50-mi (80-km) Radius Map**



Source: NextEra 2020b

Figure 2-2 Point Beach Layout

2.1.2 Nuclear Reactor Systems

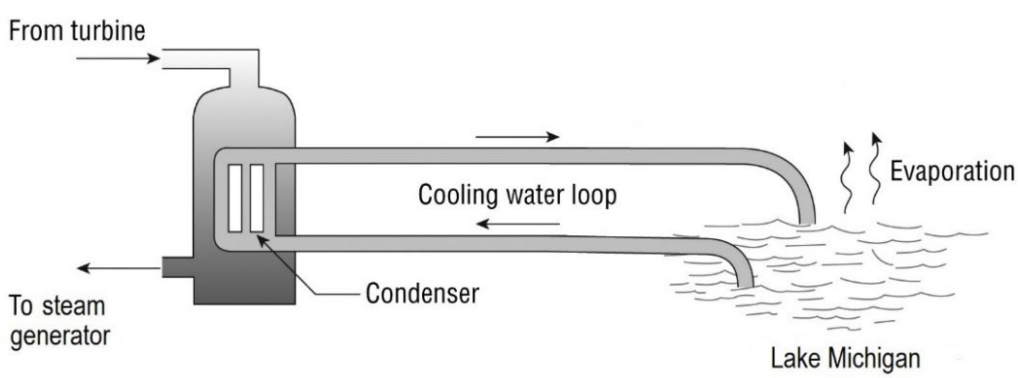
The Point Beach units are Westinghouse pressurized-water reactors (PWRs) with dry containments (steel lined and reinforced concrete). The NRC issued the original Point Beach Units 1 and 2 operating licenses on October 5, 1970, and March 8, 1973, respectively, and the first renewed licenses on December 22, 2005. The nuclear reactors produce a nominal core power rating of 1,800 megawatts thermal (MWt) for each unit (NextEra 2020b).

Point Beach use low-enriched uranium dioxide (limited to 5 percent by weight uranium-235) fuel sealed in tubes made of ZIRLO or optimized ZIRLO. Refueling occurs approximately every 18 months (NextEra 2020b).

2.1.3 Cooling and Auxiliary Water Systems

Section 2.1.3 of NUREG-1437, Supplement 23, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Point Beach Nuclear Plant Units 1 and 2*, describes and illustrates the operation of the Point Beach's cooling and auxiliary water systems, including the withdrawal of water and return flow of heated cooling water and comingled effluents back to Lake Michigan (NRC 2005a: Section 2.1.3, 2-4–2-7). Section 2.2.3 of NextEra's ER, submitted as part of its subsequent license renewal application, provides an expanded description of Point Beach's cooling and auxiliary water systems. This description includes the circulating water system, service water system, component cooling water systems, fire protection system, thermal effluent discharges, and domestic water supply systems, as well as the use of chemical treatments to control biofouling (NextEra 2020b: 2.2.3, 2-5–2-9). The NRC staff incorporates this information here by reference. Except where cited for clarity, the staff summarizes the information incorporated by reference below and presents relevant new information.

PWRs, such as Point Beach, heat water to a high temperature under pressure inside the reactor. This type of steam and power conversion system uses three heat transfer (exchange) loops. Section 3.1.2 of NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (the GEIS) describes this process (NRC 2013a). Point Beach uses a once-through cooling loop (circulating water system) to dissipate heat from the turbine condensers. Figure 2-3 provides a basic schematic diagram of this system.



Source: Modified from NRC 2013a: Fig. 2-2

Figure 2-3 Once-through Cooling Water System with Lake Water

2.1.3.1 Cooling Water Intake and Discharge

Point Beach's circulating water system is the principal interface with the hydrologic environment. Point Beach withdraws water from Lake Michigan through a circular intake crib located on the lake bottom approximately 1,750 ft (533 m) offshore in 22 ft (7 m) of water. This system provides water to the suction of four circulating water pumps, two screen wash pumps, six service water pumps, two fire water pumps, and one jockey fire pump, which are housed in the onshore pumphouse.

The intake structure stands approximately 11 ft (3.4 m) above the lakebed.[1] As detailed in Section 2.2.3.1 of the ER (NextEra 2020b), the structure consists of two concentric rings of structural steel pilings driven into the lakebed; the area between the inner and outer rings is filled with limestone blocks. Water primarily enters the crib through a 60-ft (18-m) diameter opening at the center of the crib. Water also enters the crib through three 30-inch (in.) (76-cm) diameter pipes (covered by bar grating) that penetrate the blocks as well as through the void spaces between the blocks. All the water entering the crib then traverses the two intake cones (north and south intakes) at the center of the crib (NextEra 2021a). The crib opening is covered by a high density polyethylene trash rack with 7-in. by 18-in. (18-cm by 46-cm) openings. The intake crib is also equipped with an acoustic fish-deterrent system that broadcasts high frequency sound waves to deter fish, particularly alewife, from entering the structure.

Water that enters the intake cones is drawn through two 14-ft (4.3-m) diameter intake pipes buried in the lakebed. The intake water travels through the pipes to the pumphouse forebay. During cold weather, plant operators can reverse the flow in the pipes so that warm condenser discharge water can be recirculated to prevent freezing.

In the pumphouse forebay, intake water first passes through one of two vertical bar (trash) racks to stop larger debris. The racks consist of 3/8-in. (0.95-cm) by 4-in (10.2-cm) bars, spaced with 2.25-in. (5.7-cm) gaps. After the vertical racks, intake water passes through the set of eight traveling screens in the pumphouse. These screens have 3/8 in. (0.95 cm) mesh openings and are activated as needed to prevent small debris and biota from entering the pump bays. The screens are equipped with an operator-controlled screen wash system, with the collected debris discharged through a screened, collection basket and back to the lake through a permitted outfall. Two pumps, rated at 1,100 gallons per minute (gpm) (4,200 liters per minute (Lpm)), provide screen wash water.

Withdrawn lake water is pumped through the plant's condensers to condense the steam exiting the plant's turbines. Two circulating water pumps per unit are normally used to circulate the water during summer, but only one pump per unit is normally needed during winter. Each of Point Beach's four circulating water pumps are rated at 178,000 gpm (674,000 Lpm).

Separately, the service water system provides water for essential heat removal requirements including mitigation of a loss-of-coolant accident as well as the normal heat loads associated with the main turbine lubricating oil coolers, containment coolers, component cooling heat exchangers, the spent fuel pool heat exchangers, and makeup water for treated (demineralized) uses in plant systems. Normally, two to three service water pumps are in operation, with the remaining pumps serving as backups. Each service water pump is rated at 5,320 gpm (20,100 Lpm).

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[1] Prior to May 2001, the intake structure extended 8 ft (2.4 m) above water level. The plant owner modified the structure to mitigate bird mortality among the large number of birds attracted to the structure during spring and fall migration (NRC 2005).

Two fire water pumps are also located in the pumphouse, each with a rated capacity of 2,000 gpm (7,600 Lpm). The fire water pumps do not normally withdraw lake water as the plant's fire protection system is pressurized by a jockey pump. The fire water pumps will start automatically based on a low system pressure trigger.

In total, Point Beach's peak (design) surface water withdrawal rate is 769,160 gpm (2.917 million Lpm). This rate is equivalent to about 1,108 million gallons per day (mgd) (4,190 million liters per day (mLd)) (NextEra 2020c). This peak intake rate accounts for limiting factors such as pumping head losses (ECT et al. 2020). Section 3.5.1.2 of this SEIS summarizes Point Beach's actual surface water withdrawals.

The circulating water flows from the plant's main condensers and other equipment, service water return flows, and other plant effluents are discharged back to Lake Michigan through two flumes, one for each unit (see Figure 2-3). These flumes consist of steel piling troughs at the lake surface and extend in opposite directions (at 30-degree angles from the plant centerline) approximately 200 ft (60 m) into the lake.

The discharge points are designated as Outfalls 001 and 002 under NextEra's Wisconsin Pollutant Discharge Elimination System (WPDES) permit, as discussed in Section 3.5.1.3 of this SEIS.

2.1.3.2 Well Water Supply System

Five groundwater wells supply Point Beach's domestic (potable) and miscellaneous water needs across the plant site. These wells include the E-10 site supply well, Energy Information Center well, Site Boundary Control Center well, Warehouse 6 well, and Warehouse 7 well. Section 3.6.3.2 of NextEra's ER further summarizes the construction details, uses, and applicable permits regarding these wells (NextEra 2020b). Section 3.5.2.2 of this SEIS further discusses Point Beach's groundwater supply wells and associated withdrawals.

2.1.4 Radioactive Waste Management Systems

Section 2.1.4 of NUREG-1437, Supplement 23, describes the operation of Point Beach's radioactive waste treatment systems (NRC 2005a: Section 2.1.4, 2-7–2-11). Section E2.2.6 of NextEra's ER, submitted as part of its subsequent license renewal application, provides an expanded description of Point Beach's radioactive waste treatment systems (NextEra 2020b: Section E2.2.6, E-2-14 to E-2-34). The NRC staff incorporates this information here by reference. Except where cited for clarity, the staff summarizes the information incorporated by reference below and presents relevant new information.

The NRC licenses all nuclear plants with the expectation that they will release radioactive material to both the air and water during normal operations. However, NRC regulations require that gaseous and liquid radioactive releases from nuclear power plants meet radiation dose-based limits specified in 10 CFR Part 20, "Standards for Protection Against Radiation," and the as low as is reasonably achievable (ALARA) criteria in 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low As Is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." In other words, the NRC places regulatory limits on the radiation dose that members of the public can receive from radioactive effluents of a nuclear power plant. For this reason, all nuclear power plants use radioactive waste management systems to control and monitor radioactive wastes.

Point Beach uses the liquid, gaseous, and solid waste management systems to collect and process radioactive materials and waste produced as a byproduct of plant operations. The waste disposal system outside containment is common to both units. The radioactive waste systems and the control room is located between Point Beach Units 1 and 2. The waste disposal systems can process the waste produced by continuous operation of the primary system assuming that the fission products escape to the reactor coolant by diffusion through defects in the cladding of 1 percent of the fuel rods. These waste management systems assure that the dose to members of the public from radioactive effluents is reduced to ALARA levels in accordance with NRC regulations (NextEra 2020b).

NextEra maintains a radiological environmental monitoring program (REMP) to assess the radiological impact, if any, to the public and the environment from radioactive effluents released during operations at Point Beach (NextEra 2020b). The REMP is discussed in Section 2.1.4.5 of this SEIS.

NextEra has an Offsite Dose Calculation Manual (ODCM) that contains the methods and parameters for calculating offsite doses resulting from liquid and gaseous radioactive effluents. These methods ensure that radioactive material discharges from Point Beach meet NRC and U.S. Environmental Protection Agency (EPA) regulatory dose standards. The ODCM also contains the requirements for the REMP.

2.1.4.1 Radioactive Liquid Waste Management

NextEra uses waste management systems to collect, analyze, and process radioactive liquids produced at Point Beach. These systems reduce radioactive liquids before they are released to the environment. The Point Beach liquid waste disposal system meets the design objectives of 10 CFR Part 50, Appendix I, and controls the processing, disposal, and release of radioactive liquid wastes.

The liquid waste disposal system is common to both reactors and accommodates radioactive waste produced during simultaneous operation. The system was designed to receive, process, and discharge potentially radioactive liquid waste. Holdup capacity is provided for retention of liquid effluents, particularly where unfavorable environmental conditions can be expected to require operational limitations upon the release of radioactive effluents to the environment. Radioactive fluids entering the waste disposal system are processed or collected in tanks until determination of subsequent treatment can be made. They are sampled and analyzed to determine the quantity of radioactivity. Liquid wastes are processed as required and then released under controlled conditions. In summary, potentially radioactive liquid wastes originate from the equipment drains, vents, and leaks; chemical laboratory drains; radioactive laundry and hot shower drains; decontamination area drains; chemical and volume control system (CVCS) sampling system drains and local sample sinks; normal letdown; steam generator blowdown (if required by radioactivity content); floor drains from the controlled areas of the plant; liquids used to transfer solid radwaste; steam generator facility sump (if required by radioactive content); and warehouse 7 sump (if required by radioactive content). The liquid waste disposal system also collects and transfers liquids from the pressurizer relief tank; reactor coolant pump secondary seals; excess letdown (during startup); accumulators; valve and reactor vessel flange leak-offs; and refueling canal drains. These liquids flow to the reactor coolant drain tank and are discharged to the CVCS holdup tanks or to the -19’3” auxiliary building sump by either of the two reactor coolant drain tank pumps (NextEra 2020b, Section 2.2.6.1 p 2-15). All routine liquid radioactive releases are from the waste disposal system distillate tanks or the CVCS monitor tanks. All radioactive liquid wastes will be sampled and analyzed prior to release to the plant discharge system. The system design considers potential personnel exposure and ensures that radioactive releases to the environment are as low as reasonably achievable. During normal plant operation, the total activity from radionuclides leaving the discharge streams does not exceed the limits of applicable regulations. The sources of radioactivity are from the core, fuel rod gap, and coolant. As detailed in Section 2.2.6.1 of the ER, radioactive liquids entering the waste disposal system are collected in tanks for analysis prior to discharge and/or further treatment. Each reactor unit has a steam generator blowdown tank and one reactor coolant drain tank inside each containment. Point Beach Units 1 and 2 share one laundry and hot shower tank, one chemical tank, one waste holdup tank, two waste condensate tanks, and one waste distillate tank. The blowdown evaporator system is the primary way radioactive liquid waste effluents are processed. This system is designed to remove radioactive particulate and gases from radioactive liquid waste and from steam generator blowdown water in the event of primary to secondary leakage. Evaporator bottoms and ion exchange resins are pumped to the primary auxiliary building truck bay for dewatering prior to disposal. All piping, pumps, and valves carrying liquid wastes have provisions to minimize leakage, prevent over-pressurization, and isolate equipment as required for operation and maintenance.

All liquid wastes are monitored prior to release to ensure that they will not exceed the limits of 10 CFR Part 20. The radiation monitoring system monitors the effluent, closing the discharge valve if the amount of radioactive material in the effluent exceeds preset values. NextEra performs offsite dose calculations based on effluent samples obtained at this release point to ensure that the limits of 10 CFR Part 50, Appendix I are not exceeded. The ODCM prescribes the alarm/trip setpoints for the liquid-effluent radiation monitors. NextEra's use of these radiological waste systems and the procedural requirements in the ODCM provides assurance that the dose from radiological liquid effluents at Point Beach complies with NRC and EPA regulatory dose standards. NextEra calculates dose estimates for members of the public using radiological liquid effluent release data.

NextEra's annual radioactive effluent release reports contain a detailed presentation of liquid effluents released from Point Beach and the resultant calculated doses (NextEra 2020b). These reports are publicly available on the NRC's Web site.

The NRC staff reviewed 5 years of radioactive effluent release data from 2016 through 2020 (NextEra 2017, 2018, 2019, 2020d, 2021d). A 5-year period provides a dataset that covers a broad range of activities that occur at a nuclear power plant, such as refueling outages, routine operation, and maintenance, which can affect the generation of radioactive effluents into the environment. The NRC staff compared the data against NRC dose limits and looked for indications of adverse trends (i.e., increasing dose levels or increasing radioactivity levels).

The following summarizes the calculated doses from radioactive liquid effluents released from Point Beach during 2020 (NextEra 2021d).

<u>Point Beach Unit 1 in 2020</u>

- The total-body dose to an offsite member of the public from Point Beach Unit 1 radioactive effluents was 9.5×10^{-4} millirem (mrem) (9.5×10^{-6} millisievert (mSv)), which is well below the 3 mrem (0.03 mSv) dose criterion in Appendix I to 10 CFR Part 50.
- The maximum organ dose (gastrointestinal tract) to an offsite member of the public from Point Beach Unit 1 radioactive effluents was 1.01×10^{-3} mrem (1.01×10^{-5} mSv), which is well below the 10 mrem (0.1 mSv) dose criterion in Appendix I to 10 CFR Part 50.

<u>Point Beach Unit 2 in 2020</u>

- The total-body dose to an offsite member of the public from Point Beach Unit 2 radioactive effluents was 9.5×10^{-4} mrem (9.5×10^{-6} mSv), which is well below the 3 mrem (0.03 mSv) dose criterion in Appendix I to 10 CFR Part 50.
- The maximum organ dose (gastrointestinal tract) to an offsite member of the public from Point Beach Unit 2 radioactive effluents was 1.01×10^{-3} mrem (1.01×10^{-5} mSv), which is well below the 10 mrem (0.1 mSv) dose criterion in Appendix I to 10 CFR Part 50.

In the values cited above, the NRC staff divided NextEra's reported total-body and maximum organ liquid effluent doses for the entire facility evenly between Units 1 and 2. This was done to attribute the approximate dose contribution to each of the licensed nuclear units. The NRC staff's review of NextEra's radioactive liquid effluent control program shows that the applicant maintained radiation doses to members of the public within NRC and EPA radiation protection standards as contained in Appendix I to 10 CFR Part 50, 10 CFR Part 20, and Title 40, "Protection of Environment," of the *Code of Federal Regulations* (40 CFR) Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations." The NRC staff observed no adverse trends in the dose levels.

During the subsequent license renewal term, NextEra will continue to perform routine plant refueling and maintenance activities. Based on NextEra's past performance in operating a radioactive waste system at Point Beach that maintains ALARA doses from radioactive liquid effluents, the NRC staff expects that NextEra will maintain similar performance during the subsequent license renewal term.

2.1.4.2 Radioactive Gaseous Waste Management

NextEra calculates dose estimates for members of the public based on radioactive gaseous effluent release data and atmospheric transport models. NextEra's annual radioactive effluent release reports present in detail the radiological gaseous effluents released from Point Beach and the resultant calculated doses. As described above in Section 2.1.4.1, the NRC staff reviewed 5 years of radioactive effluent release data from the 2016 through 2020 reports (NextEra 2017, 2018, 2019b, 2020d, 2021d). The NRC staff compared the data against NRC dose limits and looked for indications of adverse trends (i.e., increasing dose levels) over the period.

The following summarizes the calculated doses from radioactive gaseous effluents released from Point Beach during 2020 (NextEra 2021d):

<u>Point Beach Unit 1 in 2020</u>

- The air dose due to noble gases with resulting gamma radiation in gaseous effluents was 5.45×10^{-5} millirad (mrad) (5.45×10^{-7} milligray), which is well below the 10 mrad (0.1 milligray) dose criterion in Appendix I to 10 CFR Part 50.
- The air dose from beta radiation in gaseous effluents was 2.33×10^{-5} mrad (2.33×10^{-7} milligray), which is well below the 20 mrad (0.2 milligray) dose criterion in Appendix I to 10 CFR Part 50.
- The critical organ dose to an offsite member of the public from radiation in gaseous effluents as a result of iodine-131, iodine-133, hydrogen-3, and particulates with greater than 8-day half-lives was 5.35×10^{-3} mrem (5.35×10^{-5} mSv), which is below the 15 mrem (0.15 mSv) dose criterion in Appendix I to 10 CFR Part 50.

<u>Point Beach Unit 2 in 2020</u>

- The air dose due to noble gases with resulting gamma radiation in gaseous effluents was 5.45×10^{-5} mrad (5.45×10^{-7} milligray), which is well below the 10 mrad (0.1 milligray) dose criterion in Appendix I to 10 CFR Part 50.
- The air dose from beta radiation in gaseous effluents was 2.33×10^{-5} mrad (2.33×10^{-7} milligray), which is well below the 20 mrad (0.2 milligray) dose criterion in Appendix I to 10 CFR Part 50.
- The critical organ dose to an offsite member of the public from radiation in gaseous effluents as a result of iodine-131, iodine-133, hydrogen-3, and particulates with greater

than 8-day half-lives was 5.35×10^{-3} mrem (5.35×10^{-5} mSv), which is below the 15 mrem (0.15 mSv) dose criterion in Appendix I to 10 CFR Part 50.

In the values cited above, the NRC staff divided NextEra's reported air dose due to noble gases, air dose from beta radiation, and critical organ dose for the entire facility evenly between Units 1 and 2. This was done to attribute the approximate dose contribution to each of the licensed nuclear units. The NRC staff's review of Point Beach's radioactive gaseous effluent control program showed radiation doses to members of the public that were well below NRC and EPA radiation protection standards contained in Appendix I to 10 CFR Part 50, 10 CFR Part 20, and 40 CFR Part 190. The NRC staff observed no adverse trends in the dose levels over the 5 years reviewed.

During the subsequent license renewal term, NextEra will continue to perform routine plant refueling and maintenance activities. Based on NextEra's past performance in operating a radioactive waste system at Point Beach that maintains ALARA doses from radioactive gaseous effluents, the NRC staff expects that NextEra will maintain similar performance during the subsequent license renewal term.

2.1.4.3 Radioactive Solid Waste Management

Point Beach's solid waste disposal system provides for packaging and/or solidification of radioactive waste that will subsequently be shipped offsite to an approved burial facility. These activities reduce the amount of waste shipped for offsite disposal. Solid radioactive wastes are logged, processed, packaged, and stored for subsequent shipment and offsite burial. Solid radioactive wastes and potentially radioactive wastes include reactor components, equipment and tools removed from service, chemical laboratory samples, spent resins, used filter cartridges, and radioactively contaminated hardware, as well as compacted wastes such as contaminated protective clothing, paper, rags, and other trash generated from plant design modifications and operations and routine maintenance activities. In addition, nonfuel solid wastes result from treating and separating radionuclides from gases and liquids and from removing containment material from various reactor areas.

Spent resins from the demineralizers, filter cartridges, and the concentrates from the evaporators are packaged and stored onsite until they are shipped for offsite disposal. Miscellaneous materials such as paper, plastic, wood, and metal are collected and shipped offsite for vendor supplied volume reduction (e.g., incineration, super compaction, metal melt, deconstruction) followed by disposal.

Spent resins from the CVCS and other system demineralizers are flushed to a shielded, lined, stainless steel storage tank located in the auxiliary building basement. When the tank is full, the resin is dewatered and liquids from the dewatering operation are sent to the waste holdup tank. After resin dewatering, the tank and its shield are transferred to the truck access area or to the new fuel storage area where the resin is sluiced to a disposable cask liner. When the disposable cask liner is full, it is dewatered to meet disposal site or processor criteria. The disposable cask liner is then shipped offsite for processing or disposal at a suitable burial site or stored until shipped for offsite burial.

2.1.4.4 Radioactive Waste Storage

In 2011, the installation of a warehouse for radwaste storage was one of the minor changes at the plant since the initial Point Beach license renewal. At Point Beach, low-level radioactive waste (LLRW) is stored temporarily onsite at a low-level waste storage facility before being shipped offsite for processing or disposal at licensed LLRW treatment and disposal facilities. LLRW is classified as Class A, Class B, or Class C (minor volumes are classified as greater than Class C). Class A includes both dry active waste and processed waste (e.g., dewatered resins). Classes B and C normally include processed waste and irradiated hardware. As indicated in NextEra's ER and discussed with the NRC staff at the virtual audit, Point Beach has sufficient existing capability to store all generated LLRW onsite. No additional construction of onsite storage facilities is necessary for LLRW storage during the subsequent period of extended operation.

Point Beach Units 1 and 2 each store spent fuel in a spent fuel pool and in an onsite independent spent fuel storage installation (ISFSI). The ISFSI safely stores spent fuel onsite in licensed and approved dry cask storage containers. Spent fuel is stored in the ISFSI under a separate license. The possible need to expand the size of the ISFSI would depend on the U.S. Department of Energy's (DOE) future performance of its obligation to accept spent nuclear fuel or the availability of other interim storage options. Per the Point Beach ER, if ISFSI expansion were needed, it would most likely be constructed west of the existing facility within the ISFSI-defined area and the licensee stated that it would cause no significant environmental impact (NextEra 2020b, Section 3.1.4). Currently, NextEra has not proposed the installation of additional spent fuel storage pads to the current ISFSI area to support subsequent license renewal. If future changed circumstances require the installation of additional spent fuel storage pads, then this would be subject to a separate NEPA review. Therefore, the staff does not consider expansion of the ISFSI in this SEIS. The NRC staff notes, however, that the impacts of onsite storage of spent nuclear fuel during the period of extended operation have been determined to be SMALL, as stated in 10 CFR Part 51, Appendix B, Table B-1; see also NUREG-2157, *Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel* (NRC 2014a).

2.1.4.5 Radiological Environmental Monitoring Program

NextEra maintains a radiological environmental monitoring program (REMP) to assess the radiological impact, if any, to the public and the environment from Point Beach operations.

The REMP measures the aquatic, terrestrial, and atmospheric environment for ambient radiation and radioactivity. Monitoring is conducted for the following: direct radiation, air, precipitation, well water, river water, surface water, milk, food products and vegetation (such as edible broad leaf vegetation), fish, silt, and shoreline sediment. The REMP also measures background radiation (i.e., cosmic sources, global fallout, and naturally occurring radioactive material, including radon).

In addition to the REMP, NextEra established a Point Beach onsite groundwater protection initiative program in accordance with NEI 07-07, "Industry Ground Water Protection Initiative" (NEI 2007). This program monitors the onsite plant environment to detect leaks from plant systems and pipes containing radioactive liquid. Section 3.5.2.3, "Groundwater Quality," of this SEIS contains information on Point Beach's groundwater protection initiative program. In 2019, the groundwater protection program included 14 wells. The REMP program collected samples from one additional well (15 in total). As part of the REMP program, analyses are conducted for gross beta, tritium, Sr-89, SR-90, I-131, and gamma isotopic analyses on a quarterly basis for groundwater. Lake water is also sampled for a subset of these parameters.

Section 3.5.2.3 of this SEIS describes the results from the 2019 annual groundwater sampling. During this sampling period, tritium was detected in shallow groundwater at concentrations well below the EPA-established safe drinking water maximum contaminant level of 20,000 picocuries per liter (pCi/L). In addition, the short-lived radionuclide cobalt-58 was also detected at a very low concentration but did not appear in later samples and was concluded to not be indicative of a potential leak. No detectable radionuclides were identified in 2019 deep well water samples (NextEra 2020d).

Section 3.5.2.3 of this SEIS also contains a more complete description of the groundwater protection program and a historical description of tritium and other radionuclides detected in groundwater at the site.

Based on its review of this information as described in Section 3.5.2.3 of this SEIS, the staff determined that the impacted groundwater, which is in the shallow aquifer, is migrating east to Lake Michigan where it will be greatly diluted. In addition, the absence of tritium in monitored drinking water wells near the power block and at the site boundary indicates that it is not migrating deeper into the drinking water aquifer or offsite and does not impact onsite and offsite water uses and users. There is no apparent increasing trend in concentration or pattern indicating either a new inadvertent release or persistently high tritium concentrations that might indicate an ongoing inadvertent release from Point Beach. In addition, based on its review of the groundwater monitoring program, the NRC staff concluded that the current groundwater monitoring network is strategically located to promptly detect and monitor any potential impacts to groundwater at the site.

2.1.5 Nonradioactive Waste Management Systems

Section 2.1.5 of NUREG-1437, Supplement 23, describes Point Beach's nonradioactive waste management systems (NRC 2005a: Section 2.1.5, 2-11–2-12). Section E2.2.7 of NextEra's ER provides an expanded description of Point Beach's nonradioactive waste management systems (NextEra 2020b, Section 2.2.7, 2-22–2-34). This information is incorporated here by reference, with key information summarized below and in the following subsections.

Like any other industrial facility, nuclear power plants generate wastes that are not contaminated with either radionuclides or hazardous chemicals. Point Beach generates nonradioactive waste as a result of plant maintenance, cleaning, and operational processes. NextEra manages nonradioactive wastes in accordance with applicable Federal and state regulations as implemented through its corporate procedures. Point Beach generates and manages the following types of nonradioactive wastes:

Hazardous Wastes: Point Beach is classified as a small-quantity hazardous waste generator. The amounts of hazardous wastes generated are only a small percentage of the total wastes generated. These generally consist of paint wastes, spent and off-specification (e.g., shelf-life expired) chemicals, gun cleaning rags with lead residue, and occasional project-specific wastes. Table E2.2-2 in the ER provides a list and the amounts of hazardous waste (NextEra 2020b).

Nonhazardous Wastes: These generally include glycol and antifreeze (state-specific), used polishing resin, nonhazardous paint, coatings, sealants, lubricants, grease, two-part epoxies, and fire barrier foam. Recycled waste typically consists of scrap metal, batteries, and used oil. Municipal waste is disposed of at the local permitted solid waste management facility. Table E2.2-2 in the ER provides a list and the amounts of nonhazardous waste (NextEra 2020b).

Universal Wastes: These typically consist of used oil, fluorescent lamps, batteries, mercury devices, and electronics (state-specific) (NextEra 2020b).

NextEra maintains a list of waste vendors that it has approved for use across the entire company to remove and dispose of the identified wastes offsite (NextEra 2020b).

2.1.6 Utility and Transportation Infrastructure

The utility and transportation infrastructure at nuclear power plants typically interfaces with public infrastructure systems available in the region. Such infrastructure includes utilities, such as suppliers of electricity, fuel, and water; as well as roads and railroads that provide access to the site. The following sections briefly describe the existing utility and transportation infrastructure at Point Beach. Site-specific information in this section is derived from NextEra's ER (NextEra 2020b), unless otherwise cited.

2.1.6.1 Electricity

Nuclear power plants generate electricity for other users; however, they also use electricity to operate. Offsite power sources provide power to engineered safety features and emergency equipment in the event of a malfunction or interruption of power generation at the plant. Planned independent backup power sources provide power in the event that power is interrupted from both the plant itself and offsite power sources.

2.1.6.2 Fuel

Point Beach operates with low-enriched uranium dioxide fuel. With the NRC approval of optimized ZIRLO cladding fuel usage, NextEra operates the reactor cores to yield an equilibrium cycle (normal cycle) burnup of approximately 19,000 megawatt-days per metric ton uranium (MWd/MTU) and lead rod average burnup limit of 62,000 MWd/MTU. Refueling occurs approximately every 18 months. NextEra stores spent fuel in the spent fuel pool in the auxiliary building next to the containment building or in dry cask storage containers at the onsite ISFSI (NextEra 2020b).

2.1.6.3 Water

In addition to cooling and auxiliary water from Lake Michigan, Point Beach uses groundwater wells to supply water for the potable and sanitary needs of plant personnel and for other miscellaneous uses. Section 2.1.3, "Cooling and Auxiliary Water Systems," of this SEIS describes the Point Beach cooling and industrial water systems.

2.1.6.4 Transportation Systems

Nuclear power plants are served by controlled access roads that are connected to U.S. highways and Interstate highways. In addition to roads, many plants also have railroad connections for moving heavy equipment and other materials. Plants located on navigable waters may have facilities to receive and ship loads on barges. Section 3.10.6, "Local Transportation," of this SEIS describes the Point Beach transportation systems.

2.1.6.5 Power Transmission Systems

For license renewal and subsequent license renewal, the NRC (NRC 2013a) evaluates, as part of the proposed action, the continued operation of those Point Beach power transmission lines that connect to the substation where it feeds electricity into the regional power distribution system. The transmission lines that are in scope for the Point Beach subsequent license renewal environmental review are onsite and are not accessible to the general public. The NRC also considers the continued operation of the transmission lines that supply outside power to the nuclear plant from the grid. Section 3.11.4, "Electromagnetic Fields," of this SEIS describes these transmission lines.

2.1.7 Nuclear Power Plant Operations and Maintenance

Maintenance activities conducted at Point Beach include inspection, testing, and surveillance to maintain the current licensing basis of the facility and to ensure compliance with environmental and safety requirements (NextEra 2020b). These activities include in-service inspections of safety-related structures, systems, and components; quality assurance and fire protection programs; and radioactive and nonradioactive water chemistry monitoring.

Additional programs include those implemented to meet technical specification surveillance requirements and those implemented in response to NRC generic communications. Such additional programs include various periodic maintenance, testing, and inspection procedures necessary to manage the effects of aging on structures and components. Certain program activities are performed during the operation of the units, whereas others are performed during 18-month scheduled refueling outages (NextEra 2020b).

2.2 Proposed Action

As stated in Section 1.1 of this SEIS, the NRC's proposed Federal action is to decide whether to issue subsequent renewed Point Beach operating licenses for an additional 20 years of operation. Section 2.2.1 below provides a description of normal power plant operations during the subsequent license renewal term.

2.2.1 Plant Operations during the Subsequent License Renewal Term

Most plant operation activities during the subsequent license renewal term would be the same as, or similar to, those occurring during the current license term. The GEIS describes the issues that would have the same impact at all nuclear power plants, or a distinct subset of plants (i.e., generic issues), as well as those issues that would have different impact levels at different nuclear power plants (i.e., site-specific issues). The impacts of generic issues are described in the GEIS as Category 1 issues; those impacts are set out in the GEIS and Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and those determinations apply to each license renewal application (applicable to plants and sites within the designated generic classification), subject to the consideration of any new and significant information on a plant-specific basis. A second group of issues (i.e., Category 2 issues) was identified in the GEIS as having potentially different impacts at each plant, on a site-specific basis; those issues with plant-specific impact levels need to be discussed in a plant-specific SEIS such as this one.

Section 2.1.1, "Plant Operations during the License Renewal Term," of the GEIS describes the general types of activities carried out during the operation of all nuclear power plants:

- reactor operation
- waste management
- security
- office and clerical work; possible laboratory analysis
- surveillance, monitoring, and maintenance
- refueling and other outages

As part of its subsequent license renewal application, NextEra submitted an ER, which states that Point Beach will continue to operate during the subsequent license renewal term in the same manner as it would during the current license term except for additional aging management programs, as necessary (NextEra 2020b). Such programs would address structure and component aging in accordance with 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

2.2.2 Refurbishment and Other Activities Associated with Subsequent License Renewal

Refurbishment activities include replacement and repair of major structures, systems, and components. As described in the GEIS, most major refurbishment activities are actions that would typically take place only once in the life of a nuclear plant, if at all (NRC 2013a). For example, replacement of pressurized-water reactor steam generator systems is a refurbishment activity. Refurbishment activities may have an impact on the environment beyond those that occur during normal operations and may require evaluation, depending on the type of action and the plant-specific design.

In preparation for its subsequent license renewal application, NextEra evaluated major structures, systems, and components in accordance with 10 CFR 54.21, "Contents of application—technical information," to identify major refurbishment activities necessary for the continued operation of Point Beach during the proposed 20-year period of extended operation (NextEra 2020b).

NextEra did not identify any major refurbishment activities necessary for the continued operation of Point Beach beyond the end of the existing operating licenses (NextEra 2020b).

2.2.3 Termination of Nuclear Power Plant Operations and Decommissioning After the Subsequent License Renewal Term

NUREG-0586, Supplement 1, Volumes 1 and 2, *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Regarding the Decommissioning of Nuclear Power Reactors* (NRC 2002a) (the decommissioning GEIS), describes the impacts of decommissioning. The majority of plant operations activities would cease with reactor shutdown. However, some activities (e.g., security and oversight of spent nuclear fuel) would remain unchanged, whereas others (e.g., waste management, administrative work, laboratory analysis, surveillance, monitoring, and maintenance) would continue at reduced or altered levels. Systems dedicated to reactor operations would cease operation. However, if these systems are not removed from the site after reactor shutdown, their physical presence may continue to impact the environment. Impacts associated with dedicated systems that remain in place, or with shared systems that continue to operate at normal capacities, could remain unchanged.

Decommissioning will occur whether Point Beach is shut down at the end of its current operating licenses or at the end of the subsequent period of extended operation 20 years later. There is no site-specific issue related to decommissioning. The GEIS concludes that license renewal would have a negligible (SMALL) effect on the impacts of terminating operations and decommissioning on all resources (NRC 2013a).

2.3 Alternatives

As stated above, the National Environmental Policy Act of 1969, as amended (NEPA), requires the NRC to consider reasonable alternatives to the proposed action of issuing subsequent renewed facility operating licenses for Point Beach. For a replacement power alternative to be reasonable, it must be either (1) commercially viable on a utility scale and operational before the reactor's operating license expires or (2) expected to become commercially viable on a utility scale and operational before the reactor's operating license expires (NRC 2013a). The NRC published the most recent GEIS revision in 2013, and it incorporated the latest information on replacement power alternatives available at that time; however, rapidly evolving technologies are likely to outpace the information in the GEIS. Thus, for each supplement to the GEIS, the NRC staff must perform a site-specific analysis of replacement power alternatives that accounts for changes in technology and science since the most recent GEIS revision.

The first alternative to the proposed action of the NRC issuing subsequent renewed facility operating licenses for Point Beach is for the NRC to not issue the licenses. This is called the no-action alternative and is described below in Section 2.3.1. In addition to the no-action alternative, this section discusses three reasonable replacement power alternatives. As described in Section 2.3.2 below, these alternatives seek to replace Point Beach's generating capacity by meeting the region's energy needs through other means or sources that are, or expected to be, commercially viable on a utility scale and operational before Point Beach's current renewed facility operating licenses expire.

2.3.1 No-Action Alternative

At some point, all operating nuclear power plants will permanently cease operations and undergo decommissioning. Under the no-action alternative, the NRC does not issue the subsequent renewed facility operating licenses for Point Beach and the units shut down at or before the expiration of the current renewed facility operating licenses on October 5, 2030 (Unit 1), and March 8, 2033 (Unit 2). The license renewal GEIS describes the environmental impacts that arise directly from permanent plant shutdown. The NRC expects shutdown impacts to be relatively similar, whether they occur at the end of the current license term (i.e., after 60 years of operation) or at the end of a subsequent renewed license term (i.e., after 80 years of operation).

After permanent shutdown, plant operators will initiate decommissioning in accordance with 10 CFR 50.82, "Termination of license." The decommissioning GEIS (NUREG-0586) (NRC 2002a) describes the environmental impacts from decommissioning a nuclear power plant and related activities. The analysis in the decommissioning GEIS identifies resource area issues that are generic (and therefore bounded by the analysis in the decommissioning GEIS) and separately identifies six site-specific issues. A licensee in decommissioning must assess in its post-shutdown decommissioning activities report submitted to the NRC whether there are planned decommissioning activities with reasonably foreseeable environmental impacts that are not bounded in previous EISs, including the decommissioning GEIS. For bounded activities, licensees need not provide additional analysis; for not-bounded activities, such as site-specific issues not bounded in previous site-specific EISs or generic issues where the impacts fall outside of the bounds stated in the decommissioning GEIS, licensees must provide additional analysis. Chapter 4 of the license renewal GEIS (NUREG-1437) (NRC 2013a) and Section 3.15.2, "Terminating Plant Operations and Decommissioning," of this SEIS describe the incremental environmental impacts of subsequent license renewal on decommissioning activities.

Termination of operations at Point Beach would result in the total cessation of electrical power production by Point Beach Units 1 and 2. Unlike the replacement power alternatives described below in Section 2.3.2, the no-action alternative does not expressly meet the purpose and need of the proposed action, as described in Section 1.2, because the no-action alternative does not provide a means of delivering baseload power to meet future electric system needs. Assuming that a need currently exists for the power generated by Point Beach, the no-action alternative would likely create a need for a replacement power alternative. The following section describes a wide range of replacement power alternatives and Chapter 3 of this SEIS assesses their potential environmental impacts. Although the NRC's authority only extends to deciding whether to issue subsequent renewed facility operating licenses for Point Beach, the replacement power alternatives described in the following sections represent possible options for energy-planning decisionmakers if the NRC decides not to issue subsequent renewed facility operating licenses for these units.

2.3.2 Replacement Power Alternatives

In evaluating alternatives to subsequent license renewal, the NRC considered energy technologies or options currently in commercial operation on a utility scale, as well as technologies likely to be commercially available on a utility scale by the time the current renewed facility operating licenses for Point Beach expire.

The license renewal GEIS presents an overview of some alternative energy technologies but does not conclude which alternatives are most appropriate. Because alternative energy technologies continually evolve in capability and cost, and because regulatory structures change to either promote or impede the development of particular technologies, the analyses in this chapter rely on a variety of sources of information to determine which alternatives would be available and commercially viable on a utility scale when the current renewed facility operating licenses expire. NextEra's ER provides a discussion of replacement power alternatives. In addition, the NRC staff's analyses also consider updated information from the following sources:

- U.S. Department of Energy's (DOE), U.S. Energy Information Administration (EIA)
- other offices within the DOE
- U.S. Environmental Protection Agency
- industry sources and publications

In total, the NRC staff considered 16 replacement power alternatives to the proposed action and eliminated 13, leaving 3 reasonable replacement power alternatives for in-depth evaluation. Sections 2.3.2.1 through 2.3.2.3 of this SEIS contain the NRC staff's description of the alternatives evaluated in depth.

The NRC staff eliminated from in-depth evaluation those alternatives that could not provide the equivalent of Point Beach's current generating capacity, as those alternatives would not be able to satisfy the objective of replacing Point Beach's power generation. Also, in some cases, the NRC staff eliminated those alternatives whose costs or benefits could not justify inclusion in the range of reasonable alternatives. Further, the NRC staff eliminated as unfeasible those alternatives not likely to be constructed and operational by the time the Point Beach licenses expire in 2030 (Unit 1), and 2033 (Unit 2). Section 2.4 of this SEIS contains a brief discussion of each of the 13 eliminated alternatives and provides the basis for each elimination. To ensure that the alternatives considered in the SEIS are consistent with state or regional energy policies, the NRC staff reviewed energy-related statutes, regulations, and policies within the Point Beach region. Accordingly, the NRC staff also eliminated from further consideration any alternative that would be in conflict with these requirements.

The evaluation of each alternative considers the environmental impacts across the following impact categories: land use and visual resources, air quality and noise, geologic environment, water resources, ecological resources, historic and cultural resources, socioeconomics, human health, environmental justice, and waste management.

The GEIS assigns most site-specific issues (called Category 2 issues) a significance level of SMALL, MODERATE, or LARGE. For ecological resources subject to the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA) and the Magnuson–Stevens Fishery Conservation and Management Act of 1996, as amended (16 U.S.C. 1801 et seq.); and historic and cultural resources subject to the National Historic Preservation Act of 1966, as amended (54 U.S.C. 300101 et seq.) (NHPA), the impact significance determination language is specific to the authorizing legislation. The order in which this SEIS presents the different alternatives does not imply increasing or decreasing level of impact; nor does the order imply that an energy-planning decisionmaker would be more (or less) likely to select any given alternative.

Region of Influence

Point Beach is located on the western shore of Lake Michigan in Manitowoc County, WI, approximately 15 mi (24 km) north-northeast of Manitowoc, WI. The power station is owned and operated by NextEra Energy Point Beach, LLC (NextEra). NextEra is a merchant generator that sells the electricity generated at Point Beach to the Wisconsin Electric Power Company, whose electric service area extends primarily across eastern Wisconsin (NextEra 2020b, We Energies 2019). This area constitutes the region of influence (ROI) for the NRC staff's analysis of Point Beach replacement power alternatives.

In 2019, electric generators in Wisconsin had a net summer generating capacity of approximately 17,000 megawatts (MW). This capacity included units fueled by natural gas (44 percent), coal (36 percent), nuclear power (8 percent), and petroleum (4 percent). Hydroelectric, biomass, wind, and solar sources comprised the balance of generating capacity in the State (EIA 2021b).

The electric industry in Wisconsin generated approximately 64,000 gigawatt hours (GWh) of electricity in 2019. This electrical production was dominated by coal (42 percent), gas (32 percent), and nuclear power (16 percent). Hydroelectric, wind, biomass, petroleum, and solar energy sources collectively fueled the remaining 10 percent of this electricity (EIA 2021c).

In the United States, natural gas-fired generation rose from 16 percent of the total electricity generated in 2000 to 37 percent in 2019 (EIA 2013, 2020a). Given known technological and demographic trends, the EIA predicts that natural gas-fired generation in the United States will remain relatively constant through 2050, whereas electricity generated from renewable energy is expected to double from 21 percent of total generation to 42 percent over that period (EIA 2021a). However, fossil fuel and renewable energy levels within the Point Beach ROI may not follow nationwide forecasts, and uncertainties in U.S. energy policies and the energy market could affect forecasts. In particular, the implementation of policies aimed at reducing greenhouse gas emissions could have a direct effect on fossil fuel-based generation technologies (Power 2018). In 2013, Wisconsin utilities met the State's renewable portfolio standard target of 10 percent renewable energy production. Wisconsin's renewable energy goals call for all new installed generating capacity to be powered by renewable energy resources to the extent that it is cost effective and technically feasible. Also, in 2019, the governor signed an executive order that set a goal that electricity consumed in the State be 100 percent carbon-free by 2050 (EIA 2021h).

The remainder of this section describes in depth the following three reasonable replacement power alternatives to Point Beach subsequent license renewal:

- a new nuclear (small modular reactor (SMR)) alternative (Section 2.3.2.1)
- a natural gas combined-cycle alternative (Section 2.3.2.2)
- a combination alternative of new nuclear (SMR) power, solar power, and onshore wind power (Section 2.3.2.3)

Table 2-1 below summarizes key design characteristics of these alternative replacement power technologies.

1 **Table 2-1 Overview of Replacement Power Alternatives Considered In-Depth**

Alternative	New Nuclear (Small Modular Reactor)	Natural Gas Combined-Cycle	Combination (Small Modular Reactor, Solar, and Onshore Wind)
Summary	Three units for a total of approximately 1,200 MWe	Three units for a total of approximately 1,200 MWe	800 MWe from small modular reactor generation, 200 MWe from solar, and 200 MWe from onshore wind.
Location	On available land within the Point Beach site. Would use Point Beach's existing transmission lines and some existing infrastructure (NextEra 2020b)	On available land within the Point Beach site. Would use Point Beach's existing transmission lines and some existing infrastructure (NextEra 2020b)	The small modular reactor portion would be located on available land within the Point Beach site (NextEra 2020b). In general, the solar and wind portions would be located at multiple sites distributed across the ROI, offsite of Point Beach. A small amount of the solar portion would be located within the Point Beach site (NextEra 2020b).
Cooling System	Closed-cycle with mechanical draft cooling towers. Cooling water withdrawal—40 mgd; Consumptive water use—28 mgd (NRC 2018a)	Closed-cycle with mechanical draft cooling towers. Cooling water withdrawal—8.4 mgd; Consumptive water use—6.5 mgd (NETL 2013)	The small modular reactor portion would be closed-cycle with mechanical draft cooling towers. Cooling water withdrawal—26.5 mgd; Consumptive water use—18 mgd (NRC 2018a). No cooling system would be required for the solar and wind portions.
Land Required	Approximately 110 ac (45 ha) for plant facilities (NuScale 2021a)	Approximately 60 ac (24 ha) for plant facilities, with up to an additional 120 acres (49 ha) for right-of-way to access existing gas pipelines. No new gas wells would be needed to support the facility (NextEra 2020b)	The small modular reactor portion would require approximately 72 ac (29 ha) (NuScale 2021a). The solar portion would collectively require approximately 3,200 ac (1,300 ha) (NRC 2013a). The onshore wind portion would collectively require approximately 31,000 ac (12,000 ha) (NREL 2009; WAPA and FWS 2015).
Workforce	Peak construction—1,650 workers Operations—750 workers (NRC 2018a)	950 workers during peak construction and 120 workers during operations (NRC 2016)	The small modular reactor, solar, and onshore wind portions would collectively require approximately 1,700 workers during peak construction and 540 workers during operations (BLM 2019; NRC 2018a; DOE 2011b; Tegen 2016).

Key: ac = acres, ha = hectares, mgd = million gallons per day, MWe = megawatts electric, ROI=region of influence

2.3.2.1 New Nuclear (Small Modular Reactor) Alternative

The NRC staff considers the construction of a new nuclear plant to be a reasonable alternative to Point Beach's subsequent license renewal. Nuclear generation currently accounts for approximately 16 percent of the electricity produced in Wisconsin (EIA 2021c). Other than Point Beach, no other nuclear power plants currently operate within the ROI. The Kewaunee Power Station, located approximately 5 mi (8 km) to the north, shut down in 2013 and is undergoing decommissioning (NRC 2020d).

For the new nuclear alternative, the NRC staff considered the installation of multiple small modular reactors (SMRs). SMRs, in general, are light-water reactors that use water for cooling and enriched uranium for fuel in the same manner as conventional, large light-water reactors currently operating in the United States. SMR modules typically generate 300 megawatts electric (MWe) or less, compared to today's larger designs that can generate 1,000 MWe or more per reactor. However, their smaller size means that several SMRs can be bundled together in a single containment. Their smaller size also means greater siting flexibility, because they can fit in locations not large enough to accommodate a conventional nuclear reactor (NRC 2020d; DOE 2020). SMR design features can include below-grade containment and inherent safe-shutdown features, longer station blackout coping time without external intervention, and core and spent fuel pool cooling without the need for active heat removal.

SMR power generating facilities are also designed to be deployed in an incremental fashion to meet the power generation needs of a service area, in which generating capacity can be added in increments to match load growth projections (NRC 2018a).

The NRC received the first design certification application for an SMR in December 2016 (NRC 2020e). Following NRC certification, this design could potentially achieve operation on a commercial scale by 2027 (NuScale 2021b). Therefore, SMRs could be constructed and operational by the time the Point Beach licenses expire in 2030 and 2033.

For this subsequent license renewal analysis, the NRC staff assumed that an SMR facility would replace Point Beach. Although SMR modules typically generate 300 MWe or less, for this analysis the NRC staff assumed the use of a slightly larger (400 MWe) module based upon an established generic SMR plant design and representative construction and operating parameters derived from several commercial designs (NRC 2018a). To account for replacing the full amount of Point Beach's generating capacity, the NRC staff assumed that the SMR facility would be comprised of three, 400 MWe reactor modules with a total net generating capacity of approximately 1,200 MWe.

As indicated in NextEra's ER, more than 200 acres (81 ha) of open land are available within the Point Beach property to accommodate the SMR facility footprint. This open land is comprised of two separate parcels located north and south of the existing Point Beach power block: a 60-acre (24-ha) open area to the north and a 146-acre (59-ha) area to the south that includes an existing parking area, training building, firing range, and the Point Beach Energy Center. (NextEra 2020b, 2021). The SMR facilities are estimated to require approximately 110 ac (45 ha) of this land (NuScale 2021a). To support the plant's cooling needs, the SMR facility would use a closed-cycle cooling system with mechanical draft cooling towers. This cooling system would withdraw approximately 40 million gallons per day (mgd) (150,000 cubic meters per day (m^3/d)) of water and consume approximately 28 mgd (105,000 m^3/d) of water. Onsite visible structures could include cooling towers and buildings within the power block (NRC 2018a). Although some infrastructure upgrades may be required, it is assumed that the existing transmission line infrastructure would be sufficient to support the SMR alternative (NextEra 2020b).

2.3.2.2 Natural Gas Combined-Cycle Alternative

As discussed earlier, natural gas represents approximately 44 percent of the installed generation capacity and 32 percent of the electrical power generated in Wisconsin (EIA 2021b, EIA 2021c). The NRC staff considers the construction of a natural gas combined-cycle power plant to be a reasonable alternative to Point Beach subsequent license renewal because natural gas is a feasible, commercially available option for providing baseload electrical generating capacity beyond the expiration of Point Beach's current licenses.

Baseload natural gas combined-cycle power plants (abbreviated in this section as natural gas plants) have proven their reliability and can have capacity factors as high as 87 percent (EIA 2015b). In a natural gas combined-cycle system, electricity is generated using a gas turbine that burns natural gas. A steam turbine uses the heat from gas turbine exhaust through a heat recovery steam generator to produce additional electricity. This two-cycle process has a high rate of efficiency because the natural gas combined-cycle system captures the exhaust heat that otherwise would be lost and reuses it. Similar to other fossil fuel burning plants, natural gas power plants are a source of greenhouse gases, including carbon dioxide (CO_2) (NRC 2013a).

For the natural gas alternative, the NRC staff assumes that three, approximately 460 MWe natural gas units would be constructed and operated using an 87 percent capacity factor to collectively replace Point Beach's approximate generating capacity of 1,200 MWe. Each unit configuration would consist of two combustion turbine generators, two heat recovery steam generators, and one steam turbine generator with mechanical draft cooling towers for heat rejection. The NRC staff assumes that the natural gas power plant will incorporate a selective catalytic reduction system to minimize the plant's nitrogen oxide emissions. Natural gas would be extracted from the ground through wells, treated to remove impurities, and then blended to meet pipeline gas standards before being piped through the State's pipeline system to the Point Beach site. The natural gas alternative would produce waste, primarily in the form of spent catalysts used for control of nitrogen oxide emissions.

NextEra indicated that the gas plant would be located at Point Beach in the same area considered for the new nuclear (small modular reactor) alternative (i.e., within the more than 200 acres (81 ha) of open land located north and south of the existing Point Beach power block) (NextEra 2020b). Approximately 60 acres (24 ha) would be used to construct and operate the natural gas plant. The natural gas plant would also require up to an additional 120 acres (49 ha) for right-of-way to connect with existing natural gas supply lines located approximately 1 mi (1.6 km) south in Two Rivers, WI. No new gas wells would be needed to support the facility. Although some infrastructure upgrades may be required in association with the natural gas alternative, it is assumed that the existing transmission line infrastructure at the selected location would be adequate to support the alternative (NextEra 2020b).

The NRC staff assumes that the natural gas combined-cycle plant would use a closed-cycle cooling system with mechanical draft cooling towers. To support the plant's cooling needs, this cooling system would withdraw approximately 8.4 mgd (32,000 m^3/d) of water and consume 6.5 mgd (24,000 m^3/d) of water (NETL 2013). Onsite visible structures could include cooling towers, exhaust stacks, intake and discharge structures, transmission lines, natural gas pipelines, and an electrical switchyard.

2.3.2.3 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

This alternative considers a combination of replacement power generation technologies as a reasonable alternative to Point Beach subsequent license renewal. For this evaluation, the NRC staff assumes that (1) small modular reactors would supply 800 MWe, (2) solar photovoltaic facilities would supply 200 MWe, and (3) onshore wind facilities would supply 200 MWe.

Small Modular Reactor Portion of Combination Alternative

The SMR portion of the combination alternative would entail construction and operation of a two-unit, 800 MWe plant located at Point Beach. The plant would be similar in function and appearance to the larger SMR plant described in Section 2.3.2.1 for the new nuclear-only alternative. Although some infrastructure upgrades may be required at Point Beach in association with the SMR portion of the combination alternative, the NRC staff assumes that the existing transmission line infrastructure would be adequate to support this alternative. Like the new nuclear-only plant described in Section 2.3.2.1, the SMR portion of the combination alternative would be located within the more than 200-acre (81-ha) area north and south of the existing Point Beach facilities (NextEra 2020b). However, the smaller two-unit SMR plant supporting the combination alternative would require correspondingly less land (a total of approximately 72 acres (29 ha)) (NuScale 2021a).

To support the plant's cooling needs, the SMR plant would use a closed-cycle cooling system with mechanical draft cooling towers. This system would withdraw approximately 26.5 mgd (100,000 m^3/d) of water and consume approximately 18 mgd (70,000 m^3/d) of that amount (NRC 2018a). Similar to the SMR-only alternative discussed in Section 2.3.2.1, onsite visible structures would include cooling towers and buildings within the power block (NRC 2018a).

Solar Portion of Combination Alternative

Solar photovoltaic energy facilities located in the ROI would generate the solar portion of the combination alternative. For this analysis, the NRC staff assumes that four approximately 125 MWe standalone, utility scale solar facilities would be constructed and operated to provide a total gross generating capacity of 500 MWe. Each of these facilities would be paired with a 125 MW/500 MWh battery energy storage system. In general, this new solar and battery storage capacity would be located offsite of Point Beach at locations within the ROI. However, a relatively small amount of the solar portion (25 MW) would be located in the northern-most part of the Point Beach property on approximately 220 acres (89 ha)(NextEra 2020b, 2021). This area would be separate from the area identified for siting the SMR portion of the combination alternative. Combining an assumed 25 percent solar photovoltaic capacity factor (EIA 2021d) with the energy dispatch capabilities of the associated battery systems, the solar units would collectively have a net generating capacity of approximately 200 MWe.

Nationwide, growth in utility scale solar photovoltaic facilities (greater than 1 MW) has resulted in an increase from 145 MW of installed capacity in 2009 to over 35,000 MW of installed capacity in 2019 (EIA 2021e).

Solar photovoltaic resources across Wisconsin can range up to 4.25 kilowatt hours per square meter per day (kWh/m^2/day) (NREL 2018). The feasibility of solar energy resources serving as alternative baseload power depends on the location, value, accessibility, and constancy of solar radiation. Solar photovoltaic power generation uses solar panels to convert solar radiation into usable electricity. Solar cells are formed into solar panels that can then be linked into photovoltaic arrays to generate electricity. The electricity generated can be stored, used directly, fed into a large electricity grid, or combined with other electricity generators as a hybrid plant. Solar photovoltaic cells can generate electricity whenever there is sunlight, regardless of whether the sun is directly or indirectly shining on the solar panels. Therefore, solar photovoltaic technologies do not need to directly face and track the sun. This capability has allowed solar photovoltaic systems to have broader geographical use than concentrating solar power (which relies on direct sun) (DOE 2011a).

Utility-scale solar facilities require large areas of land to be cleared for the solar panels. For standalone sites, solar photovoltaic facilities may require approximately 6.2 acres (2.5 ha) per megawatt (NRC 2013a). Therefore, a total of approximately 3,200 acres (1,300 ha) would be required to construct and operate the four proposed solar power and storage installations needed under this alternative. Although not all of this land would be cleared of vegetation and permanently impacted, it represents the land enclosed in the total site boundary of the solar facility (NREL 2013). Solar photovoltaic systems do not require water for cooling purposes, but they do require a small amount of water to clean the panels and potable water for the workforce.

Although solar resources in Wisconsin are modest in comparison to solar resources available elsewhere in the Nation, solar generating systems remain a commercially available option for providing electrical generating capacity. This is evidenced by the commissioning of new solar facilities within the ROI, including 250 MW of solar generating capacity recently installed on and adjacent to the Point Beach property, and plans for installing more than 1,000 MW of additional generating capacity across Wisconsin by 2025 (NextEra 2020b, WSJ 2020, Alliant 2021). Accordingly, the NRC staff considers the construction and operation of solar photovoltaic facilities to be reasonable when combined with other generation sources.

<u>Onshore Wind Portion of Combination Alternative</u>

Land-based wind energy facilities located in the ROI would comprise the wind portion of the combination alternative. For this analysis, the NRC staff assumes three onshore wind farms averaging approximately 120 MWe each would be constructed and operated to provide a total gross generating capacity of 360 MWe. Each of these facilities would be paired with a 120 MW/480 MWh battery energy storage system. The wind energy facilities and battery storage capacity would be located offsite of Point Beach at locations within the ROI. Combining an assumed 40 percent onshore wind capacity factor (DOE 2019) with the energy dispatch capabilities of the associated battery systems, these facilities would collectively have a net generating capacity of approximately 200 MWe.

The NRC staff assumes that an additional installed capacity of 360 MWe can be reasonably attained in the ROI by the time the Point Beach licenses expire in 2030 and 2033. As is the case with other renewable energy sources, the feasibility of wind resources serving as alternative baseload power is dependent on the location (relative to expected load centers), value, accessibility, and constancy of the resource. Wind energy must be converted to electricity at or near the point where it is extracted, and there are limited energy storage opportunities available to overcome the intermittency and variability of wind resources. Wind resources in Wisconsin have speeds of 15.7 miles per hour (7.0 meters per second) and higher and are considered suitable for most utility-scale applications (DOE 2021a).

The average nameplate capacity of newly installed wind turbines in the United States, in 2018, was 2.4 MW (DOE 2019). Assuming the use of 2.4-MW turbines, a total of approximately 150 wind turbines would be required to provide the required installed capacity. Construction and operation of these turbines, associated access roads, and power collection and transmission systems would result in approximately 610 acres (250 ha) of temporary disturbance and 310 acres (125 ha) of permanent disturbance. Because wind turbines require ample spacing between one another to avoid interturbine air turbulence, the total land requirement of utility-scale wind farms is significantly larger than the disturbed land. Under this alternative, approximately 31,000 acres (12,000 ha) would be required for an installed capacity of 360 MWe (NREL 2009; WAPA and FWS 2015).

Wind energy's intermittency affects its viability and value as a baseload power source. However, the variability of wind-generated electricity can be tempered if the proposed wind farms were located at a large distance from one another and were operated as interconnected wind farms, an aggregate controlled from a central point. Distance between wind farms helps to ensure that multiple wind farms do not simultaneously experience the same weather conditions, and that power will likely be produced at some of the wind farms at any given time (Archer and Jacobson 2007).

2.4 Alternatives Considered but Eliminated

The NRC staff originally considered 16 replacement power alternatives to Point Beach's subsequent license renewal but ultimately eliminated 13 of these from detailed study. The NRC staff eliminated these 13 alternatives because of technical reasons, resource availability limitations, or commercial or regulatory limitations. Because many of these limitations will likely still exist when the current Point Beach licenses expire in 2030 (Unit 1), and 2033 (Unit 2), the NRC staff does not expect that these 13 alternatives will be reasonably available when needed to replace Point Beach's generating capacity. This section describes the 13 eliminated alternatives as well as the reasons why the NRC staff eliminated each alternative.

2.4.1 Solar Power

Solar power, including solar photovoltaic and concentrating solar power technologies, generates power from sunlight. Solar photovoltaic systems convert sunlight directly into electricity using solar cells made from silicon or cadmium telluride. Concentrating solar power uses heat from the sun to boil water and produce steam. The steam then drives a turbine connected to a generator to ultimately produce electricity (NREL undated).

Solar generators are considered an intermittent resource because their availability depends on ambient exposure to the sun, also known as solar insolation. Insolation rates of solar photovoltaic resources in Wisconsin are modest and range up to 4.25 $kWh/m^2/day$ (NREL 2018). With less than 300 MW of utility scale capacity installed across Wisconsin as of 2021, solar photovoltaic power represents a small but increasing contribution to the State's electrical power generation (EIA 2021h).

To be considered a viable alternative, a solar alternative must replace the amount of electricity that Point Beach currently provides. Assuming a capacity factor of 25 percent (EIA 2021d), approximately 3,000 to 4,800 MWe of additional solar energy capacity would need to be installed in the ROI to replace the electricity that Point Beach provides, depending on whether this new capacity is paired with battery energy storage systems.

Accordingly, key design characteristics associated with the solar portion of the combination alternative presented in Table 2-1 and Section 2.3.2.3 of this SEIS could be scaled to suggest the relative impacts of using solar as a standalone technology to replace the generating capacity of Point Beach. Utility-scale solar facilities require large areas of land to be cleared for the solar panels. A solar only alternative is likely to require 18,000 to 30,000 acres (7,300 to 12,000 ha) of land within the ROI.

Considering the above factors, the NRC staff concludes that solar power energy facilities alone do not provide a reasonable alternative to Point Beach's subsequent license renewal. However, the NRC staff does consider as reasonable an alternative using solar power in combination with other power technologies, as described in Section 2.3.2.3 of this SEIS.

2.4.2 Biomass Power

Biomass resources used for biomass-fired power generation include agricultural residues, animal manure, wood wastes from forestry and industry, residues from food and paper industries, municipal green wastes, dedicated energy crop, and methane from landfills (IEA 2007). Using biomass-fired generation for baseload power depends on the geographic distribution, available quantities, constancy of supply, and energy content of biomass resources. For this analysis, the NRC staff assumes that biomass would be combusted for power generation in the electricity sector.

In 2019, biomass facilities in the ROI had a total installed capacity of approximately 360 MW, and approximately 2 percent of the total power in the ROI was generated from biomass sources (EIA 2021b, 2021c).

For utility scale biomass electricity generation, the NRC staff assumes that the technologies used for biomass conversion would be similar to the technology used in other fossil fuel plants, including the direct combustion of biomass in a boiler to produce steam (NRC 2013a). Accordingly, biomass generation is generally considered a carbon-emitting technology.

One of the largest new biomass plants in the United States, the 103-MW Gainesville Renewable Energy Center, opened in Florida in 2013 (EIA 2016). Replacing the generating capacity of Point Beach using only biomass would require the construction of approximately 12 additional facilities of this size. However, most biomass-fired generation plants generally only reach capacities of 50 MW, which means replacing the generating capacity of Point Beach would require the construction of twice as many new average-sized biomass facilities.

Sufficiently increasing biomass-fired generation capacity by expanding existing biomass units or constructing new biomass units by the time Point Beach's licenses expire in 2030 and 2033 is unlikely. For these reasons, the NRC staff does not consider biomass-fired generation to be a reasonable alternative to Point Beach subsequent license renewal.

2.4.3 Wind Power

The American Clean Power Association reports a total of more than 122,000 MW of installed wind energy capacity nationwide as of December 31, 2020. Approximately 750 MW of this wind energy capacity has been installed across Wisconsin (DOE 2021a). However, Wisconsin's potential capacity for onshore wind is estimated to be more than 100,000 MW, with some of the State's best onshore wind energy resources located along ridges in eastern Wisconsin (EIA 2021h; NextEra 2020b). To be considered a reasonable replacement power alternative to Point Beach's subsequent license renewal, the wind power alternative must replace the amount of electricity that Point Beach provides. Assuming a capacity factor of 40 percent for onshore facilities (NREL 2020), approximately 2,200 to 3,000 MWe of additional onshore wind energy capacity would need to be installed in the ROI to replace the electricity that Point Beach provides, depending on whether this new capacity is paired with battery energy storage systems.

Accordingly, key design characteristics associated with the wind portion of the combination alternative presented in Table 2-1 and Section 2.3.2.3 of this SEIS could be scaled to suggest the relative impacts of using wind as a standalone technology to replace the generating capacity of Point Beach. Utility-scale wind facilities require large areas of land, and a wind-only alternative is likely to require 187,000 to 255,000 acres (76,000 to 103,000 ha) of land within the ROI.

Increasing attention has also been focused recently on developing offshore wind resources. In 2016, a 30 MW project off the coast of Rhode Island became the first operating offshore wind farm in the United States (Energy Daily 2016). A 21-MW offshore wind demonstration project located in Lake Erie off the coast of Ohio is scheduled to begin construction and become operational in 2022. However, no utility scale offshore wind farms are currently in operation in the Great Lakes, in part due to the challenges associated with designing installations to withstand the force of freshwater ice flows (NextEra 2020b). Given the amount of wind capacity necessary to replace Point Beach, the intermittency of the resource, and the status of wind development in the ROI, the NRC staff finds a wind-only alternative—either land-based, offshore, or some combination of the two—to be an unreasonable alternative to Point Beach's subsequent license renewal. However, the NRC staff does consider as reasonable an alternative using onshore wind power in combination with other power technologies, as described in Section 2.3.2.3 of this SEIS.

2.4.4 Demand-Side Management

Demand-side management (DSM) refers to energy conservation and efficiency programs that do not require the addition of new generating capacity. Demand-side management programs can include reducing energy demand through consumer behavioral changes or through altering the characteristics of the electrical load. These programs can be initiated by a utility, transmission operators, the State, or other load serving entities. In general, residential electricity consumers have been responsible for the majority of peak load reductions, and participation in most demand-side management programs is voluntary (NRC 2013a).

Therefore, the mere existence of a DSM program does not guarantee that reductions in electricity demand will occur. The GEIS concludes that, although the energy conservation or energy efficiency potential in the United States is substantial, the NRC staff is aware of no cases in which an energy efficiency or conservation program alone has been implemented expressly to replace or offset a large baseload generation station (NRC 2013a).

However, because NextEra is a merchant generator and does not have a retail customer base in Wisconsin, it does not have a DSM program in Wisconsin or the ability to implement such a program in Wisconsin (NextEra 2020b). Therefore, the NRC staff does not consider demand-side management programs to be a reasonable alternative to Point Beach subsequent license renewal.

2.4.5 Hydroelectric Power

Currently, approximately 2,000 hydroelectric facilities operate in the United States. Hydroelectric technology captures flowing water and directs it to a turbine and generator to produce electricity (NRC 2013a). There are three variants of hydroelectric power: (1) run of the river (diversion) facilities that redirect the natural flow of a river, stream, or canal through a hydroelectric facility, (2) store and release facilities that block the flow of the river by using dams that cause water to accumulate in an upstream reservoir, and (3) pumped storage facilities that use electricity from other power sources to pump water to higher elevations during off peak load periods to be released during peak load periods through the turbines to generate additional electricity (EIA 2020b, 2021c).

A 1997 comprehensive survey of hydropower resources identified Wisconsin as having 153 MW of potential new hydroelectric capacity when adjusted for environmental, legal, and institutional constraints (Conner et al. 1998). These constraints could include: (1) scenic, cultural, historical, and geological values; (2) Federal and state land use; and (3) legal protection issues, such as wild and scenic rivers legislation and threatened or endangered fish and wildlife legislative protection. In a separate assessment of nonpowered dams (dams that do not produce electricity), the Department of Energy (DOE) concluded that hydropower resources in the ROI could potentially generate 245 MW of electricity (ORNL 2012). These nonpowered dams serve various purposes, such as providing water supply to inland navigation. Although the EIA projects that hydropower will remain a leading source of renewable power generation in the United States through 2040, there is little expected growth in large-scale hydropower capacity (EIA 2013). The potential for future construction of large hydropower facilities has diminished because of increased public concerns over flooding, habitat alteration and loss, and destruction of natural river courses (NRC 2013a).

Given the projected lack of growth in hydroelectric power production, the competing demands for water resources, and the expected public opposition to the environmental impacts that would result from the construction of large hydroelectric facilities, the NRC staff concludes that the expansion of hydroelectric power is not a reasonable alternative to Point Beach subsequent license renewal.

2.4.6 Geothermal Power

Geothermal technologies extract the heat contained in geologic formations to produce steam to drive a conventional steam turbine generator. Facilities producing electricity from geothermal energy have demonstrated capacity factors of 95 percent or greater, making geothermal energy a potential source of baseload electric power. However, the feasibility of geothermal power generation to provide baseload power depends on the regional quality and accessibility of geothermal resources. Utility scale geothermal energy generation requires geothermal reservoirs with a temperature above 200 °F (93 °C). Known utility-scale geothermal resources are concentrated in the Western United States, specifically Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. In general, most assessments of geothermal resources have been concentrated on these Western States (DOE 2013b; USGS 2008). No utility-scale development of geothermal resources occurs within the ROI (NREL 2016). Given the low resource potential in the ROI, the NRC staff does not consider geothermal power to be a reasonable alternative to Point Beach subsequent license renewal.

2.4.7 Wave and Ocean Energy

Waves, currents, and tides are often predictable and reliable, making them attractive candidates for potential renewable energy generation. Four major technologies may be suitable to harness wave energy: (1) terminator devices that range from 500 kilowatts to 2 MW, (2) attenuators, (3) point absorbers, and (4) overtopping devices (BOEM undated). Point absorbers and attenuators use floating buoys to convert wave motion into mechanical energy, driving a generator to produce electricity. Overtopping devices trap a portion of a wave at a higher elevation than the sea surface; waves then enter a tube and compress air that is used to drive a generator that produces electricity (NRC 2013a). Some of these technologies are undergoing demonstration testing at commercial scales, but none are currently used to provide baseload power (BOEM undated). In the United States, there are currently several such projects that are licensed or seeking permits, the largest of which is 20 MW (NextEra 2020b).

The Great Lakes do not experience large tides, and energy output for wave technologies in the region is limited. The Electric Power Research Institute (EPRI) published an analysis of ocean wave energy resources in the United States, but it did not include the Great Lakes (EPRI 2011). Although additional studies suggest that the Great Lakes may hold potential wave energy applications (Sogut et al. 2018), the NRC staff has identified no major studies that address the likely use of wave energy in the Great Lakes on a commercial scale by the time Point Beach's licenses expire in 2030 and 2033. Consequently, the NRC staff concludes that wave and ocean energy technologies are not feasible alternatives to Point Beach subsequent license renewal.

2.4.8 Municipal Solid Waste-Fired Power

Energy recovery from municipal solid waste converts nonrecyclable waste materials into usable heat, electricity, or fuel through combustion. The three types of combustion technologies include mass burning, modular systems, and refuse derived fuel systems. Mass burning is the method used most frequently in the United States. The heat released from combustion is used to convert water to steam, which is used to drive a turbine generator to produce electricity. Ash is collected and taken to a landfill, and particulates are captured through a filtering system (EPA 2020d).

Currently, 75 waste-to-energy plants are in operation in 21 states, processing approximately 29 million tons of waste per year. These waste-to-energy plants have an aggregate capacity of 2,725 MWe (Michaels and Krishnan 2019). Although some plants have expanded to handle additional waste and to produce more energy, only one new plant has been built in the United States since 1995 (Power 2019). Because the average waste-to-energy plant produces about 50 MWe, approximately 24 average-sized waste-to-energy plants would be necessary to provide the same level of output as Point Beach.

The decision to burn municipal waste to generate energy is usually driven by the need for an alternative to landfills rather than a need for energy, and additional stable supplies of municipal solid waste would be needed to support 24 new facilities in the ROI. Based on these considerations, the NRC staff does not consider municipal solid waste combustion to be a reasonable alternative to Point Beach subsequent license renewal.

2.4.9 Petroleum-Fired Power

Petroleum-fired electricity generation accounted for less than 1 percent of Wisconsin’s total electricity generation in 2019 (EIA 2021c). The variable costs and environmental impacts of petroleum-fired generation tend to be greater than those of natural gas-fired generation. The historically higher cost of oil has also resulted in a steady decline in its use for electricity generation, and the EIA forecasts no growth in capacity using petroleum-fired power plants through 2040 (EIA 2013, 2015a). Therefore, the NRC staff does not consider petroleum-fired generation to be a reasonable alternative to Point Beach subsequent license renewal.

2.4.10 Coal-Fired Power

Although coal has historically been the largest source of electricity in the United States, both natural gas generation and nuclear energy generation surpassed coal generation at the national level in 2020. Coal-fired electricity generation in the United States has continued to decrease as coal-fired generating units have been retired or converted to use other fuels and as the remaining coal-fired generating units have been used less often (EIA 2021g). Wisconsin mirrors this trend, with coal-fired power plants providing 39 percent of Wisconsin's electricity generation in 2020, down from a high of 82 percent in 1997 (EIA 2021i)

Baseload coal units have proven their reliability and can routinely sustain capacity factors as high as 85 percent. Among the technologies available, pulverized coal boilers producing supercritical steam (supercritical pulverized coal boilers) have become increasingly common at newer coal-fired plants given their generally high thermal efficiencies and overall reliability.

Supercritical pulverized coal facilities are more expensive than subcritical coal-fired plants to construct, but they consume less fuel per unit output, reducing environmental impacts. Integrated gasification combined-cycle is another technology that generates electricity from coal. It combines modern coal gasification technology with both gas turbine and steam turbine power generation. The technology is cleaner than conventional pulverized coal plants because some of the major pollutants are removed from the gas stream before combustion. Although several smaller, integrated gasification combined-cycle power plants have been in operation since the mid-1990s, more recent large-scale projects using this technology have experienced a number of setbacks and opposition that have hindered the technology from being fully integrated into the energy market.

Wisconsin utilities have shuttered 12 coal generators in the last 5 years with a combined capacity of 2,300 MW, and this trend is expected to continue. In November 2020, We Energies Group (parent company of Wisconsin Electric Power Company) also announced plans to retire an additional 1,800 MW of coal-fired generation and replace it with cleaner energy technologies (WSJ 2020). Based on these considerations, the NRC staff concludes that coal-fired technologies are not a reasonable alternative to Point Beach subsequent license renewal.

2.4.11 Fuel Cells

Fuel cells oxidize fuels without combustion and, therefore, without the environmental side effects of combustion. Fuel cells use a fuel (e.g., hydrogen) and oxygen to create electricity through an electrochemical process. The only byproducts are heat, water, and carbon dioxide (depending on the hydrogen fuel type) (DOE 2013a). Hydrogen fuel can come from a variety of hydrocarbon resources. Natural gas is a typical hydrogen source. As of October 2020, the United States had only 250 MW of fuel cell generation capacity (EIA 2021h).

Currently, fuel cells are not economically or technologically competitive with other alternatives for electricity generation. The EIA estimates that fuel cells may cost $6,866 per installed kilowatt (total overnight capital costs in 2020 dollars), which is high compared to other alternative technologies analyzed in this section (EIA 2021f). In June 2021, the DOE launched an initiative to reduce the cost of hydrogen production to spur fuel cell and energy storage development over the next decade (DOE 2021b). However, it is unclear to what degree this initiative will lead to increased future development and deployment of fuel cell technologies.

More importantly, fuel cell units used for power production are likely to be small (approximately 10 MW). The world’s largest industrial hydrogen fuel cell power plant is a 50 MWe plant that came online in South Korea in 2020 (Power 2020). Using fuel cells to replace the power that Point Beach provides would require the construction of approximately 120 average-sized units and modifications to the existing transmission system. Given the relatively immature status, limited deployment, and high cost of fuel cell technology, the NRC staff does not consider fuel cells to be a reasonable alternative to Point Beach subsequent license renewal.

2.4.12 Purchased Power

It is possible that replacement power may be purchased and imported from outside the Point Beach ROI. Although purchased power would likely have little or no measurable environmental impact in the immediate vicinity of Point Beach, impacts could occur where the power is generated or anywhere along the transmission route, depending on the generation technologies used to supply the purchased power (NRC 2013a). As discussed in NextEra’s ER, purchasing power from non-utility generators such as Point Beach may be a reasonable short-term alternative for utilities such as Wisconsin Electric Power Company to meet demand. However, to replace this scale of generation on a long-term basis is subject to uncertainties and would likely require the development of new generation facilities (NextEra 2020b).

Purchased power is generally economically adverse because, historically, the cost of generating power has been less than the cost of purchasing the same amount of power from a third-party supplier (NRC 2013a). Power purchase agreements also carry the inherent risk that the supplying plant will not deliver the contracted power.

Based on these considerations, the NRC staff concludes that purchased power does not provide a reasonable alternative to Point Beach subsequent license renewal.

2.4.13 Delayed Retirement of Other Generating Facilities

Retiring a power plant ends its ability to supply electricity. Delaying the retirement of a power plant enables it to continue supplying electricity. A delayed retirement alternative would delay the retirement of generating facilities (other than Point Beach) within or near the ROI.

Power plants retire for several reasons. Because generators are required to adhere to additional regulations that will require significant reductions in plant emissions, some power plant owners may opt for early retirement of older units (which often generate more pollutants and are less efficient) rather than incur the cost for compliance. Additional retirements may be driven by low competing commodity prices (such as low natural gas prices), slow growth in electricity demand, and the requirements of the EPA's Mercury and Air Toxics Standards (EIA 2015a; EPA 2021b).

Because NextEra does not operate any other units within the ROI that it could delay retiring or reactivate to replace the generation of Point Beach, another generation company would need to agree to delay retiring or reactivate a plant (NextEra 2020b). As discussed earlier, Wisconsin utilities continue to retire large amounts of coal-fueled generation to replace them with cleaner energy technologies (WSJ 2020). Because of these conditions, the NRC staff concludes that delayed retirement does not provide a reasonable alternative to Point Beach subsequent license renewal.

2.5 Comparison of Alternatives

In this chapter, the NRC staff considered in depth one alternative to Point Beach subsequent license renewal that does not replace the plant's energy generation (i.e., the no-action alternative) and three alternatives to Point Beach subsequent license renewal that may reasonably replace the plant's energy generation. These replacement power alternatives are (1) new nuclear generation (a small modular reactor facility with three reactor modules), (2) a new natural gas combined-cycle facility, and (3) a combination of a small modular reactor facility, solar photovoltaic generation with battery storage, and onshore wind generation with battery storage. Chapter 3 in this SEIS describes and assesses the environmental impacts of the proposed action and the alternatives. Table 2-2 below summarizes the environmental impacts of Point Beach subsequent license renewal, the no-action alternative, and the three reasonable replacement power alternatives to Point Beach subsequent license renewal. The environmental impacts of the proposed action (issuing Point Beach subsequent renewed facility operating licenses) would be SMALL for all impact categories.

In comparison, each of the three reasonable replacement power alternatives has environmental impacts in at least four resource areas that are greater than the environmental impacts of the proposed action. In addition, the replacement power alternatives would also have the environmental impacts inherent to new construction projects. If the NRC takes the no-action alternative and does not issue Point Beach subsequent renewed facility operating licenses, energy-planning decisionmakers would likely implement one of the three replacement power alternatives discussed in depth in this chapter. Based on the NRC staff's review of these three reasonable replacement power alternatives, the no-action alternative, and the proposed action, the NRC staff concludes that the proposed action of Point Beach subsequent license renewal is the environmentally preferred alternative. Therefore, the NRC staff's preliminary recommendation is that the NRC issue the Point Beach subsequent renewed facility operating licenses.

Table 2-2 Summary of Environmental Impacts of the Proposed Action and Alternatives

Impact Area (Resource)	Point Beach License Renewal (Proposed Action)	No-Action Alternative	New Nuclear Alternative (Small Modular Reactor)	Natural Gas Combined-Cycle Alternative	Combination Alternative (Small Modular Reactor, Solar, Onshore Wind)
Land Use	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	MODERATE to LARGE
Visual Resources	SMALL	SMALL	SMALL TO MODERATE	SMALL to MODERATE	MODERATE to LARGE
Air Quality	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL
Noise	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE
Geologic Environment	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Surface Water Resources	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Groundwater Resources	SMALL	SMALL	SMALL	SMALL	SMALL
Terrestrial Resources	SMALL	SMALL	SMALL	SMALL to MODERATE	MODERATE to LARGE
Aquatic Resources	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Special Status Species & Habitats	SEE NOTE[(a)]	SEE NOTE[(b)]	SEE NOTE[(c)]	SEE NOTE[(c)]	SEE NOTE[(c)]
Historic and Cultural Resources	SEE NOTE[(d)]	SEE NOTE[(e)]	SEE NOTE[(f)]	SEE NOTE[(f)]	SEE NOTE[(f)]
Socioeconomics	SMALL	SMALL to MODERATE	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE
Transportation	SMALL	SMALL	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE
Human Health	SMALL[(g)]	SMALL[(g)]	SMALL[(g)]	SMALL[(g)]	SMALL[(g)]
Environmental Justice	SEE NOTE[(h)]	SEE NOTE[(i)]	SEE NOTE[(i)]	SEE NOTE[(i)]	SEE NOTE[(i)]
Waste Management and Pollution Prevention	SMALL[(j)]	SMALL[(j)]	SMALL[(j)]	SMALL	SMALL[(j)]

Table 2-2 Summary of Environmental Impacts of the Proposed Action and Alternatives (cont.)

Impact Area (Resource)	Point Beach License Renewal (Proposed Action)	No-Action Alternative	New Nuclear Alternative (Small Modular Reactor)	Natural Gas Combined-Cycle Alternative	Combination Alternative (Small Modular Reactor, Solar, Onshore Wind)

[(a)] May affect but is not likely to adversely affect northern long-eared bat or piping plover. No effect on essential fish habitat (EFH).

[(b)] Overall, the effects on federally listed species, critical habitats, and EFH would likely be smaller under the no-action alternative than the effects under continued operation but would depend on the specific shutdown activities as well as the listed species, critical habitats, and designated EFH present when the no-action alternative is implemented.

[(c)] The effects on federally listed species, critical habitats, and EFH would depend on the proposed alternative site and plant design and operation, as well as listed species and habitats present when the alternative is implemented. Therefore, the NRC staff cannot forecast a level of impact for this alternative.

[(d)] Given that no new ground disturbance or modifications and no periodic maintenance dredging or shoreline stabilization is anticipated during the subsequent license renewal term, and that NextEra has procedures in place to manage and protect cultural resources, the NRC staff concludes that Point Beach subsequent license renewal would not adversely affect any known historic properties or historic and cultural resources.

[(e)] Land-disturbing activities or dismantlement as a result of facility shutdown are not anticipated as these would be conducted during decommissioning. However, effects on historic properties or historic and cultural resources would depend on the specific shutdown activities when the no-action alternative is implemented.

[(f)] The impact determination of this alternative would depend on the specific location of the new facility.

[(g)] The chronic effects of electromagnetic fields on human health associated with operating nuclear power and other electricity generating plants are uncertain.

[(h)] Disproportionately high and adverse human health and environmental effects to minority and low-income populations are not expected. There would be no new or increased human health and environmental effects beyond what is currently being experienced.

[(i)] Not renewing the operating licenses and terminating reactor operations could have a noticeable impact on socioeconomic conditions in communities near Point Beach, and a reduction in tax revenue resulting from nuclear plant shutdown could decrease the availability of public services. Minority and low-income populations dependent on these services could be disproportionately affected. It is unlikely that a replacement power generating facility would be constructed and allowed to operate in a manner that would result in disproportionately high and adverse human health and environmental effects on minority and low-income populations. However, this determination would depend on the location, plant design, and operational characteristics of the alternative. Therefore, it cannot be determined whether this alternative would result in disproportionately high and adverse human health and environmental effects to nearby minority and low-income populations.

[(j)] NUREG-2157, *Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel* (NRC 2014a), discusses the environmental impacts of spent fuel storage for the time frame beyond the licensed life for reactor operations.

3 AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATING ACTIONS

3.1 Introduction

In conducting its environmental review of the Point Beach Nuclear Plant, Units 1 and 2 (Point Beach), subsequent license renewal application by NextEra Energy Point Beach, LLC (NextEra), the staff of the U.S. Nuclear Regulatory Commission (NRC) defines and describes the environment that could be affected by the proposed action (issuing subsequent renewed licenses authorizing an additional 20 years of operation). The staff then evaluates the environmental consequences of the proposed action as well as reasonable alternatives to the proposed action.

Chapter 2 of this supplemental environmental impact statement (SEIS) describes the Point Beach facility and its operations, as well as the scope of the agency's proposed action and the no-action alternative. Chapter 2, Section 2.3, further describes the NRC staff's process for developing a range of reasonable alternatives to the proposed action, including the replacement power alternatives that the staff selected for detailed analysis in this chapter and the supporting assumptions and data relied upon. As noted in Chapter 2, Table 2-1, the site location for the replacement power alternatives would be within the Point Beach site or within NextEra's service area. Chapter 2, Table 2-2, summarizes the environmental impacts of the proposed action and alternatives to the proposed action.

In this chapter, the NRC staff first defines the affected environment as the environment that currently exists at and around the Point Beach site. Because existing conditions are at least partially the result of past construction and nuclear power plant operations, this chapter considers the nature and impacts of past and ongoing actions and evaluates how, together, these actions have shaped the current environment. This chapter also describes reasonably foreseeable environmental trends. The effects of ongoing reactor operations at the site have become well established as environmental conditions have adjusted to the presence of the facility.[2] Sections 3.2 through 3.13 describe the affected environment for each resource area, followed by the staff's evaluation of the environmental consequences of the proposed action and alternatives to the proposed action. The NRC staff compares the environmental impacts of subsequent license renewal with those of the no-action alternative and replacement power alternatives to determine whether the adverse environmental impacts of subsequent license renewal are so great that it would be unreasonable to preserve the option of subsequent license renewal for energy-planning decisionmakers.

The NRC staff's evaluation of environmental consequences includes the following:

- impacts associated with continued operations similar to those that have occurred during the current license renewal term
- impacts of various alternatives to the proposed action, including a no-action alternative (not issuing the renewed subsequent licenses) and replacement power alternatives (new nuclear (small modular reactor (SMR)), natural gas combined-cycle, and a combination alternative (new nuclear, solar photovoltaic (PV), onshore wind)

[2] Where appropriate, the NRC staff has summarized referenced information or incorporated information by reference into this SEIS. This allows the staff to focus on new and potentially significant information identified since initial license renewal of Point Beach, Units 1 and 2.

- impacts from the termination of nuclear power plant operations and decommissioning after the subsequent license renewal term
- impacts associated with the uranium fuel cycle
- impacts of postulated accidents (design-basis accidents and severe accidents)
- cumulative impacts of the proposed action
- resource commitments associated with the proposed action, including unavoidable adverse impacts, the relationship between short-term use and long-term productivity, and irreversible and irretrievable commitment of resources
- new and potentially significant information on environmental issues related to the impacts of operation during the subsequent license renewal term

As stated in Sections 1.4 and 1.5, this SEIS documents the NRC staff's environmental review of the Point Beach subsequent license renewal application and supplements the information provided in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 2013a). The GEIS identifies 78 issues (divided into Category 1 and Category 2 issues) to be evaluated for the proposed action in the license renewal environmental review process. Section 1.4 of this SEIS explains the criteria for Category 1 issues (generic to all, or a distinct subset of, nuclear power plants) and Category 2 issues (specific to individual nuclear power plants), as well as the definitions of SMALL, MODERATE, and LARGE impact significance.

For Category 1 issues, the NRC staff relies on the analysis in the GEIS unless otherwise noted. Table 3-1 lists the Category 1 (generic) issues that apply to Point Beach during the proposed subsequent license renewal period. For these issues, the NRC staff did not identify any new and significant information that would change the conclusions of the GEIS. To identify any new and significant information, the staff reviewed the applicant's environmental report (ER) (NextEra 2020b), conducted a public environmental scoping process, conducted environmental site audits, and reviewed the sources referenced in this SEIS. Therefore, there are no impacts related to the issues beyond those discussed in the GEIS (Tables 3-1 and 3-2 below), as cited in Sections 3.2 through 3.13 below. Section 3.14 describes the staff's process for evaluating new and significant information.

Table 3-1 Applicable Category 1 (Generic) Issues for Point Beach

Issue	GEIS Section	Impact
Land Use		
Onsite land use	4.2.1.1	SMALL
Offsite land use	4.2.1.1	SMALL
Visual Resources		
Aesthetic impacts	4.2.1.2	SMALL
Air Quality		
Air quality impacts (all plants)	4.3.1.1	SMALL
Air quality effects of transmission lines	4.3.1.1	SMALL
Noise		
Noise impacts	4.3.1.2	SMALL
Geologic Environment		
Geology and soils	4.4.1	SMALL

Table 3-1 Applicable Category 1 (Generic) Issues for Point Beach (cont.)

Issue	GEIS Section	Impact
Surface Water Resources		
Surface water use and quality (non-cooling system impacts)	4.5.1.1	SMALL
Altered current patterns at intake and discharge structures	4.5.1.1	SMALL
Scouring caused by discharged cooling water	4.5.1.1	SMALL
Discharge of metals in cooling system effluent	4.5.1.1	SMALL
Discharge of biocides, sanitary wastes, and minor chemical spills	4.5.1.1	SMALL
Surface water use conflicts (plants with once-through cooling systems)	4.5.1.1	SMALL
Effects of dredging on surface water quality	4.5.1.1	SMALL
Temperature effects on sediment transport capacity	4.5.1.1	SMALL
Groundwater Resources		
Groundwater contamination and use (non-cooling system impacts)	3.5.2.1	SMALL
Groundwater use conflicts (plants that withdraw less than 100 gallons per minute [gpm])	3.5.2.1	SMALL
Groundwater quality degradation resulting from water withdrawals	3.5.2.1	SMALL
Terrestrial Resources		
Exposure of terrestrial organisms to radionuclides	4.6.1.1	SMALL
Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)	4.6.1.1	SMALL
Bird collisions with plant structures and transmission lines	4.6.1.1	SMALL
Transmission line right-of-way (ROW) management impacts on terrestrial resources	4.6.1.1	SMALL
Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	4.6.1.1	SMALL
Aquatic Resources		
Entrainment of phytoplankton and zooplankton (all plants)	4.6.1.2	SMALL
Infrequently reported thermal impacts (all plants)	4.6.1.2	SMALL
Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication	4.6.1.2	SMALL
Effects of nonradiological contaminants on aquatic organisms	4.6.1.2	SMALL
Exposure of aquatic organisms to radionuclides	4.6.1.2	SMALL
Effects of dredging on aquatic resources	4.6.1.2	SMALL
Effects on aquatic resources (non-cooling system impacts)	4.6.1.2	SMALL
Impacts of transmission line ROW management on aquatic resources	4.6.1.2	SMALL
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.6.1.2	SMALL
Socioeconomics		
Employment and income, recreation, and tourism	4.8.1.1	SMALL
Tax revenues	4.8.1.2	SMALL
Community services and education	4.8.1.3	SMALL
Population and housing	4.8.1.4	SMALL
Transportation	4.8.1.5	SMALL

Table 3-1 Applicable Category 1 (Generic) Issues for Point Beach (cont.)

Issue	GEIS Section	Impact
Human Health		
Radiation exposures to the public	4.9.1.1.1	SMALL
Radiation exposures to plant workers	4.9.1.1.1	SMALL
Human health impact from chemicals	4.9.1.1.2	SMALL
Microbiological hazards to plant workers	4.9.1.1.3	SMALL
Physical occupational hazards	4.9.4.1.5	SMALL
Postulated Accidents		
Design-basis accidents	4.9.1.2	SMALL
Waste Management		
Low-level waste storage and disposal	4.11.1.1	SMALL
Onsite storage of spent nuclear fuel	4.11.1.2	SMALL
Offsite radiological impacts of spent nuclear fuel and high-level waste disposal	4.11.1.3	[(a)]
Mixed waste storage and disposal	4.11.1.4	SMALL
Nonradioactive waste storage and disposal	4.11.1.4	SMALL
Uranium Fuel Cycle		
Offsite radiological impacts—individual impacts from other than the disposal of spent fuel and high-level waste	4.12.1.1	SMALL
Offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste	4.12.1.1	[(b)]
Nonradiological impacts of the uranium fuel cycle	4.12.1.1	SMALL
Transportation	4.12.1.1	SMALL
Termination of Nuclear Power Plant Operations and Decommissioning		
Termination of plant operations and decommissioning	4.12.2.1	SMALL

[(a)] The environmental impact of this issue for the time frame beyond the licensed life for reactor operations is contained in NUREG-2157 (NRC 2014a).

[(b)] There are no regulatory limits applicable to collective doses to the general public from fuel cycle facilities. The practice of estimating health effects on the basis of collective doses may not be meaningful. All fuel cycle facilities are designed and operated to meet the applicable regulatory limits and standards. The Commission concludes that the collective impacts are acceptable.

The Commission concludes that the impacts would not be sufficiently large to require the National Environmental Policy Act of 1969 (NEPA) conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective impacts of the uranium fuel cycle, this issue is considered Category 1.

Source: Table B-1 in Appendix B, Subpart A, to 10 CFR Part 51; NRC 2013a

The NRC staff analyzed the Category 2 (site-specific) issues applicable to Point Beach during the proposed subsequent license renewal period and assigned impacts on these issues as shown in Table 3-2.

Table 3-2 Applicable Category 2 (Site-Specific) Issues for Point Beach

Issue	GEIS Section	Impact[(a)]
Groundwater Resources		
Radionuclides released to groundwater	4.5.1.2	SMALL
Terrestrial Resources		
Effects on terrestrial resources (non-cooling system impacts)	4.6.1.1	SMALL
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	4.6.1.2	SMALL
Thermal impacts on aquatic resources (plants with once-through cooling systems or cooling ponds)	4.6.1.2	SMALL
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat	4.6.1.3	May affect but is not likely to adversely affect northern long-eared bat and piping plover
Historic and Cultural Resources		
Historic and cultural resources	4.7.1	Would not adversely affect historic properties
Human Health		
Microbiological hazards to the public (plants with cooling ponds or canals or cooling towers that discharge to a river)	4.9.1.1.1	SMALL
Chronic effects of electromagnetic fields[(b)]	4.9.1.1.1	Uncertain impact
Electric shock hazards	4.9.1.1.1	SMALL
Postulated Accidents		
Design-basis accidents	4.9.1.2	SMALL
Severe accidents	4.9.1.2	See Appendix F of this SEIS
Environmental Justice		
Minority and low-income populations	4.10.1	No disproportionately high and adverse human health and environmental effects on minority and low-income populations
		No disproportionately high and adverse human health impacts would be expected in special pathway receptor populations in the region because of subsistence consumption of water, local food, fish, and wildlife
Cumulative Impacts		
Cumulative impacts	4.13	Not applicable

(a) Impact determinations for Category 2 issues are based on findings described in Sections 3.2 through 3.13 below, as applicable, for the proposed action.

(b) This issue was not designated as Category 1 or 2 and is discussed in Section 3.11.6.2 below.

Source: Table B-1 in Appendix B, Subpart A, to 10 CFR Part 51; NRC 2013a

3.2 Land Use and Visual Resources

This section describes the land uses and visual resources in the vicinity of the Point Beach site. Following this description, the NRC staff analyzes the potential impacts on land use and visual resources from the proposed action and alternatives to the proposed action. Section E3.2 of NextEra's ER (NextEra ER 2020b) describes NextEra's current onsite and offsite land use conditions as well as visual resources.

3.2.1 Land Use

As described in Section 2.1.1 of this SEIS, the Point Beach site lies on the shores of Lake Michigan in east central Wisconsin. The plant lies 29 mi (47 km) southeast of Green Bay, WI, which is the largest population center in the region; 90 mi (145 km) north-northeast of Milwaukee, WI; and 200 mi (322 km) southwest of the Canadian border (NextEra 2020b). This section describes onsite and offsite (within a 6-mi (10-km) radius) land uses in the affected area. This section also describes the Wisconsin coastal zone, with an emphasis on the statutory and regulatory provisions that govern its use.

3.2.1.1 Onsite Land Use

According to NextEra (ER 2020b), Point Beach Units 1 and 2 are located in northeastern Manitowoc County, WI, on the western shore of Lake Michigan, which provides cooling and auxiliary water for the plant. The nearest towns are Two Creeks, WI, approximately 2 mi (3.2 km) northwest and Mishicot, WI, approximately 6 mi (9.7 km) west-southwest (NextEra 2020b). See Figure 3.1-3 (NextEra 2020b: 3-8), which the staff incorporates here by reference.

The Point Beach site consists of 1,260 acres (ac) (510 hectares (ha)) of gently rolling to flat land that slopes downward to 2 mi (3.2 km) of frontage on Lake Michigan (NRC 2005a). The Town of Two Creeks Comprehensive Plan zones the Point Beach site as an exclusive agriculture district (Manitowoc County 2019). However, Manitowoc County has granted Point Beach a variance and permit that allows its present industrial use (Manitowoc County 2019).

While NextEra owns all land within the Point Beach site boundary, it maintains five leases allowing outside entities to use onsite land: four agricultural lease agreements and one solar lease and easement agreement. The four individual agricultural leases within Point Beach boundaries total 357 acres (144 ha) or about 28 percent of the Point Beach site (NextEra 2021a). Point Beach lies in a productive dairy farming and vegetable canning region. In fact, prime farmlands or prime farmlands if drained cover 94 percent of the Point Beach site—nearly the entire site outside the plant power block and operations area (NextEra 2020b). The agricultural leases do not change onsite land use. However, the solar lease and easement agreement, which has a 30-year term and possible extensions of up to 20 additional years (PSC 2019a), will change land use in designated areas. This 2019 lease allows for the development of two, independent solar electric generating facilities partially on Point Beach land and partially on adjacent and nearby lands.

According to the Multi-Resolution Land Characteristic Consortium's National Land Cover Database—2016, over three-quarters of the Point Beach onsite land use is cultivated crops (60 percent) and pasture/hay (16 percent). The remaining land use/land cover consists of developed land (11 percent), wetlands and open water (7.2 percent), forest (4.2 percent), and barren land (2.1 percent) (see Table 3.2-1 in NextEra's ER (2020b)). However, once both solar power facilities are completed in late 2021, Point Beach onsite land use will change because an estimated 215 acres (87 ha), or about 17 percent, of the Point Beach site area will then lie behind solar array fence lines for up to 50 years (NextEra 2021a). This land will be impacted because standalone solar photovoltaic facilities cannot be co-located with other land uses such as grazing or agriculture.

The first solar facility, Two Creeks Solar Farm, began operating in November 2020, as Wisconsin's first utility-scale solar plant. Madison Gas and Electric and the Wisconsin Public Service Corp. co-own this 150-megawatt facility. The second, Point Beach Solar Project, is a 100-megawatt facility scheduled to begin operation in October 2021. Together, both solar projects are expected to change 885–1,235 acres (358–500 ha) of mostly agricultural lands both on and around the Point Beach site (NextEra 2020b). See the map of the solar facilities in Figure 3.103, "PBN Site and 6-mile Radius," in NextEra's ER (2020b; 3-8), which the staff incorporates here by reference.

In general, the plans for both solar facilities use mainly former agricultural lands and are expected to impact less than 0.1 acre of wetlands total (NextEra 2020b). The Point Beach Solar Project application states that no wetlands will be permanently impacted although one farmed wetland may be temporarily impacted (PSC 2019a). Some farmed wetland areas will be behind the fenced area although these wetland areas will not be disturbed or covered by solar panels (PSC 2019a). The application also states that tree clearing will be minimized. Under the terms of the solar lease, NextEra still maintains the legal authority to determine all activities on its property, but the solar lease holders are responsible for land management including obtaining permits and establishing programs for adhering to applicable State and Federal regulations. Construction of the solar facilities on the Point Beach site will change onsite land use. However, after construction, the solar facility will follow a vegetation management plan seeding a non-native low turf under and between panel rows (PSC 2019a). Only limited areas such as solar facility access roads will remain permanently cleared (PSC 2019a). Point Beach Solar states that it will use best management practices to minimize impacts to soil and potentially improve soil health over the lease term. Upon decommissioning, the land will be tilled to break new vegetative growth and enhance topsoil in order to return the land to agricultural use (PSC 2019a).

3.2.1.2 Coastal Zone

Section 307(c)(3)(A) of the Coastal Zone Management Act of 1972, as amended (CZMA) (16 U.S.C. 1456(c)(3)(A)) requires that applicants for Federal licenses who conduct activities in a coastal zone provide a certification to the licensing agency (here, the NRC) that the proposed activity complies with the enforceable policies of the State's coastal zone program. The Federal regulations that implement the CZMA indicate that this requirement is applicable to renewal of Federal licenses for actions not previously reviewed by the state (15 CFR 930.51(b)(1)).

Point Beach lies on the western shore of Lake Michigan within the Wisconsin coastal zone. This requires NextEra to provide a CZMA certification for the proposed action of Point Beach subsequent license renewal. The Wisconsin Coastal Management Program is responsible for coordinating the State's review of Federal consistency determinations and certifications with cooperating agencies and for responding to the appropriate Federal agency or applicant (WCMP 2007).

In a letter dated November 10, 2020, NextEra submitted a CZMA consistency certification package to the Wisconsin Coastal Management Program (WCMP) in support of the subsequent renewal of the Point Beach operating licenses (NextEra 2020b, Appendix F). This letter states, "[t]he proposed continued operation of [Point Beach] complies with the policies of the [WCMP] and will continue to be conducted in a manner consistent with such policies" and provides supporting information. The NRC has not been notified by the WCMP that the WCMP concurs with or objects to this NextEra consistency certification. Therefore, the WCMP's concurrence with the certification is presumed and the requirements of the CZMA relevant to the Point Beach subsequent license renewal are satisfied.

3.2.1.3 Offsite Land Use

This section describes offsite land use within a 6-mi (10-km) radius of the Point Beach site boundary. This radius includes portions of Manitowoc and Kewaunee counties. Lake Michigan is the predominant natural feature. According to NextEra (2020b), the largest land use and land cover categories in the 6-mi (10-km) vicinity are open water (45 percent), cultivated crops (33 percent), wetlands (9.3 percent), and pasture/hay (7.5 percent). The remaining 5 percent of land use/land cover categories in the vicinity are grassland, shrub/scrub, forest, barren land, and developed land.

Manitowoc County is primarily rural and agricultural, with over 86 percent of the county classified as undeveloped (Manitowoc County 2020). According to a 2017, USDA agricultural census, approximately 61 percent of the county is proportioned to farmland (NextEra 2020b). Because of its proximity to the Green Bay and Fox River Valley metro areas, Manitowoc County anticipates growing residential, commercial, and industrial use over a 20-year planning period. The county projects it will lose approximately 7,779 acres (3,148 ha) of current agricultural production, open space, and woodlands to residential, commercial, and industrial uses. (Manitowoc County 2020). Neighboring Kewaunee County is also rural agricultural with 93 percent of its land use classified as undeveloped and 63 percent as cropland or pasture (Kewaunee County 2016). Kewaunee projects a trend of consolidating numerous small farms into fewer, larger farms (Kewaunee County 2016).

Wisconsin State Statue 16.1001(2)(i) requires comprehensive plans to be updated no less than once every 10 years. In 2020, Manitowoc County issued its Manitowoc County 20-Year Comprehensive Plan Update (Manitowoc County 2020). In 2019, the Town of Two Creeks (where Point Beach is located) issued its 2039 comprehensive land use plan (Two Creeks 2019). In 2016, Kewaunee County issued its 20-year comprehensive plan update (Kewaunee County 2016). In addition, the Bay Lakes Regional Planning Commission provides planning and technical assistance to Northeast Wisconsin governments including counties, cities, towns, villages, and the Oneida Tribe.

Although the surrounding area is primarily rural agricultural, several industrial sites exist in the 6-mi (10-km) vicinity of the Point Beach site. Since 2019, portions of the Point Beach and Two Creeks solar generation facilities have been in construction or operation on land within and near to Point Beach site boundaries. Two Creeks Solar Farm began operating in November 2020, with 500,000 solar panels spread across approximately 800 acres (324 ha) mainly in Manitowoc County with a small area in Kewaunee County (MGE 2020). The smaller, 100-megawatt Point Beach Solar Project will occupy approximately 565 acres (229 ha) in Manitowoc County (PSC 2019a). Together, the two solar projects will change approximately 885–1,235 acres (358–500 ha) of mostly agricultural lands (NextEra 2020b). However, since the 6-mi radius contains 29,672 acres (12,008 ha) of agricultural land (NextEra 2020b) and Manitowoc County contains over 230,000 acres (93,077 ha) of land managed by farming operations (Manitowoc County 2020), the loss of 1,235 acres will not noticeably impact the rural agricultural nature of the area.

Another notable industrial site is Kewaunee Power Station, a nuclear power plant located 5 mi (8 km) north of Point Beach that is currently undergoing decommissioning. Kewaunee operated from 1973 to 2013. Major decommissioning and dismantling activities are scheduled to begin in 2069 with closure in 2073 (NRC 2021k).

There are 10 public use lands within the 6-mi (10-km) vicinity of Point Beach with the closest being Two Creeks Town Park, Two Creeks Park, and Ice Age National Scenic trail (NextEra 2020b). In addition, in 2015, the National Oceanic and Atmospheric Administration (NOAA) proposed a new Federal project in the vicinity of Point Beach—the Wisconsin Shipwreck Coast National Marine Sanctuary (ONMS 2020). On June 23, 2021, NOAA published the final rule for the 962-mi^2 (2491-km^2) marine sanctuary. The designation of the sanctuary became effective on August 16, 2021 (86 FR 45860). The marine sanctuary will encompass a portion of waters and submerged lands of Lake Michigan adjacent to Ozaukee County, Sheboygan County, Kewaunee County, and Manitowoc County (where it will border the Point Beach site eastern boundary). The sanctuary will include 82 mi (132 km) of Lake Michigan shoreline extending out approximately 7–16 mi (11–26 km) into the lake, all within Wisconsin State waters (ONMS 2020). It will protect 36 known shipwrecks in the area and may contain about 59 additional important undiscovered shipwrecks. NOAA's establishment of the sanctuary will not affect Point Beach site boundaries or access as the sanctuary does "not change existing riparian rights of the property owners of Wisconsin nor would it change state law regarding public access to shoreline areas where property owners have exclusive access" (86 FR 32737). For example, the permanent security zone on Lake Michigan in front of the Point Beach plant will continue to restrict water vessel traffic from approaching the plant's eastern boundary (NextEra 2020b).

3.2.2 Visual Resources

The Point Beach site is in northeastern Manitowoc County, WI, on the western shore of Lake Michigan in a rural agricultural and residential area with woodlands, wetlands, and open spaces (NextEra 2020b). The tallest structures are the reactor containment buildings, at approximately 63 feet (ft) (19 meters (m)). These are clad in green and brown to blend with the surrounding landscape. Other prominent structures include the auxiliary, service, and turbine buildings and the transmission lines (NextEra 2020b). The plant is visible from either direction on the north–south running State Highway 42. Existing tree breaks and wooded areas shield the plant somewhat from a view of the road. Site buildings are set back from Lake Michigan but still clearly visible from recreational boats on Lake Michigan outside the Point Beach permanent security zone marked by offshore buoys. There are also several public lands from which Point Beach buildings are visible. These include from the beach of Rahr Memorial School Forest, from the Two Creek Buried Forest State Natural Area, and from Two Creeks Park. The nearest private residence to the Point Beach site lies 1.2 mi (2 km) west from the site center. Trees hide most site structures from view of the residence during the day; at night, faint lights from the plant are visible.

3.2.3 Proposed Action

As identified in Table 3-1 of this SEIS, the impacts of all generic land use or visual resource issues for the proposed action of Point Beach subsequent license renewal would be SMALL. The resent changes in onsite land use from the solar lease and easement agreement will place 215 acres (87 ha) of Point Beach land behind solar array fence lines (NextEra 2021a). However, the NRC staff does not foresee this change creating potential land use conflicts between the solar facilities and the continued operation of the plant. If NextEra needs to expand the Point Beach spent nuclear fuel storage during the subsequent license term, there is sufficient land to do so in the ISFSI-defined area west of the existing ISFSI without disturbing solar leased areas (NextEra 2020b). The NRC staff did not identify any applicable site-specific (Category 2) land use or visual resource issues, as shown in Table 3-2 of this SEIS.

3.2.4 No-Action Alternative

3.2.4.1 Land Use

Under the no-action alternative, the NRC would not issue subsequent renewed licenses, and Point Beach would shut down on or before the expiration of the current renewed facility operating licenses in 2030 and 2033. Onsite land presently accommodating the nuclear facilities would remain occupied by existing plant facilities until decommissioning is completed. According to NextEra (2020b), decommissioning could take up to 60 years after the permanent shutdown of Point Beach. Most transmission lines would remain in service after the plant stops operating. Maintenance of most existing infrastructure would continue. The NRC staff concludes that the land use impacts of the no-action alternative would be SMALL.

3.2.4.2 Visual Resources

The shutdown of Point Beach Units 1 and 2 would not significantly change the visual appearance of the site. The most visible structures at the site are the reactor containment buildings, and they would likely remain in place for some time during decommissioning until they are eventually dismantled. Overall, the NRC staff concludes that the impacts of the no-action alternative on visual resources would be SMALL.

3.2.5 Replacement Power Alternatives: Common Impacts

3.2.5.1 Land Use

The NRC staff's analysis of common land use impacts focuses on the amount of land area that would be affected by the construction and operation of a replacement power facility on the Point Beach site.

<u>Construction</u>

Construction of a replacement power facility on the Point Beach site would likely require the dedication of all available land areas on the site excluding areas leased to the solar facilities. Existing Point Beach transmission lines and infrastructure (e.g., roads, fences, and water and sewage lines), with any necessary refurbishment, would adequately support each of the onsite replacement power alternatives, thus reducing the need for additional land commitments.

<u>Operations</u>

Operation of new power facilities on the Point Beach site would have no land use impacts beyond land committed for the permanent use of the replacement power facility. Additional land may be required to support power facility operations, including land for transmission lines, natural gas pipelines and rights-of-way, mining, extraction, and waste disposal activities associated with each alternative.

3.2.5.2 Visual Resources

The NRC staff's visual impact analysis focuses on the degree of contrast between the replacement power facility and the surrounding landscape and the visibility of the new power facility.

<u>Construction</u>

Land for any replacement power facility would require clearing, excavation, and the use of construction equipment. Temporary visual impacts may occur during construction from cranes and other construction equipment. On the eastern side of the site, boaters on Lake Michigan would see construction activities and equipment. From roads and public areas to the south and west of the site, the distance to the site boundary, existing structures, and the Point Beach solar facility would largely screen the view of construction activities and equipment.

Operations

Visual impacts during facility operations of any of the onsite replacement power alternatives would be similar in type and magnitude. For the new nuclear facility components, new mechanical cooling towers and their associated vapor plumes would be the most obvious visual impact and would likely be visible farther from the site than other buildings and infrastructure. New plant stacks or towers may require aircraft warning lights that would be visible at night.

3.2.6 New Nuclear (Small Modular Reactor) Alternative

3.2.6.1 Land Use

Construction

Approximately 110 acres (45 ha) of land on the Point Beach site would be required to operate a new nuclear alternative consisting of three 400-MWe small modular reactor modules with a net generating capacity of 1,200 MWe. Additional land would also be temporarily disturbed for construction facility and laydown areas. NextEra (2020b) identified over 200 acres (81 ha) of previously developed and undeveloped land spread across two parcels on the Point Beach site for siting a new nuclear replacement alternative. These two parcels include 60 acres (24 ha) of land north of the Point Beach power block and 146 acres (59 ha) of land south of the power block (NextEra 2020b) and do not overlap with land leased to the two solar power facilities. The southern parcel includes an existing parking area, training building, firing range, and the Point Beach Energy Center. The three reactor modules would use existing Point Beach infrastructure and transmission lines. Considering the information above and that there is sufficient land to construct the SMR facility without interfering with the new onsite solar facilities, the NRC staff concludes that land use impacts from the construction of a new nuclear alternative of three SMR modules on the Point Beach site would be SMALL because the land is already permitted for industrial use.

Operations

The NRC estimates that the operations footprint for the small modular reactor alternative consisting of three 400-MWe small modular reactor modules would be approximately 110 acres (45 ha) (NuScale 2021a). Offsite land use impacts associated with uranium mining and fuel fabrication needed to support nuclear power plant operations generally would be similar to the amount of offsite land needed to support current Point Beach operations, although more land would be required for mining additional uranium for up to 40 years of operation. Based on this information, the NRC staff concludes that the onsite and offsite land use impacts from operating a new SMR nuclear power plant on the Point Beach site could range from SMALL to MODERATE, depending on how much additional land may be needed for uranium mining and fuel fabrication.

3.2.6.2 Visual Resources

Construction and Operations

Visual impacts from a new nuclear alternative consisting of three 400-MWe small modular reactor modules would be similar to the common impacts of all replacement power alternatives described in Section 3.2.5.2, “Visual Resources.” Construction activities and equipment such as cranes could be visible from publicly accessible areas such as State Highway 42, Lake Michigan, and public lands, but these would be temporary and in character with the existing Point Beach industrial site. During operations, the new SMR facility buildings would have a greater visual impact than the existing Point Beach power blocks. First, there would be up to a 97-ft (30-m) height increase in the new SMR plant profile. Currently, the tallest structures at Point Beach are the reactor containment buildings at 63 ft (19 m) in height (NextEra 2020b). At the new small modular reactor plant, the tallest structures would be approximately 160 ft (50 m) in height. The SMR plant's new mechanical draft cooling towers would also increase the visual impact. At approximately 65 ft (20 m) in height, new mechanical draft cooling towers at the SMR facility would be just 5 ft (1.5 m) taller than the existing Point Beach reactor containment buildings. However, these new mechanical draft cooling towers add new tall structures to the site and produce water vapor plumes that could be visible from great distances. However, NextEra (2020b) suggests that plume abatement technology can minimize plumes. The NRC staff concludes that visual impacts during the construction and operation of a small modular reactor new nuclear power plant at the Point Beach site, including several taller structures and cooling tower plumes that could be visible from great distances, depending on seasonal weather conditions and use of plume abatement technology, could range from SMALL to MODERATE.

3.2.7 Natural Gas Combined-Cycle Alternative

3.2.7.1 Land Use

Construction

The NRC staff assumes that a 1,200 MWe natural gas combined-cycle replacement power alternative would require 60 acres (24 ha) to operate on the Point Beach site. Building the three 460-MWe combined-cycle combustion turbines would also disturb additional land for construction staging and laydown. In addition, the natural gas plant would require 120 acres (49 ha) of offsite land to establish a new right-of-way corridor for laying a natural gas pipeline. The pipeline would connect with an existing natural gas supply line that terminates 10 mi (16 km) away in Two Rivers, WI (NextEra 2020b). Approximately 200 acres (81 ha) of previously developed and undeveloped land spread across two parcels on the Point Beach site are available for siting the natural gas facility. These two parcels include 60 acres (24 ha) of land north of the Point Beach power block and 146 acres (59 ha) of land south of the power block and do not overlap with the solar leased lands (NextEra 2020b). The southern land parcel includes an existing parking area, training building, firing range, and the Point Beach Energy Center.

The natural gas power plant would use available Point Beach infrastructure and existing transportation and transmission lines on land already zoned for industrial use. The plant would require no new gas wells to support it because of the current abundant supply of natural gas in the United States (NextEra 2020b). In addition, the elimination of land used for uranium mining to supply fuel to Point Beach would partially offset any land use impacts of the natural gas alternative (see Section 3.15.1, "Fuel Cycle," for a description of land use impacts caused by uranium mining and natural gas extraction and collection). However, the acquisition of land to establish a new right-of-way for laying a 10-mi (16-km) natural gas pipeline to Twin Rivers, WI, would require permanently clearing a corridor of 120 acres (49 ha) of previously undisturbed or agricultural land and converting it to industrial use. Depending on the route chosen, right-of-way corridors from the Point Beach site to Twin Rivers would likely pass through predominantly agricultural land (cultivated crops and pasture) but could also pass through forest, wetland, and grassland. NextEra (2020b) has stated that the land selection process would avoid sensitive areas or sensitive wildlife habitats. Considering the information above, the NRC staff concludes that land use impacts from the construction of a natural gas combined-cycle facility would be SMALL to MODERATE largely because of the offsite land that would be cleared and converted to industrial use for a new natural gas pipeline and right-of-way corridor.

Operations

The NRC estimates that the onsite operations footprint for the natural gas combined-cycle alternative would be approximately 60 acres (24 ha) for the power block and support facilities on available Point Beach land as described above. The operations of a natural gas facility on the Point Beach site would not change the existing land use on the site. However, the operations of a natural gas plant would change offsite land use near the site. The plant would require establishing a new 120-acre (49-ha) right-of-way corridor for a 10-mi (16-km) natural gas pipeline to Two Rivers, WI. The right-of-way corridor would require initial vegetation clearing and pipeline laying; however, this disturbance would be temporary and end after construction. Operations would require permanent management to keep the area free of woody vegetation (NextEra 2020b). NextEra (2020b) has stated that it would select land to mitigate land use impacts. Based on the above information, the NRC staff concludes that the land use impacts from operating a new natural gas combined-cycle power plant would be SMALL.

3.2.7.2 Visual Resources

Construction and Operations

Visual impacts from a natural gas combined-cycle alternative would be similar to the common impacts of all replacement power alternatives described in Section 3.2.5.2, "Visual Resources." Construction activities and equipment such as cranes could be visible from publicly accessible areas such as State Highway 42, Lake Michigan, and public lands. However, these would be temporary and in character with the existing Point Beach industrial site. During operations, the visual appearance of the new natural gas facility would differ from that of the existing Point Beach Units 1 and 2 power blocks. First, there would be up to an 87-ft (27-m) height increase in the new natural gas plant profile. Currently, the tallest structures at Point Beach are the reactor containment buildings at 63 ft (19 m) in height (NextEra 2020b). At the new natural gas plant, the tallest structures would be the plant stacks at approximately 150 ft (46 m) in height. Overall, this would result in a greater visual impact. At approximately 70 ft (21 m) in height, new mechanical draft cooling towers at the natural gas facility would be just 7 ft (2 m) taller than the existing Point Beach reactor containment buildings. However, these new mechanical draft cooling towers would increase the visual impact by adding new tall structures to the site and by producing water vapor plumes that could be visible from great distances. In total, the NRC staff concludes that visual impacts during the construction and operations of a natural gas combined-cycle plant at the Point Beach site, including cooling tower plumes that could be visible from great distances, depending on seasonal weather conditions, could range from SMALL to MODERATE.

3.2.8 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

3.2.8.1 Land Use

Construction and Operations

For the SMR portion of the combination alternative, the land use impacts would be similar to but less than the land use impacts described above in Section 3.2.6.1 for the new nuclear alternative. Under the combination alternative, the licensee would construct and operate only two 400-MWe SMR units requiring 72 acres (29 ha) of land, as opposed to three SMRs requiring 110 acres (45 ha) of land. Onsite land use impacts from construction and operations of two SMR units at the Point Beach site would be SMALL, as the land is already permitted for industrial use. Offsite land use impacts associated with uranium mining and fuel fabrication needed to support the two SMRs would likely be less than the amount of land needed to support Point Beach operations, although this may be offset by the land required for mining additional uranium for up to 40 years of operation. Based on this information, the NRC staff concludes that onsite and offsite land use impacts from the construction and operations of two SMRs as part of the combination alternative would be SMALL.

The solar portion of the combination alternative would require four utility-scale solar photovoltaic plants with battery energy storage systems occupying a total area of 3,200 acres (1,300 ha). Additional land would be required for construction staging and laydown. Most of the solar photovoltaic alternative would be offsite, but in the Point Beach region of influence and with access to NextEra transmission systems. A small portion of the solar alternative would be located on 220 acres (89 ha) of the Point Beach site. Impacts on land use would depend largely on the offsite land chosen for the solar installations. For example, if the land were previously cleared and used for industrial activity, the impacts on land use would be less significant than if the land were undisturbed forest containing important habitats and near residential or recreational areas. Adding to the land use impact is the fact that standalone solar photovoltaic facilities cannot be co-located with other land uses (e.g., grazing and crop-producing agriculture). The NRC staff concludes that land use impacts from the solar portion of the combination alternative could range from MODERATE to LARGE, depending on the type of land and the location of the land chosen for the construction and operation of the four utility-scale solar installations.

The onshore wind component of the combination alternative would be installed offsite at several locations across the Point Beach region of influence. Utility-scale wind farms require relatively large areas for operation. In total, the NRC staff estimates 31,000 acres (12,000 ha) of land would be required for an installed capacity of 360 MWe. However, after construction, much of the required land around the turbines would return to being unaffected by the operation of the turbines and could return to original uses such as agriculture. The only permanently disturbed land would lie within the foundation and footprints of the turbine towers, access roads, battery storage systems, and power collection and transmission systems. Adding up only the square footage of the disturbed land as described above results in 310 acres (125 ha) permanently disturbed land and 610 acres (248 ha) of temporarily disturbed land. Impacts on land use would depend largely on the land chosen for the onshore wind farms. For example, if the land were previously cleared and used for industrial activity, the impacts on land use would be less significant than if the land were undisturbed forest containing important habitats or near residential or recreational areas. The NRC staff concludes that the impacts on land use from the construction and operation of multiple utility-scale onshore wind facilities could range from MODERATE TO LARGE depending on the type of land and the location of the land chosen.

The NRC staff concludes that overall land use impacts of the combination alternative could range from MODERATE to LARGE, due to the large areas and multiple locations required for the solar and wind portions of the alternative and depending on the types of land chosen for the solar and wind facilities.

3.2.8.2 Visual Resources

Construction and Operations

Visual impacts from two SMRs constructed and operated as part of the combination alternative would be similar to but less than the impacts described in Section 3.2.6.2, “Visual Resources,” for the new nuclear replacement power alternative of three SMRs. Construction activities and equipment such as cranes could be visible from publicly accessible areas such as State Highway 42, Lake Michigan, and public lands, but these would be temporary and in character with the existing Point Beach industrial site. During operations, the visual impact of the SMR portion of the combination alternative would be greater than that of the existing Point Beach Units 1 and 2 power blocks. First, there would be up to a 97-ft (30-m) height increase in the new SMR plant profile. Currently, the tallest structures at Point Beach are the reactor containment buildings at 63 ft (19 m) in height (NextEra 2020b). At the two SMR, the tallest structures would be approximately 160 ft (50 m) in height. Second, the addition of new mechanical draft cooling towers at approximately 65 ft (20 m) in height would be just 5 ft (1.5 m) taller than the existing Point Beach reactor containment buildings. However, these new mechanical draft cooling towers would increase the visual impact by adding new tall structures to the site and by producing water vapor plumes that could be visible from great distances. In total, the NRC staff concludes that visual impacts during the construction and operations of the SMR portion of the combination alternative at Point Beach, including several taller structures and cooling tower plumes that could be visible from great distances, depending on seasonal weather conditions, could range from SMALL to MODERATE.

Utility-scale solar photovoltaic facilities require clearing large areas of land, which can significantly affect visual resources. For the solar portion of the combination alternative, the NRC estimates approximately 3,200 acres (1,300 ha) of land for four solar facilities would be required within the Point Beach region of influence with access to existing NextEra transmission lines. If the solar panels chosen are similar to the ones used at the Point Beach and Two Creeks solar facilities, they would range from 6–8 ft in height, which would not be visible at distances greater than 0.5 mi (PSC 2018). Based on the topography, size, and location of the land chosen, the NRC staff concludes that the construction and operation of four solar PV facilities as part of the combination alternative would have a MODERATE to LARGE impact on visual resources.

For onshore wind facilities, the location, size, and number of turbines greatly affect the visual impact. While some visual impacts will occur during construction, these will be temporary and most visual impacts will occur during operations. The NRC assumes a wind turbine hub height of 95 m (312 ft) and a rotor of 100 m (328 ft). This would result in a maximum height of approximately 145 m (475 ft) (Vestas 2015). The NRC staff concludes that the construction and operation of the onshore wind portion of the combination alternative would have a MODERATE to LARGE impact on visual resources occurring mainly during operations.

The NRC staff concludes that the visual impacts from the construction and operations of the combination alternative could range from MODERATE to LARGE, based largely on the visual impact of the onshore wind and solar components of the alternative.

3.3 Meteorology, Air Quality, and Noise

This section describes the meteorology, air quality, and noise environment in the vicinity of Point Beach. The description of the resources is followed by the NRC staff's analysis of the potential air quality and noise impacts from the proposed action (subsequent license renewal) and alternatives to the proposed action.

3.3.1 Meteorology and Climatology

Wisconsin's climate is continental, characterized by a wide range in temperatures. Wisconsin's climate is influenced by cold air masses from Canada and warm and humid air masses from the Gulf of Mexico. Southern Wisconsin experiences cold winters and mild to hot summers, while northern Wisconsin typically experiences frigid winters and cool summers. Precipitation varies year to year with warmer months experiencing most of the State's precipitation. The average seasonal snowfall varies from 30 in. (76.2 cm) in the south to over 100 in. (254 cm) in the northern areas (NOAA 2017). Lake Superior and Lake Michigan have a moderating effect in Wisconsin along the northern and eastern shorelines.

The NRC staff obtained climatological data from the Green Bay weather station. This station is approximately 45 mi (72 km) from Point Beach and is used to characterize the region's climate because of its relative location and long period of record. NextEra also maintains a meteorological monitoring system comprised of three meteorological towers—two that are onsite and a third that is offsite (NextEra 2020b). The primary meteorological tower is southeast of Point Beach and measures wind speed, wind direction, differential temperature, and ambient temperature. The backup meteorological tower is northwest of Point Beach and measures wind speed, wind direction, and ambient temperature. The offsite meteorological tower is approximately 9 mi (14.4 km) from Point Beach and measures wind speed, wind direction, and ambient temperature. The purpose of the offsite meteorological tower is to provide information on the extent of lake breezes inland from the shoreline. In its ER, NextEra provided meteorological observations from the meteorological monitoring system for the 2001–2020 period. The staff evaluated these data in context with the climatological record from the Green Bay weather station.

The mean annual temperature for the 71-year period of record (1949–2020) at the Green Bay weather station is 44.5 °F (6.9 °C), with the mean monthly temperature ranging from a low of 16.3 °F (-8.72 °C) in January and a high of 70 °F (21.1 °C) in August (NCDC 2021a). The mean annual temperature from Point Beach's onsite meteorological tower is 44.7 °F (7.1 °C), with a mean monthly ranging from a low of 21.2 °F (-6 °C) in January and a high of 67.7 °F (19.8 °C) in July (NextEra 2020b).

The average annual total precipitation for the 71-year period of record (1949–2020) at the Green Bay weather station is 29.68 in. (75.3 cm), with mean monthly precipitation ranging from a low of 1.23 in. (3.12 cm) in January, to a high of 3.59 in. (9.1 cm) in June (NCDC 2021a). Precipitation is not recorded at Point Beach's meteorological towers (NextEra 2020b).

The mean annual wind speed during a 37-period of record at the Green Bay weather station is 8.7 miles per hour (mph) (3.9 meters/second (m/s)), with prevailing winds from the west (NCDC 2021a). The mean annual wind speed from Point Beach's onsite meteorological tower is 9.3 mph (4.2 m/s), with prevailing wind direction from the south-southwest (NextEra 2020b).

Wisconsin is subject to occasional extreme weather events including tornadoes, blizzards, and flooding. The following severe weather events have been reported in Manitowoc County from January 1, 1950, through February 28, 2021 (NOAA 2021b):

- Blizzard: 7 events
- Flooding: 13 events
- Tornado: 21 events

3.3.2 Air Quality

Under the Clean Air Act (CAA) of 1963, as amended (42 U.S.C 7401, et seq.), the EPA has set primary and secondary National Ambient Air Quality Standards (NAAQS, 40 CFR Part 50, "National Primary and Secondary Ambient Air Quality Standards") for six common criteria pollutants to protect sensitive populations and the environment. The NAAQS criteria pollutants include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), and particulate matter (PM). PM is further categorized by size—PM_{10} (diameter less than or equal to 10 micrometers) and $PM_{2.5}$ (diameter less than or equal to 2.5 micrometers).

The EPA designates areas of attainment and nonattainment with respect to meeting NAAQS. Areas for which there is insufficient data to determine attainment or nonattainment are designated as unclassifiable. Areas that were once in nonattainment, but are now in attainment, are called maintenance areas; these areas are under a 10-year monitoring plan to maintain the attainment designation status. States have primary responsibility for ensuring attainment and maintenance of the NAAQS. Under Section 110 of the Clean Air Act (42 U.S.C. 7410) and related provisions, states are to submit, for EPA approval, State Implementation Plans (SIPs) that provide for the timely attainment and maintenance of the NAAQS.

In Wisconsin, air quality designations are made at the county level. For the purpose of planning and maintaining ambient air quality with respect to the NAAQS, the EPA has developed air quality control regions. Air quality control regions are intrastate or interstate areas that share a common airshed. Point Beach is located in Manitowoc County, WI. Manitowoc County is within the Lake Michigan intrastate Air Quality Control Region (40 CFR 81.67). With regard to NAAQS, Manitowoc County is designated as nonattainment for the 8-hr ozone 2015 standard and maintenance area for the 1-hr ozone 1979 standard and 8-hr ozone 1997 standard (EPA 2021a).

The Wisconsin Department of Natural Resources (WDNR) regulates air emissions at Point Beach under an Air Pollution Control Operation Permit (Permit No. 436034500-P32). Point Beach's air pollution control operation permit expires on July 6, 2022 (WDNR 2018). Table 3-3 lists permitted air emission sources and air permit-specific conditions.

Table 3-3 Permitted Air Emissions Sources at Point Beach, Units 1 and 2

Equipment	Air Permit Condition
One (1) Oil-fired stationary gas turbine	SO_2: may burn only distillate fuel oil with sulfur content of less than 0.0015 percent (15 ppm) by weight NO_x: 0.1232 lb/gal of distillate oil burned PM: 22.0 lb/hour PM_{10}: 22.0 lb/hour $PM_{2.5}$: 9.0 lb/hour
Two (2) Diesel generators	SO_2: may burn only distillate fuel oil with sulfur content of less than 0.0015 percent (15 ppm) by weight PM: 11.5 lb/hour for each generator
Two (2) Diesel generators	SO_2: may burn only distillate fuel oil with sulfur content of less than 0.0015 percent (15 ppm) by weight PM: 2.9 lb/hour for each generator
Two (2) Oil-fired boilers	SO_2: may burn only distillate fuel oil with sulfur content of less than 0.0015 percent (15 ppm) by weight PM: 1.7 lb/hour for each boiler
Two (2) Diesel engines (to start gas turbine and used as auxiliary power source)	SO_2: may burn only distillate fuel oil with sulfur content of less than 0.0015 percent (15 ppm) by weight PM: 2.8 lb/hour for diesel engine used to start the gas turbine, and 1.4 lb/hour for diesel engine used as auxiliary power source
One (1) Air-cooled diesel engine used to drive a fire pump	SO_2: may only be fired with diesel fuel that meets the requirements of 40 CFR 80.510(b) for non-road diesel fuel PM: 0.2 g/KWh and 0.15 lb/MBtu NO_x and Non-Menthane Hydrocarbons (combined): 4.0 g/KWh

Table 3-3 Permitted Air Emissions Sources at Point Beach, Units 1 and 2 (cont.)

Equipment	Air Permit Condition
One (1) Emergency diesel engine	SO_2: may only be fired with diesel fuel that meets the requirements of 40 CFR 80.510(b) for non-road diesel fuel PM: 0.2 g/KWh and 0.50 lb/MBtu NO_x and Non-Menthane Hydrocarbons (combined): 4.0 g/KWh CO: 3.5 g/KWh
One (1) Emergency generator	SO_2: may only be fired with propane PM: 0.15 lb/MBtu heat input

NO_x = nitrogen oxide; PM = particulate matter; PM_{10} = particulate matter less than or equal to 10 microns; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns; SO_2 = sulfur dioxide; ppm = parts per million; lb/ga = pounds per gallon; lb/MBtu = pounds per million British thermal units; g/KWh = grams per kilowatt-hour

Source: WDNR 2018 and NextEra 2020b

NextEra submits annual emission reports to the WDNR in accordance with the Air Pollution Control Operation Permit. Table 3-4 shows annual emissions from the air permitted sources at Point Beach (NextEra 2021a). The contribution of air emissions from sources at Point Beach constitute less than 2 percent of Manitowoc County's annual emissions of each criteria pollutant. Greenhouse gas emissions from operation of Point Beach are discussed in Section 3.15.3 of this SEIS. NextEra identified in its ER that between 2014–2019, it received one notice of non-compliance from the WDNR pertaining to its air permit. The notice of non-compliance was as a result of failing to limit the hours of operation of a diesel engine for non-emergencies in accordance with the conditions of the air permit and for operating the diesel engine for an activity not permitted in its air permit (NextEra 2020b). To resolve the non-compliance, NextEra applied for a revision to its air permit conditions to WDNR (NextEra 2020b). The revised air permit was issued to NextEra and WDNR closed the non-compliance on November 30, 2018 (NextEra 2020b). The NRC staff's review of EPA's Enforcement and Compliance History Online (ECHO) 3-year compliance history (7/2018-6/2021) revealed no notice of violation or permit exceedance related to Point Beach's air permit (EPA 2021d).

Table 3-4 Reported Air Pollutant Emissions from Point Beach

Point Beach Emissions (tons/year)				
Year	**SO_2**	**NO_x**	**CO**	**PM_{10}**
2014	0.007	12.8	2.5	0.4
2015	0.004	10.5	2.4	0.3
2016	0.004	7.6	1.3	0.3
2017	0.005	11.8	2.7	0.3
2018	0.004	8.7	2.1	0.2
Manitowoc County Emissions (tons/year)				
2019	848	719	397	152

Key: CO = carbon monoxide; NO_x = nitrogen oxides; SO_2 = sulfur dioxide; PM_{10} = particulate matter less than or equal to 10 micrometers; VOC = volatile organic compounds

To convert tons per year to metric tons per year, multiply by 0.90718.

Source for Point Beach Air Emissions: NextEra 2021a; Source for Manitowoc Annual Air Emissions: WDNR Undated

The EPA promulgated the Regional Haze Rule to improve and protect visibility in national parks and wilderness areas from haze, which is caused by numerous, diverse air pollutant sources located across a broad region (40 CFR 51.308–309). Specifically, 40 CFR 81 Subpart D, "Identification of Mandatory Class I Federal Areas Where Visibility Is an Important Value," lists mandatory Federal areas where visibility is an important value. The Regional Haze Rule requires states to develop State Implementation Plans to reduce visibility impairment at Class I Federal Areas. There are no Class 1 Federal Areas in Wisconsin. The nearest Class 1 Federal Area to Point Beach is Seney Wilderness Area, which is approximately 150 mi (241 km) from Point Beach. Federal land management agencies that administer Federal Class I areas consider an air pollutant source that is located greater than 31 mi (50 km) from a Class I area to have negligible impacts with respect to Class I areas if the total sulfur dioxide, nitrogen oxide, particulate matter less than 10 microns, and sulfuric acid annual emissions from the source are less than 500 tons per year (70 FR 39104; NRR 2010). Given the distance of Point Beach to Class I areas and the air emissions presented in Table 3-4, there is little likelihood that ongoing activities at Point Beach adversely affect air quality in any such designated area.

3.3.3 Noise

Noise is unwanted sound that can be generated by many sources. Sound intensity is measured in logarithmic units called decibels (dB). A dB is the ratio of the measured sound pressure level to a reference level equal to a normal person's threshold of hearing. Another characteristic of sound is frequency or pitch. Noise may be comprised of many frequencies, but the human ear does not hear very low or very high frequencies. To represent noise as closely as possible to the noise levels people experience, sounds are measured using a frequency-weighting scheme known as the A-scale. Sound levels measured on this A-scale are given in units of A-weighted decibels (dBA). Levels can become annoying at 80 dBA and very annoying at 90 dBA. To the human ear, an increase of 3 dBA is barely noticeable and an increase of 10 dBA sounds twice as loud (EPA 1981).

Several different terms are commonly used to describe sounds that vary in intensity over time. The equivalent sound intensity level (Leq) represents the average sound intensity level over a specified interval, often 1 hour. The day-night sound intensity level (LDN) is a single value calculated from hourly Leq over a 24-hour period, with the addition of 10 dBA to sound levels from 10 p.m. to 7 a.m. This addition accounts for the greater sensitivity of most people to nighttime noise. Statistical sound level (Ln) is the sound level that is exceeded 'n' percent of the time during a given period. For example, L90, is the sound level exceeded 90 percent of the time and is considered the background level.

As discussed in Section 3.2.1 of this SEIS, Point Beach's designated land use is industrial. The area in the vicinity is primarily rural and characterized by farmland and small residential communities (NextEra 2020b). Manitowoc County has an ordinance that prohibits noise levels above certain thresholds for motor vehicles, radios, television, sound speaker systems, and record and tape equipment (Manitowoc County 2021). Primary offsite noise sources in the vicinity of Point Beach include vehicular traffic and farm machinery (Two Creeks Solar 2018). The nearest resident is approximately 1.2 mi (1.9 km) west of Point Beach's reactor containment buildings (NextEra 2020b).

Primary noise sources at Point Beach include emergency diesel generators, turbine generators, transformers, speakers, transmission lines, firing range, and mainsteam safety valves (NextEra 2020b). Between 2014–2020, NextEra did not receive offsite noise complaints as a result of Point Beach operations. NextEra does not anticipate refurbishment activities during the proposed subsequent license renewal term (NextEra 2020b). Therefore, the NRC staff expects that noise sources would remain similar to those currently at Point Beach.

3.3.4 Proposed Action

3.3.4.1 Air Quality

As described in the GEIS (NRC 2013a) and as cited in Table 3-1 for generic issues related to air quality, the impacts of nuclear power plant license renewal and continued operations would be SMALL. The NRC staff's review did not identify any new and significant information that would change the conclusion in the GEIS. Thus, as concluded in the GEIS, for these Category 1 (generic) issues, the impacts of continued operation of Point Beach on air quality would be SMALL. There are no site-specific (Category 2) air quality issues applicable to Point Beach (Table 3-2).

3.3.4.2 Noise

As described in the GEIS (NRC 2013a) and as cited in Table 3-1 for generic issues related to noise, the impacts of nuclear power plant license renewal and continued operations would be SMALL. The NRC staff's review did not identify any new and significant information that would change the conclusion in the GEIS. Thus, as concluded in the GEIS, for these Category 1 (generic) issues, the impacts of continued operation of Point Beach on noise would be SMALL. There are no site-specific (Category 2) air quality issues applicable to Point Beach (Table 3-2).

3.3.5 No-Action Alternative

3.3.5.1 Air Quality

Under the no-action alternative, the permanent cessation of Point Beach operations would reduce overall air pollutant emissions (e.g., from diesel generators and vehicle traffic). Therefore, the NRC staff concludes that if emissions decrease, the impact on air quality from the shutdown of Point Beach would be SMALL.

3.3.5.2 Noise

The permanent cessation of Point Beach operations would result in a reduction in noise from activities related to plant operation, including noise from the turbine generators, transformers, firing range, mainsteam safety values, and from vehicle traffic (e.g., workers, deliveries). As site activities are reduced, the NRC staff expects the impact on ambient noise levels to be less than current plant operations; therefore, the NRC staff concludes that impacts on noise levels from the no-action alternative would be SMALL.

3.3.6 Replacement Power Alternatives: Common Impacts

3.3.6.1 Air Quality

<u>Construction</u>

Construction of a replacement power alternative would result in temporary impacts on local air quality. Air emissions include criteria pollutants (particulate matter, nitrogen oxides, carbon monoxide, and sulfur dioxide), volatile organic compounds, hazardous air pollutants, and greenhouse gases (GHGs). Air emissions would be intermittent and would vary based on the level and duration of specific activities throughout the construction phase. During the construction phase, the primary sources of air emissions would consist of engine exhaust and fugitive dust emissions. Engine exhaust emissions would be from heavy construction equipment and commuter, delivery, and support vehicular traffic traveling to and from the facility as well as within the site. Fugitive dust emissions would be from soil disturbances by heavy construction equipment (e.g., earthmoving, excavating, and bulldozing), vehicle traffic on unpaved surfaces, concrete batch plant operations, and wind erosion to a lesser extent.

Various mitigation techniques and best management practices (e.g., watering disturbed areas, reducing equipment idle times, and using ultra-low sulfur diesel fuel) could be used to minimize air emissions and to reduce fugitive dust.

Operations

The impacts on air quality as a result of operation of a facility for a replacement power alternative would depend on the energy technology (e.g., nuclear or renewable). Worker vehicles and auxiliary power equipment will result in additional air emissions. Mechanical draft cooling towers will also result in air emissions for the new nuclear and natural gas alternatives.

3.3.6.2 Noise

Construction

Construction of a replacement power facility would be similar to the construction of any industrial facility in that they all involve many noise-generating activities. In general, noise emissions would vary during each phase of construction, depending on the level of activity, types of equipment and machinery used, and site-specific conditions. Typical construction equipment, such as dump trucks, loaders, bulldozers, graders, scrapers, air compressors, generators, and mobile cranes, would be used, and pile-driving and blasting activities could take place. Other noise sources include construction worker vehicle and truck delivery traffic. However, noise from vehicular traffic would be intermittent.

Operations

Noise generated during operations could include noise from transformers, turbines, equipment, speakers, as well as offsite sources, such as employees and delivery vehicular traffic. Noise from vehicles would be intermittent. With the exception of solar PV and onshore wind, mechanical draft cooling towers would also contribute to noise levels.

3.3.7 New Nuclear (Small Modular Reactor) Alternative

3.3.7.1 Air Quality

Construction

Air emissions and sources associated with construction of the new nuclear alternative would include those identified as common to all replacement power alternatives in Section 3.3.6.1. Because air emissions from construction activities would be limited, local, and temporary, the NRC staff concludes that the associated air quality impacts from construction of a new nuclear alternative would be SMALL.

Operations

Sources of air emissions from operation of a new nuclear alternative would include stationary combustion sources (e.g., diesel generators, auxiliary boilers, and gas turbines) and mobile sources (e.g., worker vehicles, truck deliveries) (NRC 2018a). Additional air emissions would result from the new nuclear plant’s use of mechanical draft cooling towers and could contribute to impacts associated with the formation of visible plumes, fogging, and subsequent icing downwind of the towers. In general, most stationary combustion sources at a nuclear power plant would operate only for limited periods during maintenance testing. A new nuclear power alternative would need to secure a permit from WDNR for air pollutants associated with its operations. Operation of a new nuclear alternative would result in air emissions similar in magnitude to air emissions, but slightly higher given the cooling towers, from operations of Point Beach given similar air emission onsite sources and worker vehicles. Therefore, the NRC staff concludes that the impacts of operation of a new nuclear alternative on air quality would be SMALL.

3.3.7.2 Noise

<u>Construction</u>

Noise generated during the construction of a new nuclear power plant would be similar to noise for all replacement power alternatives discussed in Section 3.3.6.2. Noise impacts during construction would be limited to the immediate vicinity of the Point Beach site. Based on the temporary nature of construction activities, the distance of noise sensitive receptors (approximately 1.2 mi (1.9 km) away) from the Point Beach site, and consideration of noise attenuation from the construction site, the NRC staff concludes that the potential noise impacts of construction activities from a new nuclear alternative would be SMALL.

<u>Operations</u>

Sources of noise during nuclear power plant operations would include those discussed for all replacement power alternatives in Section 3.3.6.2. Noise levels from these sources would be similar to noise levels generated during the operation of Point Beach. Operation of mechanical draft cooling towers would result in additional noise. However, given the distance of nearby sensitive receptors (approximately 1.2 mi (1.9 km) away) from the site and consideration of noise attenuation, the NRC staff does not expect offsite noise levels from mechanical towers to nearby receptors to be greater than current levels. Therefore, noise impacts during operations for a new nuclear alternative would be SMALL.

3.3.8 Natural Gas Combined-Cycle Alternative

3.3.8.1 Air Quality

<u>Construction</u>

Air emissions and sources for construction of the natural gas alternative would include those identified as common to all replacement power alternatives in Section 3.3.6.1. There would also be air emissions resulting from construction of a new pipeline that would connect with existing natural gas supply lines. Air emissions would be localized and intermittent and adherence to well developed and well understood construction best management practices would mitigate air quality impacts. Therefore, the NRC staff concludes that construction-related impacts on air quality from a natural gas alternative would be SMALL.

<u>Operations</u>

Operation of a natural gas plant would result in emissions of criteria pollutants and greenhouse gases released through heat recovery steam generator stacks. The NRC staff estimated air emissions for the natural gas alternative using emission factors developed by the U.S. Department of Energy's National Energy Technology Laboratory (NETL 2012). Assuming a total gross capacity of 1,380 MWe and a capacity factor of 0.87, the NRC staff estimates the following air emissions would result from operation of a natural gas alternative:

- carbon monoxide—36 tons (32 MT) per year
- nitrogen oxides—352 tons (320 MT) per year
- sulfur dioxide—14 tons (12 MT) per year
- particulate matter—4 tons (3 MT) per year
- carbon dioxide equivalents (CO_2eq)—4.5 million tons (4.1 million MT) per year

Operation of mechanical draft cooling towers and up to 120 worker vehicles would result in additional air emissions. A new natural gas alternative would need to secure a permit from WDNR for air pollutants associated with its operation. A new natural gas plant would qualify as a major emitting industrial facility. As such, the new natural gas plant would be subject to Prevention of Significant Deterioration (PSD) and Title V air permitting requirement under the Clean Air Act of 1970, as amended (42 U.S.C. 7651 et seq.), to ensure that air emissions are minimized and that the local air quality is not degraded substantially. Additionally, various Federal and State regulations aimed at controlling air pollution would affect a natural gas alternative.

Based on the NRC staff's air emission estimates, nitrogen oxide and greenhouse gas emissions from a natural gas plant would be noticeable and significant. Manitowoc County is designated as nonattainment and a maintenance area for various ozone standards. Ozone is formed by the chemical reaction of nitrogen oxides and volatile organic compounds in the presence of heat and sunlight. Therefore, given Manitowoc County's nonattainment and maintenance status and estimated nitrogen oxide emissions, the NRC staff concludes that the overall air quality impacts associated with operation of a natural gas alternative would be SMALL to MODERATE.

3.3.8.2 Noise

<u>Construction</u>

In addition to the onsite and offsite noise sources discussed in Section 3.3.6.2, construction of a natural gas pipeline to support operation of a natural gas alternative would result in additional offsite noise. Given the distance to noise sensitive receptors (approximately 1.2 mi (1.9 km) away), noise generated as a result of construction at Point Beach would not be noticeable. However, noise generated during construction of a natural gas pipeline may be noticeable, depending on the location and distance of nearby noise sensitive receptors relative to the 10-mi natural gas pipeline corridor. Therefore, the NRC staff concludes that the potential noise impacts of construction activities from a natural gas alternative would be SMALL to MODERATE.

<u>Operations</u>

During operations, noise sources from a natural gas alternative would include those discussed in Section 3.3.6.2 and mechanical draft cooling towers, as well as offsite mechanical noise from compressor stations and pipeline blowdowns. The majority of noise-producing equipment (turbines, pumps, mechanical draft cooling towers) would be located inside the power block, and the NRC staff does not anticipate noise levels to be significantly greater than noise levels currently at Point Beach. The Federal Energy Regulatory Commission requires that any new compressor station or any modification, upgrade, or update of an existing station must not exceed day-night sound intensity level of 55 dBA at the closest noise sensitive area (18 CFR 157.206). Day-night sound intensity level of 55 dBA was designated by the EPA as a noise level that is adequate to protect against outdoor activities (EPA 1974). Therefore, the NRC staff concludes that the noise impacts from operation of a natural gas alternative would be SMALL.

3.3.9 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

3.3.9.1 Air Quality

<u>Construction</u>

Air emissions associated with the construction of the new nuclear component of the combination alternative would be similar to, but less than, those associated with the new nuclear alternative discussed in Section 3.3.7.1, because this component would consist of two small modular reactor units. Therefore, the air quality impacts associated with construction of the new nuclear component of the combination alternative would be SMALL. The solar PV and onshore wind portion of the combination alternatives would not have a power block building. Accordingly, the number of heavy equipment and workforce, level of activities, and construction duration would be substantially lower than that for the other alternatives and consequently have less air emissions. Therefore, the NRC staff concludes that the overall air quality impacts associated with construction of the solar PV and onshore wind component of the combination alternatives would be SMALL.

Operations

Air emissions associated with the operation of the new nuclear component would be similar to those associated with the new nuclear alternative discussed in Section 3.3.7.1. Therefore, the air quality impacts associated with operations of the new nuclear component of the combination alternative would be SMALL. Direct air emissions associated with operation of the solar PV and onshore wind components of the combination alternatives are negligible because no fossil fuels are burned to generate electricity. Emissions from wind turbine arrays and solar fields would include fugitive dust and engine exhaust from worker vehicles and heavy equipment associated with site inspections, maintenance activities, and wind erosion from cleared lands and access roads. Emissions would be localized and intermittent. The NRC staff concludes that the overall air quality impacts associated with operation of the combination alternative would be SMALL.

3.3.9.2 Noise

Construction

Construction-related noise sources for the new nuclear component of the combination alternative would be similar to the new nuclear alternative discussed in Section 3.3.7.2. Therefore, the NRC staff concludes that the noise impacts associated with construction of the new nuclear component of the combination alternative would be SMALL.

A portion of the solar PV component would be located on the Point Beach site, but both the solar PV and onshore wind components would be located primarily offsite of the Point Beach site. The solar PV and onshore wind component of the combination alternative would have no power block buildings requiring construction. The number of heavy equipment and workforce, level of activities, and construction duration would be lower than for the other alternatives. However, noise levels generated by construction activities of a solar PV facility can range from 70 to 80 dBA at 50 ft (15 m) (BLM 2019). Blasting may be required during construction for turbine foundations (WAPA and FWS 2015; BLM 2013). Noise levels to nearby sensitive receptors of the solar PV and onshore wind portion of the combination alternative would depend on the distance from the sites to nearby receptors and may be noticeable. Therefore, noise impacts associated with construction of the solar PV and onshore wind component of the combination alternative would be SMALL to MODERATE. The NRC staff concludes that the overall noise impacts associated with construction of the combination alternative would be SMALL to MODERATE.

Operations

Noise impacts associated with the new nuclear component of the combination alternative would be similar to those described for the new nuclear alternative in Section 3.3.7.2. Therefore, the NRC staff concludes that operation-related noise impacts from the new nuclear component of the combination alternative would be SMALL.

The solar PV component of the combination alternative would have no power block or cooling towers; therefore, there would be a minimal number of noise sources such as transformers and vehicle traffic associated with maintenance and inspection activities. Therefore, the NRC staff concludes that operation-related noise impacts from the solar PV component of the combination alternative would be SMALL. Noise generated by wind turbines would include aerodynamic noise from the blades and mechanical noise from turbine drivetrain components (generator, gearbox). Depending on the location, layout, and proximity of wind farms to noise sensitive receptors, noise associated with operation of the wind portion of the combination alternative could be noticeable. Therefore, noise impacts associated with operation of the onshore wind component of the combination alternative could range from SMALL to MODERATE. The NRC staff concludes that the overall noise impacts associated with operations of the combination alternative would be SMALL to MODERATE.

3.4 Geologic Environment

This section describes the geologic environment of the Point Beach site and vicinity, including landforms, geology, soils, and seismic conditions. The description of the resources is followed by the NRC staff's analysis of the potential impacts on geologic and soil resources from the proposed action (subsequent license renewal) and alternatives to the proposed action.

3.4.1 Physiography and Geology

Section 3.5 of NextEra's ER (NextEra 2020b) describes the physiographic and geologic environment of the Point Beach site and vicinity. The NRC staff incorporates the information in the ER here by reference (NextEra 2020b: 3.4, 3-47–3-62). Except as otherwise cited for clarity, the staff summarizes this information in the following subsections. The staff identified no new and significant information regarding the geologic environment during the site audit, the scoping process, or as the result of its review of available information as cited in this SEIS.

Point Beach is located within the northern portion of the Central Lowlands physiographic province. The region was subject to extensive glaciation during the last Ice Age, and this glacial action is responsible for the presence of the Great Lakes and the current landforms and surficial geology across the site region. Site topography ranges from gently rolling to flat with elevations varying from 3 to 58 ft (0.9 to 17.7 m) above the plant datum. Plant datum (plant elevation zero) is defined as 580.2 ft above the international Great Lakes datum of 1955 (IGLD 1955), and is equal to 580.9 ft IGLD 1985. IGLD 1985 (IGLD85) is the datum that the U.S. Army Corps of Engineers (USACE) currently uses to report Lake Michigan water levels (NextEra 2020b).

Surficial deposits across the Point Beach site consist of a thick sequence of glacial drift including till and lake deposits, and derived soils. These materials, consisting of clays, silts, sands, gravel, cobbles, and boulders (in the lower part) are up to about 100 ft (30 m) thick beneath the plant site. The uppermost bedrock unit that underlies the glacial deposits is the Niagara formation (dolomite). This unit is up to 600 ft (180 m) thick. Bedrock that underlies the site dips to the east (beneath Lake Michigan) in association with a structural feature known as the Michigan Basin.

3.4.2 Geologic Resources

Geologic resources, encompassing rock and mineral resources, in the vicinity of the Point Beach site are primarily related to the area's extensive glacial deposits. Aggregate mining across Manitowoc County includes production of construction sand and gravel and crushed stone. Other commodities produced include lime and dimension stone (USGS 2019a).

However, there are no mapped mines or quarries (historic or active) within 5 mi (8 km) of the Point Beach site boundary (USGS 2021a).

3.4.3 Soils and Erosion

Native soils and the associated glacial parent materials in the vicinity of the Point Beach plant complex were disturbed during plant construction. Soil unit mapping by the Natural Resources Conservation Service (NRCS) identifies site soils, found in and near the Point Beach plant complex and extending north and south along the lakeshore as Udorthents, reflecting human-altered and human-transported materials (NextEra 2020b; USDA 2021). The NRCS-mapped soils located in relatively undisturbed areas surrounding the plant complex to the west and north primarily consist of loams and silt loams in the upper part and underlain by silty clay and clay. Mapped soils include Kewaunee loam, 2 to 6 percent slopes, Manawa silt loam, 0 to 3 percent slopes, and Manawa-Kewaunee-Poygan complex, 0 to 4 percent slopes. These soils are derived from loess (wind-deposited silt) and clayey till. The presence of expansive clays gives many of the soils a high shrink-swell potential and makes them poorly drained and prone to ponding. Nevertheless, all three of the dominant natural soils are listed as prime farmland or prime farmland, if drained. The NRCS rates the soil erosion hazard of the natural soils as slight to moderate but can be severe in the disturbed Udorthents materials.

As described in the ER, although they are a nature feature, the low bluffs near the center of the NextEra property where the plant is located show clear signs of erosion from storm action. In this area, the beach is narrow, ranging from 20 to 50 ft (6 to 15 m) wide, with actively eroding mud slopes. Riprap is in place to minimize erosion along the lower slopes between the plant and the beach. NextEra performs necessary shoreline and bank stabilization activities in accordance with an authorization from the USACE (NextEra 2020b).

In late 2019, NextEra initiated a project to construct a new breakwater structure (wave barrier) in Lake Michigan. The project was completed in August 2020. The breakwater extends north from near the midpoint of the Point Beach Unit 2 discharge flume for approximately 600 ft (185 m) to the existing breakwater structure. The second 600-ft (185-m) segment extends south from near the midpoint of the Point Beach Unit 1 flume and curves back to the existing shoreline near the training building parking lot. The breakwater structure consists of large armor stones (dolomite blocks) ranging up to dimensions of 12 x 6 x 5 ft (3.7 x 1.8 x 1.5 m) stacked on the lake bottom. As part of the project, NextEra also installed additional riprap protection along the shoreline, extending an additional 400 linear ft (120 m) and including the shoreline segment between the two discharge flumes (NextEra 2021a).

NextEra also has other site maintenance practices in place to minimize soil erosion. As required by NextEra's WPDES permits for Point Beach operation, NextEra has developed and implemented a Stormwater Pollution Prevention Plan (SWPPP) that includes soil erosion and sediment control measures to prevent erosion and potential water quality impacts (NextEra 2020b).

3.4.4 Seismic Setting

Eastern Wisconsin lies within the central portion of the stable North American craton. Most locations can go years without an earthquake strong enough for people to feel. Historically, the regional seismicity has featured relatively infrequent earthquakes of small to occasionally moderate magnitude.

Over the last 50 years (since 1970), no earthquakes with a magnitude equal to, or greater than, 2.5 have been recorded within a 50 mi (80 km) radius of the Point Beach site. During this timeframe, only one earthquake has been recorded within 150 mi (250 km) of the site (USGS 2021b). Earthquakes, including some strong enough to be felt across portions of Wisconsin, have occurred in adjoining states, including Michigan and Illinois, at distances of greater than 200 mi (320 km) from Point Beach (NextEra 2020b).

The NRC evaluates the potential effects of natural hazards, including seismic events, on nuclear power plants on an ongoing basis that is separate from the license renewal process. All nuclear power plants in the United States are designed and built to withstand strong earthquakes based on their location and nearby earthquake activity. Over time, the NRC's understanding of the seismic hazard for a given nuclear power plant may change as methods of assessing seismic hazards evolve and the scientific understanding of earthquake hazards improves (NRC 2014b, 2018b). As new seismic information becomes available, the NRC evaluates the information to determine whether changes are needed at existing plants or to NRC regulations.

3.4.5 Proposed Action

As evaluated and described in the GEIS (NRC 2013a) and as cited in Table 3-1, the impacts of nuclear power plant license renewal and continued operations on geology and soils would be SMALL. The NRC staff's review did not identify any new and significant information that would change the conclusion in the GEIS. Thus, as concluded in the GEIS, the staff finds that the impacts of Point Beach continued operation on the geologic environment would be SMALL. There are no site-specific (Category 2) geologic environment issues, as shown in Table 3-2.

3.4.6 No-Action Alternative

Under the no-action alternative, there would be little or no incremental impacts onsite geology and soils associated with the permanent shutdown of Point Beach. This is because before the beginning of decommissioning activities, little or no new ground disturbance would occur at the plant site as operational activities are reduced and eventually cease. As a result, the NRC staff concludes that the impact of the no-action alternative on geology and soils would be SMALL.

3.4.7 Replacement Power Alternatives: Common Impacts

<u>Construction</u>

During facility construction for replacement power alternatives and associated components, aggregate material (such as crushed stone, riprap, sand, and gravel) would be required to construct buildings, foundations, roads, parking lots, pad sites, transmission lines, and other supporting infrastructure, as applicable. The NRC staff presumes that these resources would be obtained from commercial suppliers using local or regional sources. Land clearing, grading, and excavation work expose soils to erosion and alter surface drainage. The staff also presumes that best management practices (BMPs) would be implemented in accordance with applicable state and local permitting requirements to reduce soil erosion and associated offsite impacts. These practices would include such measures as the use of sediment fencing, staked hay bales, check dams, sediment ponds, riprap aprons at construction and laydown yard entrances, mulching and geotextile matting of disturbed areas, and rapid reseeding of temporarily disturbed areas, where applicable. Standard construction practice dictates that topsoil removed during construction and any suitable excavated materials would be stored onsite for redistribution, such as for backfill at the end of construction.

<u>Operations</u>

Replacement power facilities would be built to conform with applicable state and local building codes. They would be sited and designed to mitigate potential impacts from natural phenomena. Once facility construction is completed, areas disturbed during construction, whether on land or offshore, would be within the footprint of the completed facilities, overlain by other impervious surfaces (such as roadways and parking lots), or revegetated or stabilized as appropriate, so there would be no additional land disturbance and no direct operational impacts on geology and soils. Consumption of aggregate materials or topsoil for maintenance purposes during operations would be negligible.

3.4.8 New Nuclear (Small Modular Reactor) Alternative

The impacts on geologic and soil resources from construction and operations associated with the new nuclear alternative would likely be similar to, but somewhat greater than, those described and assumed as common to all alternatives in Section 3.4.7. Implementation of this alternative would use existing infrastructure at Point Beach to the maximum extent possible, which would reduce construction impacts and connected impacts on site geology and soils, as well as consumption of geologic resources for new facility construction. However, excavation work for the nuclear power block associated with the SMR modules may extend to a depth of about 140 ft (43 m) below grade (NRC 2018a). Some blasting of bedrock may be necessary, and construction of ramps along with bracing would likely be required to access and maintain excavations during construction. Site construction work would also require the use and consumption of engineered backfill, which would likely need to be procured from offsite regional sources and transported to the site. Nevertheless, disturbance to geologic strata and soil erosion and loss under this alternative would be localized to the Point Beach site and adjoining areas within NextEra’s property, and offsite soil erosion impacts would be mitigated by using BMPs. As a result, the NRC staff concludes that the overall impacts on geology and soil resources from the new nuclear alternative would be SMALL.

3.4.9 Natural Gas Combined-Cycle Alternative

The impacts on geologic and soil resources from construction and operations associated with the natural gas alternative would likely be similar to, but of lesser intensity, than those described and assumed as common to all alternatives in Section 3.4.7. Impacts also would be generally similar to those associated with the new nuclear alternative. While more land would be disturbed and converted to industrial use to extend a natural gas pipeline to the plant site, the intensity of excavation work for the power block would be less under this alternative. Therefore, the NRC staff concludes that the impacts to geology and soil resources from this alternative would be SMALL.

3.4.10 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

Under this combination alternative, the impacts on geologic and soil resources would likely be similar to, but greater in overall magnitude, than those described and assumed as common to all alternatives in Section 3.4.7, and greater than those under either the new nuclear or natural gas alternatives. This greater potential for impacts primarily is driven by the substantial land area that would be disturbed at multiple offsite locations, along with the potential for soil erosion and loss of natural soils and sediments from the conversion of land to industrial uses for the build-out of the solar photovoltaic and wind components of the alternative. Based on these considerations, the NRC staff concludes that the potential impacts on geology and soil resources from the combination alternative could range from SMALL to MODERATE.

3.5 <u>Water Resources</u>

This section describes surface water and groundwater resources at and around the Point Beach site. The description of the resources is followed by the NRC staff's analysis of the potential impacts on surface water and groundwater resources from the proposed action (subsequent license renewal) and alternatives to the proposed action.

3.5.1 Surface Water Resources

Surface water encompasses all water bodies that occur above the ground surface, including rivers, streams, lakes, ponds, and man-made reservoirs or impoundments.

3.5.1.1 Surface Water Hydrology

The NRC staff previously considered the interaction of Point Beach's cooling and auxiliary water systems with the hydrologic environment in Section 2.1.3 of NUREG-1437, Supplement 23, for the initial license renewal of Point Beach (NRC 2005a) (see also Section 2.1.3 of this SEIS). In Sections 3.1.2 and 3.6.1 of its ER for the proposed subsequent license renewal, NextEra provides a detailed description of the current topographic and hydrologic setting of the Point Beach site, the adjoining shoreline and waters of Lake Michigan, flood protection, and related operational interactions between the Point Beach plant and surface water resources. This information is incorporated here by reference (NextEra 2020b: 3.1.2, 3.6.1, 3-3, 3-7, 3-63–3-68). Except as cited for clarity, the staff summarizes this information in the following subsections. The staff did not identify any new and significant information regarding the surface water affected environment during the site audit, the scoping process, or as the result of its review of available information as cited in this SEIS.

<u>Local and Regional Hydrology</u>

The central surface water feature of the Point Beach site is Lake Michigan. Surface water generally drains from west to east across the plant property (plant site) toward the lake (Figure 3-1). However, upland areas just to the west of the Point Beach plant complex divert the two unnamed streams that cross the plant property to the north and south. As a result, the first creek flows into the lake at a point about 1,500 ft (460 m) north of the northern corner of the NextEra property boundary, which is approximately 1.4 mi (2.3 km) north of the center point of the Point Beach nuclear island. The other stream enters the lake closer to the center of the site, approximately 0.5 mi (0.8 km) south of the center of the nuclear island. Overall, the property is poorly drained, and ponding of shallow depressions occurs during the spring.

The Point Beach plant complex is located atop low bluffs along the lake. The shoreline shows evidence of erosion near the center of the plant property, particularly from major storms. As discussed in Section 3.4.1 of this SEIS, NextEra has recently completed a major project to stabilize the lake shoreline adjacent to the plant.

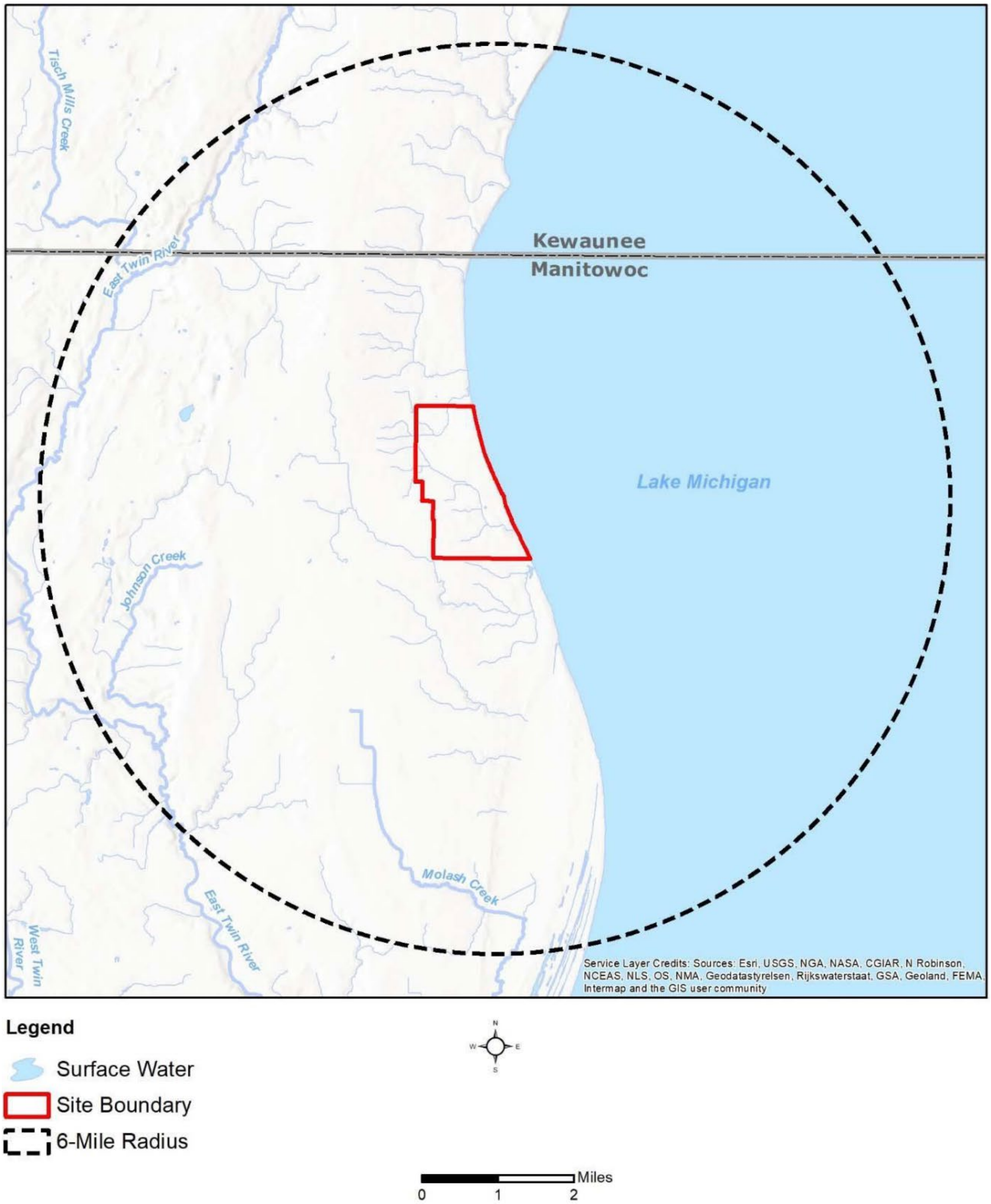
Water depths offshore from Point Beach range from about 30 ft (9 m) at a distance of 1 to 1.5 mi (1.6 to 2.3 km) from the shore and increase to around 60 ft (18 m) at a distance of 3 to 3.5 mi (4.8 to 5.6 km) from the shoreline. Currents on the western lakeshore where Point Beach is located are predominantly to the north. Wave-induced littoral drift is also predominantly to the north along the shoreline.

Water levels in Lake Michigan have recently declined from record high elevations in 2020, but lake levels remain above the long-term monthly average (USACE 2021a). As of June 2021, the mean water level in Lake Michigan was 580.49 ft IGLD 85, as compared to 582.18 ft IGLD85 in June 2020. The long-term lake level for the period of record (1918-2020) is 579.30 ft IGLD85 (USACE 2021b).

Flooding

The Federal Emergency Management Agency (FEMA) has delineated the flood hazard areas in the vicinity of the Point Beach site. FEMA has mapped the majority of the plant site including the entire main plant complex as Zone X, representing areas of minimal flood hazard and lying outside the 0.2 percent annual chance floodplain (100-year flood level) (NextEra 2020b; FEMA 2021).

Additionally, there is no record of the Point Beach site having been flooded by Lake Michigan (NextEra 2020b). The location of the plant complex relative to the shoreline, shoreline protection, the local slope and grading of the terrain, and the contour of the lake bottom reduce the risk of flooding from external and internal events. Elevations across the plant site average 20 ft (6 m) above plant datum (elevation zero), which is equal to 580.9 ft IGLD85 (see Section 3.4.1 of this SEIS). All safety-related equipment in the plant pumphouse is located at elevations above 9 ft (2.7 m) plant datum (NextEra 2020b).



Source: NextEra 2020b

Figure 3-1 Major Surface Water Features Associated with the Point Beach Site

In accordance with the NRC's general design criteria (Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities"), plant structures, systems, and components important to safety are designed to withstand the effects of natural phenomena, such as flooding, without loss of capability to perform safety functions. Point Beach is designed and located such that the plant site is protected from lake flooding, wave runup, and from postulated internal and external flooding sources, and winter ice buildup (NextEra 2020b).

Additionally, the staff evaluates nuclear power plant operating conditions and physical infrastructure to ensure ongoing safe operations through its Reactor Oversight Process (ROP). If new information about changing environmental conditions becomes available, the NRC will evaluate the information to determine whether any safety-related changes are needed. The NRC also evaluates new information important to flood projections and independently confirms that an applicant's or licensee's actions appropriately consider potential changes in flooding hazards at the site.

3.5.1.2 Surface Water Use

The waters of Lake Michigan support a wide variety of public, commercial, recreational, and conservation uses, including municipal and industrial water supply.

Point Beach withdraws water from Lake Michigan for use in the circulating water and service water cooling systems and returns the non-contact cooling water and permitted effluents to the lake through the plant's two discharge flumes (see Section 2.1.3.1 and Figure 2-3 of this SEIS).

Point Beach's peak (nominal) surface water withdrawal rate is 769,160 gpm (2.92 million Lpm), or approximately 1,108 mgd (4,190 mLd) (see Section 2.1.3.1 of this SEIS). In the SEIS for initial license renewal for Point Beach, the NRC staff cited a maximum total intake rate of 1,554 cubic feet per second, which is approximately 698,000 gpm (2,640 million Lpm) (NRC 2005a). Table 3-5 summarizes Point Beach's actual surface water withdrawals over the last 5 years.

Table 3-5 Surface Water Withdrawals, Point Beach (2016–2020)

Year	Yearly Withdrawals (mgy)	Daily Withdrawals (mgd)[a]
2016	345,360	946
2017	330,693	906
2018	330,882	907
2019	333,952	915
2020	339,066	929
Average	**335,991**	**921**

[a] All values are rounded. To convert million gallons per year (mgy) to million cubic meters (m^3), divide by 264.2. To convert million gallons per day (mgd) to million liters per day (mLd), multiply by 3.7854.

Source: NextEra 2020b; WDNR 2021a

NextEra monitors Point Beach's surface water withdrawals from Lake Michigan and submits annual reports to the WDNR in accordance with Wisconsin's "Water Use Registration and Reporting" regulations (WAC NR 856) (NextEra 2020b; WDNR 2021a). Point Beach's surface water withdrawals are subject to a State-issued Water Use Individual Permit, which was issued in May 2013, and the State's regulation at WAC NR 860. The permit expires on May 23, 2023. The modified permit allowed NextEra to increase Point Beach's water withdrawals from all surface water and groundwater sources up to a maximum of 1,251,823,000 gpd, or approximately 1,251.8 mgd (4,738.6 mLd). The permit also sets a limit on water loss (consumptive use) of 12,537,480 gpd, or about 12.5 mgd (47.3 mLd) (NextEra 2020b). This usage and consumptive use are almost exclusively related to Point Beach's cooling water intake system (see Section 3.5.2.2 of this SEIS regarding Point Beach groundwater use).

As evaluated by the NRC staff in Sections 3.5.1.1 and 4.5.1.1 of the license renewal GEIS, surface water withdrawals by operating nuclear power plants with once-through heat dissipation systems have not been found to result in water use conflicts with other users. This is because, as reflected in Point Beach's permit limits, such systems inherently return all but a very small fraction of the water they withdraw to the water source, as compared to closed-cycle systems (NRC 2013a).

3.5.1.3 Surface Water Quality and Effluents

Water Quality Assessment and Regulation

In accordance with Section 303(c) of the Federal Water Pollution Control Act (i.e., Clean Water Act of 1972, as amended (CWA) (33 U.S.C. 1251–1387), States have the primary responsibility for establishing, reviewing, and revising water quality standards for the Nation's navigable waters. Such standards include the designated uses of a water body or water body segment, the water quality criteria necessary to protect those designated uses, and an antidegradation policy with respect to ambient water quality. As established under CWA Section 101(a), water quality standards are intended to restore and maintain the chemical, physical, and biological integrity of the Nation's waters and to attain a level of water quality that provides for designated uses. EPA reviews each State's water quality standards to ensure that they meet the goals of the CWA and Federal water quality standards regulations (40 CFR Part 131, "Water Quality Standards"). The WDNR issues surface water quality standards in Wisconsin in accordance with its regulations codified at WAC NR 102.

CWA Section 303(d) requires States to identify all "impaired" waters for which effluent limitations and pollution control activities are not sufficient to attain water quality standards in such waters. Similarly, CWA Section 305(b) requires States to assess and report on the overall quality of waters in their State. States also prepare a CWA Section 303(d) list that identifies those water quality limited waterbodies that require the development of total maximum daily loads to assure future compliance with water quality standards. The list also identifies the pollutant or stressor causing the impairment and establishes a priority for developing a control plan to address the impairment. The total maximum daily loads specify the maximum amount of a pollutant that a water body can receive and still meet water quality standards. Once established, total maximum daily loads are often implemented through watershed-based programs administered by the State, primarily through permits issued under the National Pollutant Discharge Elimination System (NPDES) permit program, under CWA Section 402, and associated point and non-point source water quality improvement plans and associated BMPs. States must update and resubmit their impaired waters list every 2 years, which ensures that impaired waters continue to be monitored and assessed by the state until applicable water quality standards are met.

Wisconsin has designated the open waters of Lake Michigan for recreation use, fish and aquatic life, and public water supply (WAC NR 104). Overall, the waters of Lake Michigan support their designated uses. The EPA approved Wisconsin's 2020 303(d) list of impaired waters on October 13, 2020 (WDNR 2021b). Wisconsin's 303(d) list shows that the waters of Lake Michigan lying within Manitowoc County continue to be impaired for fish consumption due to polychlorinated biphenyls (PCBs) and mercury in fish tissue (WDNR 2021c). In addition, and as summarized in the ER, a number of lakeshore beaches in Manitowoc County have impaired water quality due to high bacterial levels (i.e., E. coli), attributable to point source and non-point source runoff (NextEra 2020b; WDNR 2021c).

Wisconsin Pollutant Discharge Elimination System Permitting Status and Plant Effluents

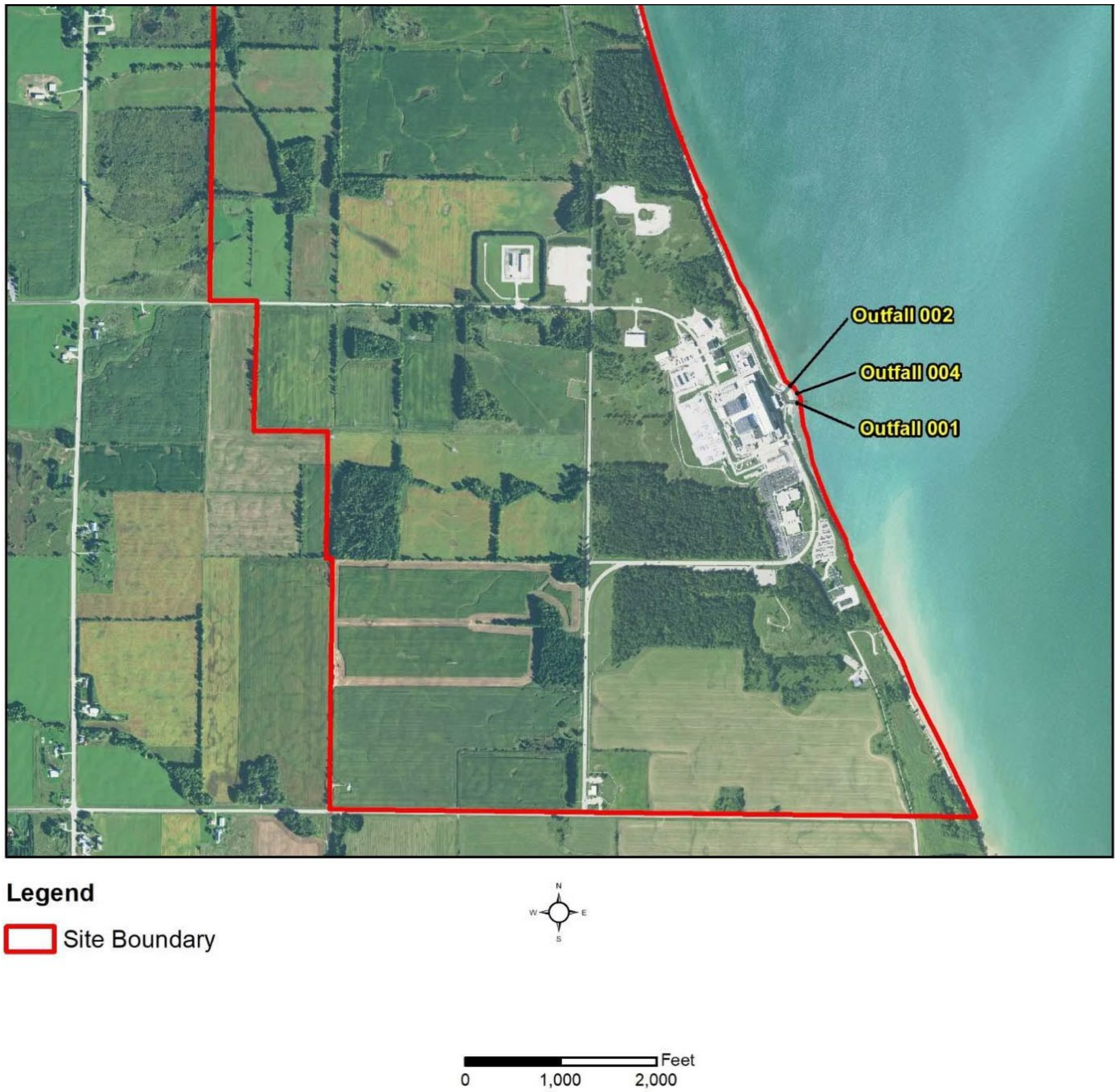
To operate a nuclear power plant, NRC licensees must comply with the CWA, including associated requirements imposed by EPA or the State, as part of the NPDES permitting system under CWA Section 402. The Federal NPDES permit program addresses water pollution by regulating point sources (i.e., pipes, ditches) that discharge pollutants to waters of the United States. NRC licensees must also meet state water quality certification requirements under CWA Section 401. EPA or the States, not the NRC, sets the limits for effluents and operational parameters in plant-specific NPDES permits. Nuclear power plants require a valid NPDES permit and a current Section 401 Water Quality Certification to operate.

EPA authorized the state of Wisconsin to assume NPDES program responsibility. WDNR administers the program as the Wisconsin Pollutant Discharge Elimination System (WPDES). The State's regulations for administering the WPDES program are contained in the Wisconsin Administrative Code at WAC NR 200-299. WDNR issues WPDES permits on a 5-year cycle.

Point Beach is authorized to discharge various wastewater (effluent) streams under WPDES individual (site-specific) permit WI-0000957-08-0. This permit has an effective date of July 1, 2016, and it expired on June 30, 2021 (WDNR 2016a). NextEra submitted a timely permit renewal application to WDNR in December 2020 (NextEra 2020c) in accordance with Wisconsin's regulations specified at WAC NR 200.06. Therefore, NextEra's 2016 permit remains valid and in force. The NRC staff reviewed NextEra's WPDES renewal application. Based on its review of the application and current permit, the staff finds that NextEra has not proposed any substantial changes in Point Beach's effluent discharges with consequences for the proposed subsequent license renewal term.

The WPDES permit authorizes monitored discharge from 10 outfalls, including 3 external outfalls and 7 internal outfalls. External outfalls discharge directly to a surface water body or to a feature that connects directly to a water body, while internal outfalls contribute flow to other waste stream(s) before collectively discharging into an external outfall. At Point Beach, external Outfalls 001 and 002 are the condenser cooling water return flows for Units 1 and 2 to Lake Michigan through the south and north flume structures, respectively (see Figure 3-2).

NextEra's WPDES permit (WDNR 2016a) further specifies the pollutant-specific discharge limitations and monitoring requirements for effluents discharged through each outfall to ensure that Point Beach's discharges comply with applicable water quality standards. Depending on the outfall, NextEra is required to monitor flow rate, pH, total suspended solids, heat rejection, average and maximum temperature, effluent toxicity, total residual halogen (as total residual chlorine), oil and grease, phosphorus, biochemical oxygen demand, and other specified parameters. In addition, under its WPDES permit, NextEra must notify and seek approval from WDNR before using any new water treatment chemicals (e.g., biocides or chemical additives) or to increase quantities used, as such changes could alter Point Beach's permitted effluent quality (WDNR 2016a). Table 3.6-2 in NextEra's ER (NextEra 2020b) summarizes applicable effluent (water quality) monitoring requirements under Point Beach's WPDES permit including a description of the processes that contribute flow to each outfall. The NRC staff incorporates the information in ER Table 3.6-2 (NextEra 2020b: Table 3.6-2, 3-79–3-81), here by reference.



Source: Modified from NextEra 2020b

Figure 3-2 Point Beach Major Permitted WPDES Outfalls

The current WPDES permit also sets an upper limit on the heat rejected from the plant's condenser cooling water flow to Lake Michigan. This limit is 8,273 MBTU/hr. NextEra must calculate the heat load value daily based on flow rate and the average intake and discharge water temperatures (NextEra 2020b; WDNR 2016a). This limit accounts for operational changes implemented at Point Beach associated with the extended power uprate (EPU) that the NRC approved in 2011, and the supporting NRC environmental assessment (NRC 2011; 76 FR 22928). As documented in Attachment B to WPDES permit WI-0000957-08-0 (WDNR 2016a), the WDNR had determined that the heat load limit on Point Beach's cooling water discharge satisfies CWA Section 316(a) variance requirements. Specifically, WDNR determined that discharges at the maximum heat load are protective of the balanced, indigenous community of shellfish, fish, and wildlife in and on Lake Michigan and that no temperature limit is needed for Point Beach's thermal discharges. As discussed in its ER, NextEra reports that the heat load of Point Beach's cooling water discharges has remained below 8,273 MBTU/hr over the last 5 years. NextEra does not plan any facility modifications or operational changes during the proposed subsequent license renewal term that would change Point Beach's thermal discharges (NextEra 2020b).

Treated and monitored, low-level radioactive liquids are intermittently discharged from the plant liquid waste disposal system to the environment. Such discharges must be ALARA and meet 10 CFR Part 20 limits. The plant's liquid wastes are collected in tanks where NextEra chemistry personnel sample and analyze the liquids to determine if the liquids are suitable for release. If suitable for discharge and other plant operating conditions are met, the liquids are pumped from the tanks through a flow meter and radiation monitor. The release point is to the service water discharge header, which leads to the circulating cooling water discharge flow to Outfall 001. As a safeguard, the radiation monitoring system will close the discharge value if radioactivity is detected at levels exceeding preset values (NextEra 2020b).

For all monitored effluent parameters, NextEra submits discharge monitoring reports to the WDNR in accordance with the reporting schedule specified in its WPDES permit. NextEra reports that it has not received any notices of violation from regulatory agencies between 2015 and 2020 (NextEra 2020b, 2021a). The NRC staff's review of EPA's Enforcement and Compliance History Online system 5-year compliance history (January 2016 through July 2021) revealed no notices of violation (EPA 2021d). However, as summarized in NextEra's ER and in response to a staff request for confirmation of information, NextEra has self-reported several effluent exceedances to the WDNR over the last 5 years. These include exceeding the total residual halogen concentration in the cooling water outfalls in December 2018 (Outfall 001) and in March 2020 (Outfall 002), and exceeding several total suspended solids limits in April 2016 (Outfall 104, sanitary effluent); March 2019 (Outfall 104); and December 2020 (Outfall 105) (NextEra 2020b, 2021a; EPA 2021d).

Industrial stormwater discharges from the Point Beach plant site are regulated under a separate WPDES general permit. As cited in NextEra's ER, WPDES general permit WI-S067857-4 expired on May 31, 2021 (NextEra 2020b, NextEra 2021a). However, the WDNR automatically extended coverage to permit holders upon issuance of new general permits for Tier 2 industrial facilities, with an effective date of May 31, 2021 (NextEra 2021a; WDNR 2021d). Therefore, Point Beach is now covered under general permit WI-S067857-5.

In summary, NextEra maintains four stormwater retention ponds that mainly receive runoff from site parking lots. A total of 13 stormwater outfalls (numbers 01 through 09, Parking Lots A through C, and Warehouse 7) receive flow from industrial areas of the plant site as well as collected groundwater. NextEra conducts quarterly inspections of the outfalls as prescribed in the WPDES general permit. NextEra also maintains and implements a Stormwater Pollution Prevention Plan (SWPP) for Point Beach operations that identifies the sources of stormwater pollution and documents control measures, including BMPs to eliminate or reduce pollutants in all stormwater discharges from the facility (NextEra 2020b).

<u>Other Surface Water Resources Permits and Approvals</u>

An applicant (in this case, NextEra) for a Federal license to conduct activities that may cause a discharge of regulated pollutants into navigable waters of the United States is required by CWA Section 401 to provide the Federal licensing agency (in this case, the NRC) with water quality certification from the responsible certifying authority (in this case, the State of Wisconsin). This certification denotes that discharges from the project or facility to be licensed will comply with CWA requirements and will not cause or contribute to a violation of State water quality standards. If the applicant has not received Section 401 certification, the NRC cannot issue a renewed license unless the State has otherwise waived the requirement.

In July 2020, EPA published a final rule revising the procedural requirements for CWA Section 401 certifications at 40 CFR 121 (85 FR 42210). The final rule became effective on September 11, 2020.[3] The revised regulations at 40 CFR 121.6 require that the Federal licensing agency establish the "reasonable period of time" and communicate that deadline to the appropriate certifying authority within 15 days of receiving notice of the applicant's certification request. Under the revised regulations, under no circumstances can the certifying authority take more than 1 year to issue the requested certification, deny certification, or waive its right to certify. The certifying authority's failure or refusal to act on a certification request within the reasonable period of time is considered a waiver.

The NRC recognizes that some NPDES-delegated states explicitly integrate their CWA Section 401 certification process with NPDES permit issuance. As indicated in its regulations at WAC NR 299, it is the policy of the State of Wisconsin to waive CWA Section 401 certification for any wastewater discharge associated with an activity that will be regulated by the permit authority under Chapter 283 (Pollutant Discharge Elimination) of the Wisconsin statutes. NextEra states in its ER (NextEra 2020b) that in support of the initial license renewal of Point Beach, the previous plant owner/operator received confirmation from the State that CWA Section 401 certification was met by issuance of a WPDES permit and the State waived certification. Nevertheless, NextEra sought confirmation from the WDNR that no new CWA Section 401 certification was required for subsequent license renewal. By letter dated January 22, 2021 (NextEra 2021b), NextEra requested consultation with WDNR on the Point Beach subsequent license renewal application and to confirm its interpretation of the CWA Section 401 certification waiver provisions at WAC NR 299. In correspondence dated February 9, 2021, in response to NextEra's request, the WDNR Bureau of Waterways provided confirmation that WAC NR 299 provides the WDNR the ability to waive certification for facilities that have a WPDES permit. Further, WDNR indicated that no separate CWA Section 401 water quality certification would be required for a WPDES permitted facility (WDNR 2021e).

The NRC staff received a copy of NextEra's consultation request letter to the State of Wisconsin on January 26, 2021. On February 9, 2021, in accordance with the requirements of the CWA Section 401 certification regulations, the NRC staff sent a letter dated February 8, 2021 (via e-mail correspondence) to the WDNR to notify them of the reasonable period of time for the State to act on NextEra's CWA Section 401 certification request for subsequent license renewal (NRC 2021e). Specifically, the staff established a timeframe of 6 months from the date of NextEra's January 26, 2021, request for the State certifying authority to act. In response, the WDNR directed the staff to its February 9, 2021, reply to NextEra, as described above. The NRC staff concludes that the documentation referenced above as provided by the WDNR in response to NextEra's request for consultation on Point Beach subsequent license renewal provides the necessary certification waiver pursuant to CWA Section 401(a)(1) to support license renewal.

CWA Section 404 governs the discharge of dredge and fill materials to navigable waters, including wetlands, primarily through permits issued by the USACE and applicable state-level permitting programs. NextEra has USACE permit authorization to conduct bank stabilization activities at Point Beach, as previously described in Section 3.4.3 of this SEIS. However, no maintenance dredging has occurred at Point Beach and NextEra has no plans to conduct dredging in the vicinity of plant intake and discharge facilities during the subsequent license renewal term (NextEra 2020b).

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[3] In 2021, the EPA initiated a process to reconsider and revise the 2020 CWA Section 401 Certification Rule (86 FR 29541).

3.5.2 Groundwater Resources

This section describes the groundwater flow systems (aquifers) and water quality in and around the Point Beach site. Aquifers are a formation, group of formations, or part of a formation that contain sufficient saturated, permeable material to yield significant quantities of water to wells and springs.

3.5.2.1 Local and Regional Groundwater Resources

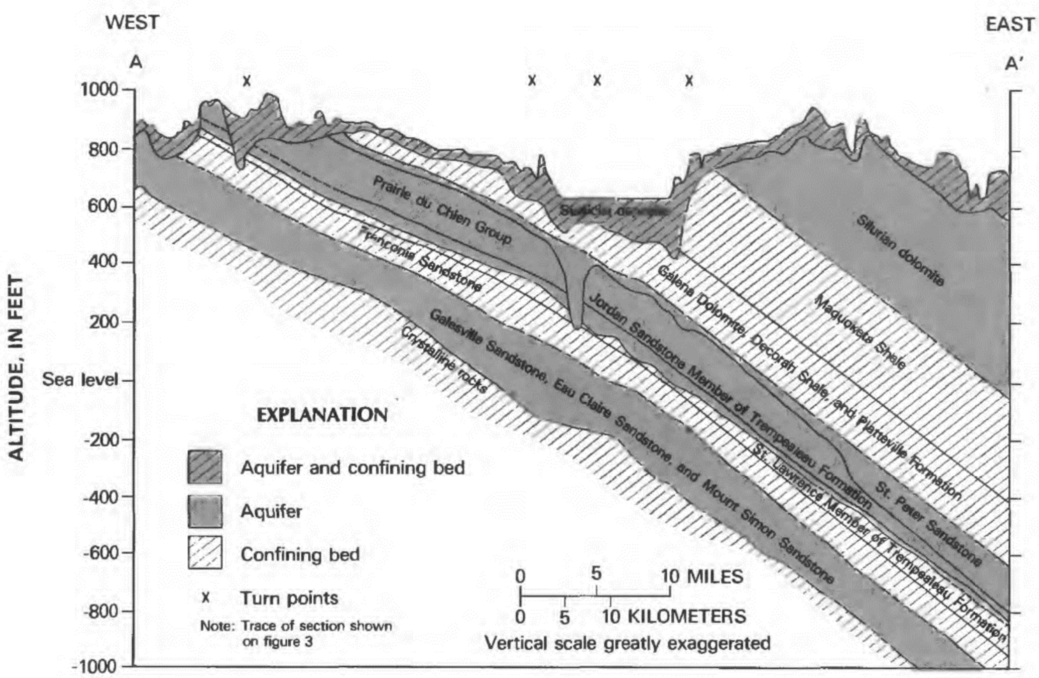
Sections 3.5.2 and 3.6.2 of NextEra's ER (NextEra 2020b) describe the geology and groundwater resources, respectively, in the Point Beach site vicinity. The NRC staff incorporates the information in the ER (NextEra 2020b: 3.5.2, 3.6.2; 3-47–3-49, 3-68–3-71) and the SEIS for initial license renewal of Point Beach (NRC 2005a: Sections 2.2.2 and 2.2.3) here by reference. A summary of this information is provided in the following subsections. The staff did not identify any new or significant information related to the groundwater resources during the site audit, the scoping process, and its review of information available as cited in this SEIS.

In the northern portion of the Central Lowlands physiographic province of eastern Wisconsin, where the Point Beach site is located, groundwater occurs in a shallow surficial aquifer and a deeper bedrock aquifer system known as the Silurian dolomite aquifer. Regional and site geology are discussed in Section 3.4.1 of this SEIS. The surficial aquifer is mainly comprised of unconsolidated sand and gravel deposits resulting from glacial drift with some alluvial and aeolian deposits. The shallow surficial aquifer is generally under water-table conditions except where laterally extensive clay layers are present. The Silurian dolomite aquifer occurs within the Niagara dolomite, which is a massive light-gray dolomite that contains minor amounts of calcite and gypsum, pyrite, and beds of shale and limestone. It dips and thickens to the east and thins to the west (Figure 3-3). It is thickest along the Lake Michigan shoreline. Most of the hydraulic conductivity of the Silurian aquifer is due to fractures associated with joints and bedding planes that have been enlarged through solution by moving water. The sequence of dolomite experiences artesian conditions in areas where sufficient clay and silt of unconsolidated deposit overlie the unit. The underlying Ordovician Maquoketa Shale, undifferentiated Galena dolomite, Decorah formation, and Platteville formation together form a confining unit between the Silurian aquifer and the underlying sandstone aquifer. The sandstone aquifer consists of the hydraulically connected St. Peter Sandstone and Prairie du Chien of Ordovician age and the Jordan Sandstone Member of the Trempealeau formation of Cambrian age, with a combined thickness up to approximately 300 ft in the region (NextEra 2020b; Section 3.5.2).

In the vicinity of Point Beach, surficial deposits of the surficial water-table aquifer are approximately 110-ft (33-m) thick and have a hydraulic conductivity ranging from 0.0028 to 0.28 ft/d (1×10^{-6} to 1×10^{4} cm/s). Infiltration of local precipitation is the principal source of recharge to the surficial aquifer. Groundwater in the aquifer generally flows from west to east toward Lake Michigan, with a hydraulic gradient of approximately 30 ft per mile.

The Silurian dolomite aquifer is approximately 600 ft (183 m) thick, is under confined conditions and does not outcrop at the Point Beach site (NextEra 2020b). As indicated in the Point Beach SEIS for initial license renewal (NRC 2005a), water levels in site wells completed in the Silurian dolomite indicate an artesian condition at the site. Values of hydraulic conductivity ranging from 0.017 to 8,000 ft/d (approximately 6×10^{-6} to 2.8 cm/s), and well yields varying between 5 and 600 gal/min were reported in the Silurian dolomite (Emmons 1987). Recharge to the Silurian aquifer and other lower bedrock aquifer mainly occurs where the units subcrop beneath the surficial deposits. The NRC staff's understanding of the site was informed by a review of its conceptual model, developed by NextEra for the Point Beach site.

The EPA has designated no sole source aquifers in the states of Wisconsin or Michigan (EPA 2020c).



Source: Emmons 1987

Figure 3-3 Hydrogeologic Section in the Vicinity of the Point Beach Site

3.5.2.2 Local and Regional Water Consumption

The main source of water in the northern portion of the Central Lowlands physiographic province of eastern Wisconsin is the Silurian aquifer. On the Point Beach site, groundwater is supplied from this aquifer from five onsite domestic water supply wells permitted through the WDNR to supply the site with potable/drinking water and sanitary and fire suppression water. These wells are the E-10 site supply well, Energy Information Center well, Site Boundary Control Center well, Warehouse 6 well, and Warehouse 7 well. Section 3.6.3.2 of NextEra's ER further summarizes the construction details, uses, and applicable permits regarding these wells (NextEra 2020b). The approved maximum withdrawals rates range from 2,000 gpd (1.4 gpm) to 100,000 gpd (69.4 gpm) (WDNR 2011a). The average groundwater withdrawals rate by Point Beach in 2019 was 10,205 gpd (7 gpm) and averaged 12,542 gpd (8.7 gpm) between 2015 and 2019 (NextEra 2020b: Table 3.6-8a).

There are 62 offsite registered private groundwater wells within a 2-mi (3.2 km) radius of Point Beach. These wells are located to the north, west, and south of the site and withdraw primarily groundwater from the Silurian aquifer for domestic purposes.

Other groundwater withdrawals are reported in nearby counties for livestock and public water supplies. In 2015, groundwater withdrawals at 5.61 mgd were reported in Manitowoc County, with livestock withdrawals as the largest use at 2.34 mgd in Manitowoc County and 2.00 mgd in

Kewaunee County. Public water supply was the next largest groundwater use, with withdrawals of 1.36 mgd in Manitowoc County and 0.87 mgd in Kewaunee County (USGS 2020b).

3.5.2.3 Groundwater Quality

A sole source aquifer is an aquifer that supplies at least 50 percent of the drinking water for an associated service area and no reasonably available alternative drinking water sources exist should the aquifer become contaminated (EPA 2020c). Point Beach obtains its water supply from wells that draw water from the Silurian aquifer, which is not a sole source aquifer (NextEra 2020b).

The chemical quality of the shallow aquifer system is suitable for most uses and, as a result, this aquifer is the source of most potable groundwater supplies in the area. However, the water may require treatment because of the hardness caused by major dissolved ions (calcium, magnesium, and bicarbonate) and locally high concentrations of iron and manganese (Kammerer 1995).

Groundwater Protection Program

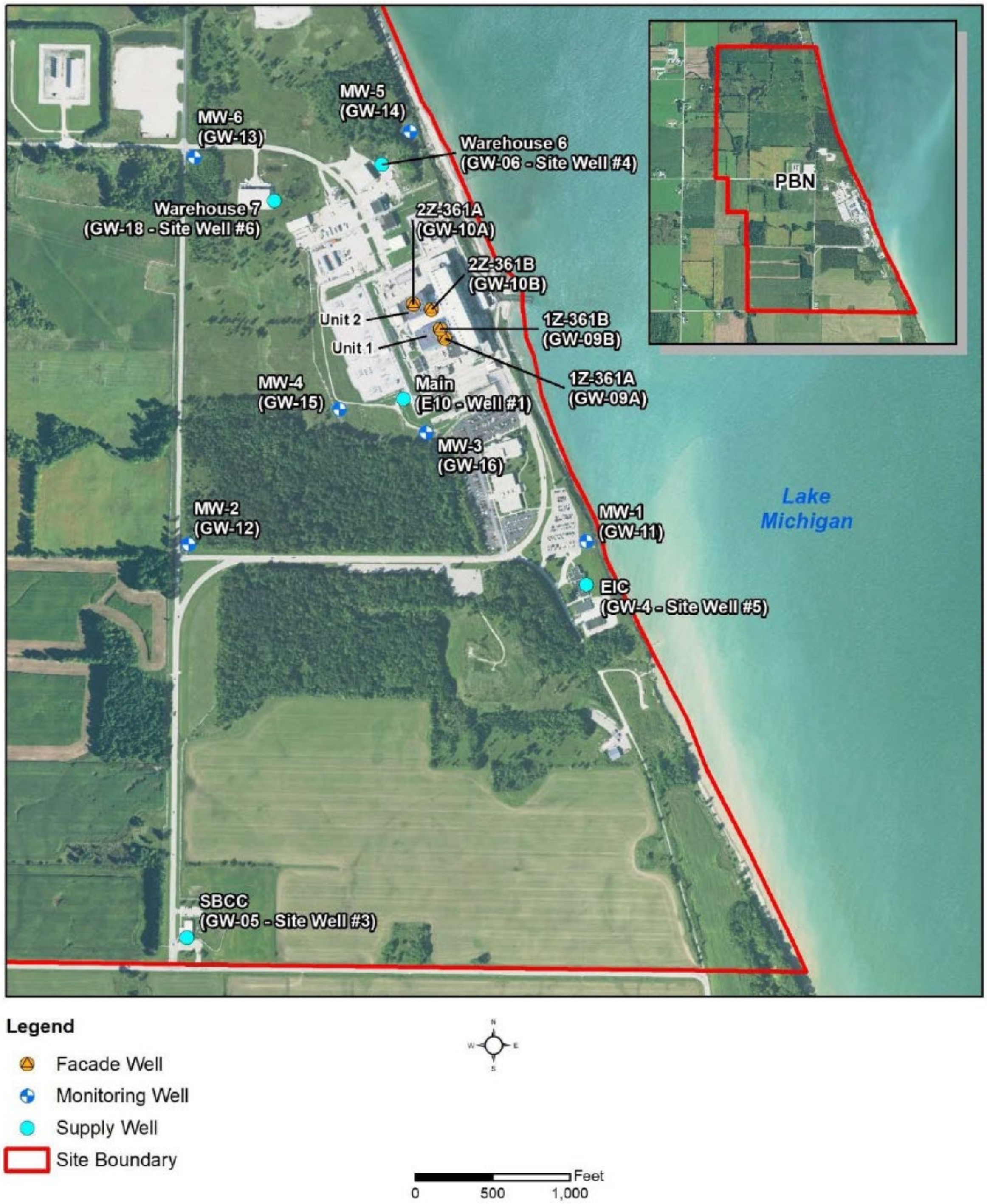
Groundwater quality at the Point Beach site is monitored through the Point Beach groundwater protection program, which is described in Section 3.6.2.4 of NextEra's ER (NextEra 2020b). This program was implemented in 2008 based on the updated Industry Groundwater Protection Initiative–Final Guidance Document (NEI 2007), which requires that that the program address site geology, hydrology, groundwater, risk assessment, and remediation and identify actions to effectively respond, manage, and communicate incidents involving impact on the subsurface and groundwater from inadvertent release of radioactive materials.

The NRC staff determined that the potential radiological sources identified at Point Beach include the spent fuel pool under the plant, the Unit 1 and Unit 2 reactor containment area, and the earthen retention pond (which is no longer in operation). Groundwater impacted by potential releases from these sources would likely flow to the beach drains, which collect stormwater runoff from the site and receive recharge from groundwater from the shallow surficial aquifer.

Under the Point Beach groundwater protection program, onsite sampling is performed at 44 locations that include beach drains, intermittent stream and bog locations, drinking water wells, facade wells, yard electrical manhole covers, groundwater monitoring wells, and the subsurface drainage sump located in the Unit 2 facade. Monitoring well construction data are provided in Table 3.7-3 of the applicant's ER (NextEra 2020b). A total of 15 wells were monitored in 2019 (except the beach drains, subsurface drainage system (SSD), and manholes) (Figure 3.6-6 and Table 3.6-3 of the ER). Among monitoring locations/wells installed to monitor the groundwater under the plant foundation, four shallow wells, two in each facade, are located at Unit 1 (1Z-361A, 2Z-361B) and Unit 2 (2Z-361A and 2Z-361B), and an SSD associated with each unit, as well as the auxiliary and turbine buildings. The SSD is in the Unit 2 façade and was sampled 12 times during 2020 (NextEra 2021d). Repairs to beach drain access in November 2019 allowed for monthly sampling of S-1 and S-3 locations throughout 2020 (NextEra 2021d).

Monitoring locations downgradient of the former operable, earthen retention pond include two bogs/ponds at GW-08 and GW-07, located southeast and north of the former retention pond between Warehouses 6 and 7. Other intermittent stream locations are GW-01 (E-01) at Creel confluence, GW-02 (E. Creek), GW-03 (W. Creek), and GW-17 (STP). Water samples collected from these locations are for tritium monitoring only, and gamma emitter and hard-to-detect (HTD) radionuclides are not available. Groundwater samples are collected quarterly, semiannually, or annually from selected onsite monitoring wells/locations. The water samples are analyzed for radionuclides (tritium and gamma scan) to monitor potential impacts to groundwater from inadvertent leaks or spills at the facility. Results of this sampling have been submitted to the NRC in yearly monitoring reports (NextEra 2016, 2017, 2018, 2019, 2020d, 2021d) and are discussed in the section below.

Based on its review of the Point Beach groundwater monitoring program, the NRC staff concludes that the current groundwater monitoring network is strategically located to promptly detect and monitor any potential impacts to groundwater at the site.



Source: NextEra 2020b

Figure 3-4 Point Beach Monitoring Wells, Facade Wells, and Water Supply Wells

Nonradiological Spills

Within the last 5 years, there has been one inadvertent nonradioactive release as an incidental spill at the Point Beach site. Petroleum-contaminated soil was found in one of the boreholes during a site excavation activity involving cathodic protection installation on December 7, 2018. A soil sample from 3-4 ft below grade was collected and analyzed for diesel range organics (DRO), gasoline range organics (GRO), and metals in the laboratory. The laboratory results showed DRO at 171 mg/kg and GRO at 44.9 mg/kg. Approximately 600 lbs. of contaminated soil were excavated and disposed of offsite. There was no indication of any active leakage. WDNR closed the case on March 20, 2019 (NextEra 2020b).

Radiological Spills

No spills to groundwater have occurred at Point Beach within the last 5 years, and concentrations of tritium have remained below the EPA-established maximum contaminant level for drinking water of 20,000 picocuries per liter (pCi/L) (40 CFR Part 141) (NextEra 2020b, 2021d; WDNR 2019a).

Tritium in Groundwater

Tritium is a byproduct of nuclear reactors, but it is also produced naturally in the upper atmosphere when cosmic rays strike nitrogen molecules in the air. Tritium also occurs naturally at very low concentrations in groundwater (EPA 2002). Tritium emits a weak form of radiation in the form of a low-energy beta particle, which is like an electron. This radiation does not travel very far in air and cannot penetrate human skin. If tritium enters the body, it disperses quickly, being uniformly distributed throughout the soft tissues. Tritium decays into a nonradiological form of helium with a half-life of approximately 12.3 years; after this time, half of the tritium will have decayed to a nonradiological form. If ingested, the human body excretes half of the ingested tritium within approximately 10 days (NRC 2019a).

Tritium was initially detected in the late 1970s in the Point Beach drains, which serve as the discharge points for the yard drainage system carrying stormwater and groundwater. It was not realized until the 1980s that this leakage may have leaked from the onsite spent fuel pool into the surficial groundwater that flowed to the beach drains, where it was detected. After improvements were made to the pool, tritium concentrations decreased below the effluent lower limit of detection (NextEra 2020b). In 2019, tritium concentrations in the beach drains were observed from 186 plus or minus 79 pCi/L to 631 plus or minus 103 pCi/L, significantly below the EPA drinking water standard of 20,000 pCi/L. Results from 2020 are similar and well below the EPA drinking water standard for tritium (NextEra 2021d). Tritium detected in the beach drains may also have originated from the former earthen retention pond.

Tritium was detected in the intermittent streams that pass on the eastern and western sides of the retention pond in the late 1990s. Concentrations in the streams have been very low since 2016 and, by 2020, tritium concentrations in monitoring results ranged from non-detectable to an average of 260 plus or minus 105 pCi/L (at GW-17) (NextEra 2021d). Tritium concentrations in bog sampling locations are well below the EPA drinking water standard and are also down significantly from those observed before the retention pond was remediated (NextEra 2021d).

Other locations close to the plant with detected low tritium include in the yard manholes, ranging from 167 plus or minus 83 to 660 plus or minus 104 pCi/L in 2020, in the plant foundation from the SSD sump varying from 634 plus or minus 106 to 10,877 plus or minus 318 pCi/L in 2020, and from the facade wells between non-detectable and 574 plus or minus 109 pCi/L in 2020 (NextEra 2021d).

In summary, tritium has been detected at levels far below the EPA safe drinking water levels in the surficial groundwater at Point Beach and has not been detected in the onsite drinking water located in the deeper Silurian dolomite aquifer. This indicates that the low permeable surficial deposits (over 100 ft) at Point Beach act as a barrier to prevent radionuclides in the surficial groundwater from impacting the underlying Silurian aquifer. In addition, because shallow onsite groundwater flows east, toward Lake Michigan, offsite groundwater users are not expected to be impacted.

Monitoring of Other Radionuclides

The Point Beach groundwater protection program evaluates site groundwater for a suite of radionuclides; however, tritium was the only radionuclide detected above its respective minimum detectable concertation (MDC) (NextEra 2020b). As discussed earlier, some monitoring locations downgradient of the formerly operable, earthen retention pond are for tritium monitoring only, and gamma emitter and HTD radionuclides are not available. Results from the 2019 annual monitoring (NextEra 2020b) performed as part of the Point Beach groundwater protection program include:

- In 2019, gamma emitters Ba-La-140, Co-58, Co-60, and Fe-59 were detected in beach drain samples, which are collected monthly from six locations (S-1, S-12, S-8, S-9, S-13, and S-3), at concentrations that are below their respective MDCs. Based on this, it was concluded in the ER (NextEra 2020b) that the detected gamma emitters are false positives. Results from sampling conducted in 2020 were also below their respective MDCs and were determined to be false positives (Next Era 2021d).
- In April 2019, elevated Co-58 was detected in a Unit 2 facade well (2Z-361A). However, the results of subsequent confirmatory sampling at this well in late April and May 2019 did not exceed the MDC for gamma and HTD radionuclides. Since no other facade well locations were observed with these gamma emitter radionuclides, since there are no known leaks in the general area, and since tritium was not also detected, it was concluded that the water sample collected from 2Z-361A in April 2019 did not indicate an impact or leakage from plant operation. Results from the facade wells were found to be below MDCs for gamma emitters in 2020 (NextEra 2021d).
- Gamma emitters were not detected above the MDC in the SSD sump samples in 2020 (NextEra 2021d).

The NRC staff reviewed these results and agrees with the conclusions reached in the ER and documented in the bulleted information above.

3.5.3 Proposed Action

3.5.3.1 Surface Water Resources

As described in the GEIS (NRC 2013a) and as cited in Table 3-1 for generic surface water resources issues, the impacts of nuclear power plant license renewal and continued operations would generally be SMALL. No significant surface water impacts with respect to Category 1 (generic) issues are anticipated during the subsequent license renewal term that would be different from those occurring during the current license term. The NRC staff's review did not identify any new and significant information that would change the conclusion in the GEIS. Thus, as concluded in the GEIS, for these Category 1 (generic) issues, the impacts of continued operation of Point Beach on surface water resources would be SMALL. There are no site-specific (Category 2) surface water resources issues applicable to Point Beach (Table 3-2).

3.5.3.2 Groundwater Resources

As documented in the GEIS (NRC 2013a) and cited in Table 3-1 for generic groundwater resource issues, the impacts of nuclear power plant license renewal and continued operations would generally be SMALL for the Category 1 issues applicable to Point Beach. These issues include:

- groundwater contamination and use (non-cooling system impacts) and
- groundwater use conflicts (plants that withdraw less than 100 gpm)

Both of these Category 1 issues were determined to result in a SMALL impact in 10 CR Part 51, Subpart A, Appendix B, Table B-1. No significant groundwater impacts with respect to Category 1 (generic) issues are anticipated during the subsequent license renewal term that would be different from those occurring during the current license term. As discussed in Section 3.5.2.3 of this SEIS, the NRC staff performed a review of groundwater use and quality. This review did not identify any new and significant information during its independent review of the ER, the scoping process, the audit, and evaluation of available information that would change the conclusion in the GEIS. During the audit, the staff confirmed that:

- No discharges to groundwater requiring permits by regulatory agencies are expected to occur throughout the subsequent license renewal period (NextEra 2021a)
- There are no foreseeable conditions during the subsequent license renewal term under which onsite groundwater withdrawal increases above the 100 gpm limit included in the GEIS conclusion (NextEra 2021a).

As a result, as concluded in the GEIS (NRC 2013a), for these Category 1 (generic) issues, which are reported in Table 3-1, the impacts of continued operation of Point Beach on groundwater resources would be SMALL.

As shown in Table 3-2, the NRC staff identified one site-specific, Category 2, issue related to groundwater resources applicable to Point Beach during the subsequent license renewal term. This issue is analyzed below.

<u>Radionuclides Released to Groundwater</u>

This issue was added for consideration as part of the groundwater review for license renewal in the 2013 GEIS revision (NRC 2013a) because of accidental releases of liquids containing radioactive material into the groundwater at power reactor sites. The majority of the inadvertent releases involved leakage of water containing tritium or other radioactive isotopes from spent fuel pools, buried piping, and failed valves on effluent discharge lines. In 2006, the NRC released a report documenting lessons learned from a review of these incidents that ultimately concluded that these instances had not adversely impacted public health and safety (NRC 2006a). This report concluded, in general, that impacted groundwater is expected to remain onsite; however, instances of offsite migration have occurred. The GEIS (NRC 2013a) determined that impacts to groundwater quality from the release of radionuclides could be SMALL or MODERATE, depending on the magnitude of the leak, the radionuclides involved, hydrogeologic factors, distance to receptors, and the response time of plant personnel to identify and stop the leak in a timely fashion. As a result, this issue is considered Category 2 requiring a site-specific evaluation.

This issue was discussed and evaluated in Sections 3.6.4.2 and 4.5.5 of NextEra's ER (NextEra 2020b) and is summarized in Section 3.5.2.3 of this SEIS. Point Beach monitors groundwater for inadvertent releases as part of the Point Beach groundwater protection program, which was implemented in 2008 under NEI 07-07 and in conjunction with

10 CFR 20.1501. Tritium is the only radionuclide that has been detected above MDC, but all previous and current measurements are in the shallow upper soil layer at concentrations well below the EPA safe drinking water standard of 20,000 pCi/L. Site hydrogeologic evaluations indicate that the impacted groundwater is migrating east to Lake Michigan where it will be greatly diluted. In addition, the absence of tritium in the deeper monitored drinking water wells near the power block and at the site boundary, indicates it is not migrating deeper into the drinking water aquifer or offsite and does not impact onsite and offsite water uses and users.

The NRC staff has evaluated and verified this information as part of its review. In addition, the staff has identified no new and significant information during the audit, scoping process, or review of available information cited in this SEIS. The staff has concluded that, over the subsequent license renewal period, potential groundwater contamination would likely remain onsite and no offsite wells should be affected. Point Beach has implemented a groundwater protection program to identify and monitor leaks and the monitoring well network and the groundwater protection program sampling strategy is robust enough that potential future releases of tritium into the groundwater would be readily detected. Therefore, over the subsequent license renewal period, there is little chance of significant impacts on the groundwater quality of onsite and offsite aquifers. Based on this, the NRC staff concludes that the impacts on groundwater use and quality related to radionuclide release from continued operations would be SMALL.

3.5.4 No-Action Alternative

3.5.4.1 Surface Water Resources

Under the no-action alternative, surface water withdrawals would greatly decrease and eventually cease. Stormwater would continue to be discharged from the site, but wastewater discharges would be reduced considerably. As a result, shutdown would reduce the overall impacts on surface water use and quality with the reduction in pollutants discharged and thermal loading to receiving waters. Therefore, the impact of the no-action alternative on surface water resources would remain SMALL.

3.5.4.2 Groundwater Resources

With the cessation of operations, there would be a reduction in onsite groundwater consumption and little or no additional impacts on groundwater quality. Therefore, the NRC staff concludes that the impact of the no-action alternative on groundwater resources would be SMALL.

3.5.5 Replacement Power Alternatives: Common Impacts

3.5.5.1 Surface Water Resources

<u>Construction</u>

Construction activities associated with replacement power alternatives may cause temporary impacts on surface water quality by increasing sediment loading to water bodies and waterways. Construction activities may also impact surface water quality through pollutants in stormwater runoff from disturbed areas and excavations, spills and leaks from construction equipment, and from sediment and other pollutants disturbed by associated dredge and fill activities. These pollutants could be detrimental to downstream surface water quality, where applicable, and to ambient water quality in waterways near work sites.

Facility construction activities might alter surface water drainage features within the construction footprints of replacement power facilities, including any wetland areas. Potential hydrologic impacts would vary depending on the nature and acreage of land area disturbed and the intensity of excavation work.

The NRC staff assumes that construction contractors would implement BMPs for soil erosion and sediment control to minimize water quality impacts in accordance with applicable Federal, State, and local permitting requirements. These measures would include spill prevention and response procedures, such as measures to avoid and respond to spills and leaks of fuels and other materials from construction equipment and activities.

For example, land clearing and related site construction activities would need to be conducted under a Wisconsin WPDES general permit (WI-S067831-5) if more than 1 acre of land would be disturbed (WDNR 2021f; WAC NR 216). In accordance with the WPDES general permit, NextEra and its contractors would need to develop and implement erosion and sediment controls, stormwater pollution prevention, and spill prevention and response practices to prevent or minimize any surface water quality impacts during construction. The permit also requires a post-construction stormwater management plan to be developed and implemented.

To the maximum extent possible, after any necessary modification, the existing Point Beach surface water intake and discharge infrastructure would be used for replacement power components located on or adjacent to the existing Point Beach plant site. This would reduce potential water quality impacts associated with the construction of new structures at the site.

Construction activities that would be conducted by NextEra and its contractors in and adjacent to waterways, wetlands, and any nearshore areas would be subject to review and approval by applicable Federal and State regulatory agencies. For example, the discharge of dredged or fill material in waterways, at any stream crossings, and placement of structures in navigable waters would be subject to USACE permit provisions under CWA Section 404 and Section 10 of the Rivers and Harbors Appropriation Act of 1899 (33 CFR Parts 322 and 323). Additionally, any potential impacts on State wetlands and adjacent waterways would be subject to regulation and permitting by WDNR in accordance with the standards prescribed under WAC NR 103, WAC NR 299, and WAC NR 300-399.

The NRC staff does not expect that any surface water would be diverted or withdrawn to support replacement power facility construction. It is more likely that, where necessary, water would be supplied by a temporary water tap from a municipal source and transported to the point of use, or onsite groundwater could be used (see Section 3.5.5.2, “Construction”). The likely use of ready-mix concrete would also reduce the need for onsite use of nearby water sources to support facility construction. Sanitary water use and wastewater generation would generally be limited to the construction workforce and would likely be accommodated with portable restroom facilities.

<u>Operations</u>

The thermoelectric power generating components of the replacement power alternatives would use closed-cycle cooling with mechanical draft cooling towers. Makeup water would be obtained from Lake Michigan. Power plants using closed-cycle cooling systems with cooling towers withdraw substantially less water for condenser cooling than thermoelectric power plants using a once-through system. However, the relative percentage of consumptive water use is greater in closed-cycle plants because of evaporative and drift losses during cooling tower operation (NRC 2013a). Surface water withdrawals would be subject to Wisconsin’s water use reporting and permitting regulations (WAC NR 856, WAC NR 860).

In addition, closed-cycle cooling systems typically require chemical treatment such as biocide injections to control biofouling (NRC 2013a). Residual concentrations of these chemical additives would be present in the cooling tower blowdown discharged to receiving waters.

However, chemical additions would be accounted for in the operation and permitting of liquid effluents. All effluent discharges from the thermoelectric power generation components would be subject to WPDES permit requirements for the discharge of wastewater and industrial stormwater to state waters (WAC NR 200-299). WPDES permit conditions require the permit holder to develop and implement an SWPPP and associated BMPs and procedures, which would help reduce surface water quality impacts during facility operation.

During operation of renewable energy facilities (i.e., solar farms and wind turbine installations), only very small amounts of water normally would be needed by facility personnel to periodically clean solar panels or turbine blades and motors as part of routine servicing. Some water may also be used for dust control. The NRC staff assumes that water would be supplied from a municipal utility, onsite groundwater, or trucked to the point of use and procured from nearby sources.

Stormwater runoff from solar farm and wind turbine installations would normally be limited to uncontaminated rainfall and snowmelt from facility surfaces, roads, and pad sites. The NRC staff assumes that all renewable energy sites would be designed and constructed with appropriate drainage and stormwater management controls to minimize offsite water quality impacts in accordance with applicable state and local regulations.

3.5.5.2 Groundwater Resources

Construction

Excavation dewatering for foundations and substructures during construction of replacement power generation facilities as applicable, may be required to stabilize slopes and permit placement of foundations and substructures below the water table. Groundwater levels in the immediate area surrounding an excavation may be temporarily affected, depending on the hydrogeologic conditions of the site, the duration of dewatering, and the methods (e.g., cofferdams, sheet piling, sumps, dewatering wells) used for dewatering. The NRC staff expects that any impacts on groundwater flow and quality affected by dewatering would be highly localized and of short duration, and that there would be no effects on other groundwater users due to the site location, the west to east flow direction of groundwater in the surficial aquifer, and the confinement between the shallow aquifer and the deeper Silurian dolomite aquifer, which is used as a source of water on and offsite. Discharges resulting from dewatering operations would be released in accordance with applicable state and local permits as described above.

Although foundations, substructures, and backfill may alter onsite groundwater flow patterns, local and regional trends would remain unaffected. Construction of replacement power generating facilities may contribute to onsite changes in groundwater infiltration and quality due to removal of vegetation and construction of buildings, parking lots, and other impervious surfaces. The potential impacts of increased runoff and subsurface pollutant infiltration or discharge to nearby water bodies would be prevented or mitigated through implementation of BMPs and an SWPPP.

In addition to construction dewatering, onsite groundwater could be used to support construction activities (e.g., dust abatement, soil compaction, water for concrete batch plants). Groundwater withdrawal during construction would have a temporary impact on local water tables or groundwater flow, and these withdrawals and resulting discharges would be subject to applicable permitting requirements. This issue was considered in the license renewal GEIS (NRC 2013a) and determined to be a Category 1 issue having a SMALL impact.

Operations

Dewatering for building foundations and substructures may be required during the operational life of the replacement power facility. Operational dewatering rates, if required, would likely be lower than those rates required for construction and be managed subject to applicable permitting requirements. Dewatering discharges and treatment would be properly managed in accordance with applicable NPDES permitting requirements. The NRC staff expects that any impacts on groundwater flow and quality affected by dewatering would be highly localized and of short duration, and that there would be no effects on other groundwater users due to the site location, the west to east flow direction of groundwater in the surficial aquifer, and the confinement between the shallow aquifer and the deeper Silurian dolomite aquifer, which is used as a source of water on and off site.

Effluent discharges (e.g., cooling water, sanitary wastewater, and stormwater) from a facility are subject to applicable Federal, State, and other permits specifying discharge standards and monitoring requirements. Adherence by replacement power facility operators to proper procedures during all material, chemical, and waste handling and conveyance activities would reduce the potential for any releases to the environment, including releases to soil and groundwater.

For replacement power alternatives, groundwater use during operation is assumed to be similar to current plant use, where five onsite groundwater wells supply domestic (potable) and miscellaneous water needs, and pumping is within the range determined by the license renewal GEIS (NRC 2013a) to result in a SMALL impact. Onsite groundwater withdrawals would be subject to applicable state water appropriation, permitting, and registration requirements.

3.5.6 New Nuclear (Small Modular Reactor) Alternative

3.5.6.1 Surface Water Resources

The hydrologic and water quality assumptions and implications for construction and operations described in Section 3.5.5.1 as common to all replacement power alternatives also apply to this alternative. Additionally, deep excavation work required to construct the power block associated with the SMR modules could require groundwater dewatering (see Section 3.5.5.2). Water pumped from excavations would be managed and discharged in accordance with WPDES requirements. As a result, the NRC staff expects that dewatering would not impact surface water quality.

During operations of the SMR complex, the closed-cycle cooling system would withdraw approximately 40 mgd (151 mLd) of makeup water, with consumptive use of 28 mgd (106 mLd). This withdrawal would be a small fraction of the volume of water that Point Beach currently withdraws from Lake Michigan (i.e., 921 mgd). In contrast, the total consumptive use associated with the SMR closed-cycle cooling system would be more than double that of Point Beach's maximum permitted consumptive use of 12.5 mgd (47.3 mLd) (see Section 3.5.1.2). Nevertheless, this consumptive use would have a negligible impact on Lake Michigan, consistent with current operations at Point Beach. In addition, the smaller volume of cooling water (primarily cooling tower blowdown) returned to Lake Michigan would have a smaller thermal impact on receiving waters than the current once-through cooling system, along with a reduction in wastewater effluent loading. Based on the above, the NRC staff concludes that the impacts on surface water resources from construction and operations under the new nuclear alternative would be SMALL.

3.5.6.2 Groundwater Resources

The hydrologic and water quality assumptions and implications for construction and operations described in Section 3.5.5.1 as common to all replacement power alternatives also apply to this alternative. The NRC staff did not identify any impacts on groundwater resources for this alternative beyond those discussed above as common to all replacement power alternatives. In addition, the staff recognizes that water demand could be decreased for the new nuclear alternative. Therefore, the staff concludes that the impacts on groundwater resources from construction and operations under the new nuclear alternative would be SMALL.

3.5.7 Natural Gas Combined-Cycle Alternative

3.5.7.1 Surface Water Resources

The hydrologic and water quality assumptions and implications for construction and operations described in Section 3.5.5.1 as common to all replacement power alternatives also apply to this alternative. Construction-related hydrologic impacts could be greater under this alternative as compared to the new nuclear alternative because of its greater potential to impact waterways from extending a natural gas pipeline to the site.

During operations of the gas-fired plant, the closed-cycle cooling system would withdraw approximately 8.4 mgd (32 mLd) of makeup water, with consumptive use of 6.5 mgd (25 mLd). This withdrawal would be a very small fraction of the volume of water that Point Beach currently withdraws from Lake Michigan (i.e., 921 mgd). The total consumptive water use associated with operation of the gas-fired plant would also be less than that associated with both the SMR facilities (i.e., 28 mgd) under the new nuclear alternative and Point Beach current operations (permit maximum of 12.5 mgd, see Section 3.5.1.2). In addition, the total volume of cooling water (blowdown) and comingled effluents discharged to Lake Michigan would be significantly less than under the new nuclear alternative or the proposed action, although there would be some differences in chemical constituents. Taken together, the NRC staff concludes that the impacts on surface water resources from construction and operations under the natural gas combined-cycle alternative would be SMALL.

3.5.7.2 Groundwater Resources

The hydrologic and water quality assumptions and implications for construction and operations described in Section 3.5.5.1 as common to all replacement power alternatives also apply to this alternative. The NRC staff did not identify any impacts on groundwater resources for this alternative beyond those discussed above as common to all replacement power alternatives. Therefore, the staff concludes that the impacts on groundwater resources from construction and operations under the natural gas combined-cycle alternative would be SMALL.

3.5.8 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

3.5.8.1 Surface Water Resources

The hydrologic and water quality assumptions and implications for construction and operations described in Section 3.5.5.1 as common to all replacement power alternatives also apply to this alternative, except as clarified below.

For the new nuclear component, the operational impacts on surface water resources would be less than those described in Section 3.5.6.1 for the standalone new nuclear alternative. This is because only two SMR modules would be installed, with reduced water demands for cooling system makeup and consumptive water use (reduced by about 30 percent). Likewise, the discharge of cooling tower blowdown and other effluents would be proportionately reduced.

Installation of utility-scale solar plants and associated infrastructure would have the potential to alter surface water drainages north and south of the current Point Beach main plant complex and at several offsite locations across NextEra's service area. The total land commitment and potential hydrologic alteration would be about 3,200 acres (1,300 ha).

Construction of 150 wind turbines and supporting infrastructure at three offsite locations would have the potential to impact surface drainage and resulting water quality impacts across 610 acres (248 ha) and permanently convert 310 acres (125 ha) of land.

As discussed in Section 3.5.5.1 of this SEIS, the NRC staff expects that all construction activities for utility-scale solar and wind farms would be conducted in accordance with applicable permits and approvals requiring the implementation of BMPs and procedures to minimize hydrologic and water quality impacts. Completed solar facilities would have little to no operational impacts on water resources. Adherence to appropriate waste management and minimization plans, spill prevention practices, and pollution prevention plans during servicing of solar plant arrays and wind turbine installations and operation of vehicles connected with site operations would minimize the risks to surface water resources from spills of petroleum, oil, and lubricant products and facility stormwater runoff.

Based on these considerations, the NRC staff concludes that the overall impacts on surface water resources from construction and operations under the combination alternative could range from SMALL to MODERATE.

3.5.8.2 Groundwater Resources

The hydrologic and water quality assumptions and implications for construction and operations described in Section 3.5.5.1 as common to all replacement power alternatives also apply to this alternative. The NRC staff did not identify any impacts on groundwater resources for this alternative beyond those discussed above as common to all replacement power alternatives. Therefore, the staff concludes that the impacts on groundwater resources from construction and operations under the combination alternative would be SMALL.

3.6 Terrestrial Resources

This section describes the terrestrial resources of the Point Beach site and surrounding landscape. Following this description, the NRC staff analyzes potential impacts on terrestrial resources from the proposed action (subsequent license renewal) and alternatives to the proposed action.

3.6.1 Ecoregion

Point Beach lies within the Lake Michigan lacustrine clay plain ecoregion (NextEra 2020b). The EPA describes the Lake Michigan lacustrine clay plain ecoregion (Level IV Ecoregion 53d) as characterized by red calcareous clay soil, lacustrine and till deposits, and flat plain. It is marked by prime farmland with longer growing seasons and more fertile soils than neighboring ecoregions (Omernik et al 2000). Forested areas contain beech, sugar maples, basswood, red oak, and white oak (NextEra 2020b).

NextEra's ER (2020b) includes descriptions of several regional ecosystems in the landscape near the Point Beach site, including:

- Clay Seepage Bluffs
- Great Lakes Beaches
- Great Lakes Dunes

- Interdunal Wetlands
- Northern Wet-Mesic Forests
- Northern Sedge Meadows
- Northern Hardwood Swamps
- Shrub-Carr

The descriptions presented in NextEra's ER (2020b: 3-106–3-112) characterize the tree canopy, shrub, and herbaceous strata of each plant community and are incorporated here by reference.

Wetlands are a common feature in the landscape surrounding Point Beach. The USACE defines wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 328.3(c)(4)). NextEra presents a map of National Wetland Inventory features in the landscape surrounding Point Beach in Figure 3.7-1 of the ER (NextEra 2020b: 3-176), which the NRC staff incorporates here by reference.

Using the U.S. Fish and Wildlife Service's National Wetlands Inventory, NextEra mapped and estimated that there are approximately 4,052 acres (1,640 ha) of wetlands in addition to 32,413 acres (13,117 ha) of lake surface within a 6-mi (10-km) radius of Point Beach (NextEra 2020b). These include the following:

- freshwater emergent wetlands—256 acres (104 ha)
- freshwater forested/shrub wetlands—3,502 acres (1,417 ha)
- freshwater ponds—56 acres (23 ha)
- lakes—32,413 acres (13,117 ha)
- riverine waters—229 acres (93 ha)

3.6.2 Point Beach Site

The Point Beach site is roughly rectangular with Lake Michigan forming its eastern boundary. Nearly 60 percent of the site is cultivated crops and 16.2 percent of the site is pasture/hay. Developed areas constitute 10.8 percent of the site and woody wetlands 7 percent. Most of the remaining area (4.2 percent) is mixed or deciduous forest. Plant communities include the quaking aspen (*Populus tremuloides*), American beech (*Fagus grandifolia*), Canadian hemlock (*Tsuga canandensis*), and maple (*Acer* spp.) (NRC 2005a).

According to the National Wetlands Inventory, the Point Beach site boundaries include a total of 49 acres of wetlands, lakes, ponds, and riverine waters (NextEra 2020b). Table 3-6 below identifies wetlands and surface water features on the Point Beach site.

Table 3-6 Wetlands and Surface Water Features on Point Beach Site

Wetland or Water Feature	Area	Percent of Onsite Wetland Habitat
Freshwater emergent wetlands	10 ac (4 ha)	21%
Freshwater forested/shrub wetlands	25 ac (10 ha)	52%
Freshwater ponds	1 ac (0.4 ha)	2%

Table 3-6 Wetlands and Surface Water Features on Point Beach Site (cont.)

Wetland or Water Feature	Area	Percent of Onsite Wetland Habitat
Lakes	3 ac (1.2 ha)	6%
Riverine waters	10 ac (4 ha)	19%

Source: NextEra 2020b

Figure E3.7-2 of NextEra's ER (NextEra 2020b: 3-177) shows the location of National Wetland Inventory wetlands on the Point Beach site and is incorporated here by reference.

The wildlife species occurring at Point Beach and the surrounding areas are typical of those found in similar habitats throughout the State of Wisconsin. Common mammals include white-tailed deer *(Odocoileous virginianus*), eastern cottontail rabbit (*Sylvilagus floridanus*), northern raccoon (*Procyon lotor*), gray fox (*Urocyon cinereoargenteus*), eastern gray squirrel *(Scirius carolinensis*), eastern chipmunk (*Tamius sriatus*), and masked shrew (*Sorex cinereus*). Table 3.7-3 of the ER presents a list of terrestrial wildlife species likely to be observed in Kewaunee or Manitowoc counties and the NRC staff incorporates it here by reference (NextEra 2020b: 3-164–3-175).

The Point Beach site offers bird habitats for year-round residents, seasonal residents, and transients (birds stopping briefly during migration). Point Beach is located within the Mississippi flyway, a major migratory bird route that extends from the Arctic Circle to the Gulf Coast of Alabama, Louisiana, and Mississippi. A major stopover point on the Mississippi flyway is Point Beach State Forest, which is within the vicinity of the Point Beach site (NextEra 2020b)

NextEra's recent solar lease and easement agreement allows for the construction and operation of two independent solar power facilities partially on the Point Beach site and partially on adjacent and nearby lands. Both facilities will be operational by 2021, and the lease term is 30 years with optional extensions of up to 20 additional years (PSC 2019). The state applications of both solar projects state that they will have minimal impact on wildlife species or their preferred habitats because the majority of impacts will be on actively tilled agricultural land (PSC 2018, PSC 2019). The applications also state that tree clearing will be minimized. If necessary, tree clearing will occur only after appropriate surveys, outside of the roosting and nesting seasons of affected migratory birds of concern, and under U.S. Fish and Wildlife Service guidelines for acceptable clearing dates in Wisconsin (PSC 2019). Under the terms of the solar lease, NextEra (2020b) still maintains the legal authority to determine all activities on its properties. However, the operators of the solar plants will conduct their own ecological management programs, including vegetation management, herbicide application, wildlife monitoring, and compliance with state and Federal laws (e.g., the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act). After construction, the Point Beach solar facility will follow a vegetation management plan seeding graminoids (grasses, sedges, and rushes) under and between panel rows to create a dense, low, non-native turf mix (PSC 2019). In areas outside of a 20-foot buffer from the panel arrays, the solar facility will revegetate with an upland pollinator-friendly seed mix containing wildflowers, native grasses, and sedges to encourage insect nesting habitat. Herbicide treatments will control weedy and invasive plant species. Only limited areas such as solar facility access roads will remain permanently cleared (PSC 2019). NextEra states that 215 acres (87 ha), or about 17 percent, of the Point Beach site area will lie behind solar array fence lines (NextEra 2021a).

3.6.3 Important Species and Habitats

3.6.3.1 Federally Listed Species

For a discussion of terrestrial species and habitats that are federally protected under the Endangered Species Act of 1973, as amended, see Section 3.8, "Special Status Species and Habitats," of this SEIS.

3.6.3.2 State-Listed Species

Based on a search of the Wisconsin National Heritage Inventory, NextEra (2020b) identified 37 State-listed species known to occur or to potentially occur in Kewaunee or Manitowoc counties. Of these 37 State-listed species, 4 species are also federally listed as threatened or endangered. As explained above, the NRC staff addresses the four federally listed species in Section 3.8 of this SEIS. Table 3-7 below shows State-listed species for Kewaunee and Manitowoc counties that are not also federally listed. The descriptions of the following State-listed species in NextEra's ER (NextEra 2020b: 3-136–3-157) are incorporated here by reference.

Table 3-7 State-Listed Species for Manitowoc or Kewaunee Counties, WI, Potentially Occurring in the Point Beach Vicinity (That Are Not Also Federally Listed)

Common Name	Scientific Name	Class	State Legal Status
Peregrine falcon	*Falco peregrinus*	Bird	State Endangered
Red-shouldered hawk	*Buteo lineatus*	Bird	State Threatened
Black tern	*Childonias niger*	Bird	State Endangered
Caspian tern	*Hydroprogne caspia*	Bird	State Endangered
Upland sandpiper	*Bartramia longicauda*	Bird	State Threatened
Acadian flycatcher	*Empidonax virescens*	Bird	State Threatened
Henslow's sparrow	*Ammodramus henslowii*	Bird	State Threatened
Cerulean warbler	*Setophaga cerulea*	Bird	State Threatened
Hooded warbler	*Setophaga citrina*	bird	State Threatened
Tri-colored bat	*Perimyotis subflavus subflavus*	mammal	State Threatened
Big brown bat	*Eptesicus fuscus*	mammal	State Threatened
Little brown bat	*Myotis lucifugus*	mammal	State Threatened
Blanchard's cricket frog	*Acris blanchardi*	amphibian	State Endangered
Redfin shiner	*Lythrurus umbratilis*	ray-finned fish (Actinopterygii)	State Threatened
Longear sunfish	*Lepomis megalotis*	ray-finned fish (Actinopterygii)	State Threatened
Pugnose shiner	*Notropis anogenus*	ray-finned fish (Actinopterygii)	State Threatened
Slippershell mussel	*Alasmidonta viridis*	bivalve	State Threatened
Monkeyface mussel	*Theliderma metanevra*	bivalve	State Threatened
Ellipse mussel	*Venustaconcha ellipsiformis*	bivalve	State Threatened
Hairy-necked tiger beetle	*Cidindela hirticollis rhodensis*	insect	State Endangered
Hubricht's vertigo/Midwest Pleistocene vertigo	*Vertigo hubrichti*	gastropod	State Endangered
Cherrystone drop snail	*Hendersonia occulta*	gastropod	State Threatened

Table 3-7 State-Listed Species for Manitowoc or Kewaunee Counties, WI, Potentially Occurring in the Point Beach Vicinity (That Are Not Also Federally Listed) (cont.)

Common Name	Scientific Name	Class	State Legal Status
Prairie sandreed/sand reedgrass	*Calamovilfa longifolia var.magna*	monocot	State Threatened
Fairy slipper orchid/calypso orchid	*Calypso bulbosa*	monocot	State Threatened
Shore sedge	*Carex lenticularis*	monocot	State Threatened
Streambank wheatgrass/thickspike wheatgrass	*Elymus lanceolatus (=Elytrigia dasystachhya) ssp. Psammophilus*	monocot	State Threatened
Clustered broomrape	*Orobanche fasciculata*	dicot	State Threatened
Shore buttercup/seaside crowfoot	*Ranunculus cymbalaria*	dicot	State Threatened
Heartleaf willow/sand dune willow	*Salix cordata*	dicot	State Endangered
Sticky tofieldia/False asphodel	*Triantha glutinosa*	monocot	State Threatened
Snow trillium	*Trillium nivale*	monocot	State Threatened
Harbinger-of-spring	*Erigenia bulbosa*	dicot	State Endangered
Forked aster	*Eurybia furcata*	dicot	State Threatened

Source: NextERA 2020b

The 33 State-listed species above include birds, bats, fish, mussels, snails, and plants as well as one amphibian and one insect species. This SEIS will not discuss further any of the fish, mussel, or snail species because they were not observed within the 6-mi (10-km) vicinity of the Point Beach site based on NextEra's (2020b) search of the Wisconsin Natural Heritage Inventory species observation data.

Of the nine State-listed bird species, six species have been documented to occur within a 6-mi (10 km) radius of Point Beach. These are the peregrine falcon, red-shouldered hawk, upland sandpiper, Acadian flycatcher, Henslow's sparrow, and hooded warbler. These species are also protected under the Migratory Bird Treaty Act (FWS 2020a).

The three State-listed mammal species that are not also federally listed are all bats—the tri-colored bat, the little brown bat, and the big brown bat. All three bats are known to occur in Manitowoc County but not Kewaunee County. Because of the sensitive nature of these species, their locations are not publicly released below the county level. Threats to all three bat species include lack of information of the species' basic ecology, the fungal white-nose syndrome, wind power, habitat degradation, pesticide exposure, and hibernaculum disturbance. All three bats feed primarily on insects such as beetles, wasps, flies, and mosquitoes, which they hunt using echolocation. Their natural predators include owls, hawks, snakes, and racoons. Feral domestic cats have also been observed gathering to prey on bats as they leave the hibernaculum (WDNR 2017a, 2017b, 2017c)

The smallest of the three bats species is the tri-colored bat. Weighing just 0.1–0.3 oz (4–8 grams), it is the smallest bat species in Wisconsin (WDNR 2017b). Once a common bat species, the tri-colored bat was listed as a species of least concern by the International Union for Conservation of Nature (IUCN) as recently as 2006. However, since then, its population has been severely reduced, and its Federal status is now under review. Slightly larger than the tri-colored bat is the little brown bat, which weighs 0.25–0.35 oz (7–10 grams) (WDNR 2017c). It feeds mainly on soft-bodied aquatic insects such as moths, wasps, gnats, mosquitoes, and crane flies. In Wisconsin, little brown bats leave their hibernacula in April and will migrate great distances (sometimes hundreds of miles) to summer roosting and foraging sites. They generally live over 10 years, although Wisconsin identification band recoveries have found bats with bands up to 25-years old. Until recently, the little brown bat was one of the most common bat species in North America, but the fungal white-nose syndrome has decimated its population such that it now faces regional or global extinction (Maslo et al 2015). The IUCN listed the little brown bat as endangered in 2018. The U.S. Fish and Wildlife Service will review the little brown bat's Endangered Species Act status in 2023 (FWS 2016b). Finally, big brown bats are the largest of the three State-threatened bat species, generally weighing between 0.42–1.0 oz (12–30 grams). They prefer deciduous forests and can live to about 19 years (WDNR 2017a). Compared to the previous two State-listed species, the big brown bat has more resistance to the fungal white-nose syndrome and is not in danger of extinction (WDNR 2017a).

One State-listed amphibian and one State-listed insect species have been documented to occur within the 6-mi (10-km) radius of Point Beach. These are the State-endangered Blanchard's cricket frog and the State-endangered hairy-necked tiger beetle. Blanchard's cricket frog is a small treefrog that was once one of the most abundant frogs in southern Wisconsin (WDNR 2017d). Adult frogs are found in shallow waters of ponds, lakes, streams, rivers, and wetlands, but they will migrate into adjacent open or semi-open canopy habitats and hibernate in the winter (WDNR 2017d). After a rapid decline in abundance and distribution, Wisconsin listed Blanchard's cricket frog as endangered in 1982. The causes of its rapid decline in abundance and distribution are not known, but they could include agricultural runoff, shoreline disturbance, water turbidity, habitat alteration, and invasive species. The frog's short lifespan of 4 to 16 months and limited dispersal ability also may have made it vulnerable to local extinction (WDNR 2017d). The endangered hairy-necked tiger beetle is a ground beetle about ½-in. (1.27-cm) long. They favor sandy beaches on large lakes and are also found in Great Lakes dunes. Threats to the species include human beach-related activities such as vehicle traffic, beach grooming, and beach stabilization.

Eleven State-listed plant species occur in Manitowoc and Kewaunee counties. Of these, six plant species have been documented within the 6-mi (10-km) radius of Point Beach according to NextEra's (2020b) review of the Wisconsin Natural Heritage Inventory (NextEra 2020b). These are the State-threatened prairie sandreed/sand reedgrass, shore sedge, streambank wheatgrass, clustered broomrape, snow trillium, and the State-endangered heartleaf willow.

3.6.3.3 Species Protected under the Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c) extends regulatory protections to the bald eagle and golden eagle. The Act prohibits anyone without a permit from the Secretary of the Interior from taking bald eagles (or golden eagles), including their parts, nests, or eggs. According to NextEra (2020b), bald eagles are known to nest in the vicinity of Point Beach, although they have not been recorded on the site. In its ER, NextEra (2020b) states that before any project initiation, it monitors sites for eagle nests and recommends human activity occur further than 660 ft (198 m) from any active bald eagle nest between January 15 and July 30.

3.6.3.4 Species Protected under the Migratory Bird Treaty Act

The Migratory Bird Treaty Act makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. NextEra monitors the intake structure for banded or migratory birds and reports any banded birds it finds to the appropriate Federal agency (NextEra 2020b). Several migratory birds that are species of concern can use different habitats on the Point Beach site during migration stopovers, for breeding season, or for year-round nesting.

3.6.3.5 Invasive Species

Invasive species are defined as alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health (EO 13112, Section 1(f)). Executive Order (EO) 13112 (64 FR 6183) directs Federal agencies to not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species unless they determine that the benefits of the action clearly outweigh the harm from invasive species and that all feasible and prudent measures to minimize risk of harm are taken (EO 13112, Section 2). NextEra (2020b) maintains guidance documents with policies and procedures for invasive species management at Point Beach. NextEra identified the following as important invasive terrestrial plant and animal species:

- invasive terrestrial plant species: hairy willow herb (*Epilobium hirsutum*), reed canary grass (*Phalaris arundinacea*), narrowleaf cattail (*Typha augustifolia*)
- invasive terrestrial animal species: emerald ash borer (*Agrilus planipennis*), gypsy moth (Lymantria dispar). Both are serious forest pests that can kill trees.

Descriptions of the above-listed invasive species are incorporated here by reference (NextEra 2020b: 3-124–3-126).

3.6.3.6 Important Habitats

Important habitats include any wildlife sanctuaries, refuges, preserves, or habitats identified by state or Federal agencies as unique, rare, or of priority for protection; wetlands and floodplains; and land areas identified as critical habitat for species listed by the U.S. Fish and Wildlife Service as threatened or endangered. Important habitats on and around the Point Beach site include wetlands (discussed above in Sections 3.6.1 and 3.6.2), Two Creeks Buried Forest, Point Beach State Forest, Michigan Islands National Wildlife Refuge, and the Leopold Wetland Management District.

3.6.4 Proposed Action

As described in the GEIS (NRC 2013a) and as cited in Table 3-1, the impacts of all generic (Category 1) terrestrial resource issues would be SMALL. Table 3-2 identifies only one site-specific (Category 2) issue related to terrestrial resources applicable to the Point Beach subsequent license renewal—Effects on terrestrial resources from non-cooling system impacts. This issue is analyzed below. The Point Beach site uses a once-through cooling system to remove waste heat from the reactor steam electric system and plant auxiliary (service water) systems and does not use cooling ponds or cooling towers (see Section 2.1.3). Therefore, the Category 2 issue described in the GEIS related to the effects of water use conflicts with terrestrial resources does not apply.

3.6.4.1 Category 2 Issue Related to Terrestrial Resources: Effects on Terrestrial Resources (Non-Cooling System Impacts)

According to the GEIS, non-cooling system impacts on terrestrial resources can include those impacts that result from site and landscape maintenance activities, stormwater management, elevated noise levels, and other ongoing operations and maintenance activities that would occur during the license renewal period on and near a plant site. The NRC staff based its analysis in this section on information derived from NextEra's ER (NextEra 2020b) unless otherwise cited. NextEra has not identified any refurbishment activities during the proposed subsequent license renewal term (NextEra 2020b). Therefore, no further analysis of potential impacts from refurbishment activities is necessary.

In its ER, NextEra (2020b) states that it will conduct ongoing operational and maintenance activities at Point Beach throughout the subsequent license renewal term, including landscape maintenance activities, stormwater management, piping installation, and fencing. NextEra states that it would confine these activities to previously disturbed areas. The NRC staff expects that physical disturbance would be limited to paved or disturbed areas or to areas of mowed grass or early successional vegetation and not encroach into wetlands or into the remaining areas of mixed forest. Therefore, the staff concurs with NextEra that the anticipated activities would have only minimal effects on terrestrial resources.

NextEra (2020b) states that it has administrative controls in place at Point Beach to ensure that it reviews operational changes or construction activities and minimizes environmental impacts through BMPs, permit modifications, or new permits, as needed. NextEra (2020b) further states that regulatory programs for issues like stormwater management, spill prevention, dredging, and herbicides further minimize impacts on terrestrial resources (NextEra 2020b). The NRC staff concurs that continued adherence to environmental management practices and BMPs already established for Point Beach would continue to protect terrestrial resources during the subsequent license renewal period.

The NRC staff presumes that NextEra will continue to comply with applicable requirements of the State of Wisconsin's regulatory programs. Furthermore, the staff presumes that if appropriate, NextEra will obtain required incidental take permits for impacts on bald eagles.

Operational noise from Point Beach facilities extends into the remaining natural areas on the site. However, Point Beach has exposed these habitats to similar operational noise levels since it began construction well over 50 years ago. The NRC staff therefore expects that wildlife in the affected habitats have long ago acclimated to the noise and human activity of Point Beach operations and adjusted behavior patterns accordingly. Extending the same level of operational noise levels over the 20-year subsequent license renewal period is therefore unlikely to noticeably change the patterns of wildlife movement and habitat use.

Based on its independent review, the NRC staff concludes that the landscape maintenance activities, stormwater management, elevated noise levels, and other ongoing operations and maintenance activities that NextEra might undertake during the subsequent license renewal term would primarily be confined to already disturbed areas of the Point Beach site. These activities would not have noticeable effects on terrestrial resources or destabilize any important attribute of the terrestrial resources on or in the vicinity of the site. Accordingly, the NRC staff concludes that non-cooling system impacts on terrestrial resources from non-cooling system activities during the subsequent license renewal term would be SMALL.

3.6.5 No-Action Alternative

Under the no-action alternative, the NRC would not issue subsequent renewed licenses, and Point Beach would permanently shut down on or before the expiration of the current renewed facility operating licenses. Much of the operational noise and human activity at Point Beach would cease, reducing disturbance to wildlife in forest cover and other natural vegetation on and near the site. However, some continued maintenance of Point Beach would still be necessary; thus, at least some human activity, noise, and herbicide application would continue at the site, with possible impacts resembling, but perhaps of a lower magnitude than, those described for the proposed action. Shutdown itself is unlikely to noticeably alter terrestrial resources. Reduced human activity and frequency of operational noise may constitute minor beneficial effects on wildlife inhabiting nearby natural habitats. The NRC staff therefore concludes that the impacts of the no-action alternative on terrestrial resources would be SMALL.

3.6.6 Replacement Power Alternatives: Common Impacts

Each of the replacement power alternatives located onsite at Point Beach would use a portion of land on two parcels, one north of the Point Beach power block and one south. Additional land would likely be temporarily disturbed for construction and laydown areas. If not already previously disturbed, the licensee could later revegetate temporarily disturbed land. The natural gas alternative and the combination alternative would also involve construction on developed or undeveloped lands outside the Point Beach site with indeterminate loss of offsite forest or wetlands.

Loss of habitat and increased noise generation during construction and operation of the new facilities could cause terrestrial wildlife to move into other habitats in the surrounding landscape, increasing demands on those habitats and competing with other wildlife. Erosion and sedimentation from clearing, leveling, and excavating land could affect adjacent riparian and wetland habitats. However, implementation of appropriate best management practices and revegetation of temporarily disturbed lands would minimize impacts.

In the GEIS (NRC 2013a), the NRC staff concluded that many of the terrestrial impacts from the operation of nuclear plants and fossil-fueled plants would be essentially similar and include cooling tower salt drift, noise, bird collisions with plant structures and transmission lines, impacts connected with herbicide application and landscape management, and potential water use conflicts connected with cooling water withdrawals. The applicability of this conclusion is limited for Point Beach, however, because the existing Point Beach nuclear facilities use once-through cooling with no cooling towers, whereas a new small modular reactor or natural gas replacement plants would instead use mechanical draft cooling towers. Fossil fuel alternatives would also expose terrestrial habitats and wildlife to air emissions of criteria pollutants.

3.6.7 New Nuclear (Small Modular Reactor) Alternative

For the new nuclear alternative, the NRC staff assumes that the applicant would build a cluster of three small modular reactors on 110 acres (45 ha) on the Point Beach site. NextEra (2020b) identified over 200 acres (81 ha) of previously developed and undeveloped land spread across two parcels on the site available for siting a new nuclear replacement alternative. These two parcels include 60 acres (24 ha) of land north of the Point Beach power block and 146 acres (59 ha) of land south of the power block and do not overlap with land leased to the two solar power facilities. The parcel north of the power block is largely open with some clearing and development. It contains a small wetland area, but NextEra (2020b) has stated that construction would avoid that area. The parcel south of the power block includes developed areas such as parking, a training building, a firing range, and an energy center. The continued use of these areas would not significantly change the impact on terrestrial resources as the areas are previously developed. The south parcel also includes some wooded areas. Trees present include aspen, blue beech, hemlock, and maple that provide food, cover, and nesting for wildlife. Wildlife would include species typically found at Point Beach and in similar habitats in Wisconsin. Clearing forested area for a new SMR facility would displace wildlife and some mortality would be inevitable. However, before tree removal, NextEra (2020b) states that it would survey the area to identify protected species and habitat and use avoidance and minimization measures.

A review of Figure 3.7-2 of the ER shows possible wetland areas in the south parcel (NextEra 2020b). If NextEra is not able to avoid these areas for construction, it would have to perform wetland delineations of affected lands and apply for permits for any wetland fill from the USACE and the WDNR. The NRC staff expects that any Federal or State permits authorizing wetland impacts would require mitigation.

The NRC staff recognizes that the affected land provides habitat for the terrestrial wildlife listed in Section 3.6 of this SEIS, and it is possible that some of the important State-listed or otherwise protected species described in Section 3.6.3 may occur onsite. Construction noise could affect wildlife in nearby forested areas and wetlands. Operational noise from the new cooling towers could also impact wildlife.

As the new nuclear SMR facility would use existing Point Beach transmission lines, the NRC staff expects no increased potential in wildlife injury from transmission lines. However, the SMR cluster will require adding new, tall structures to the landscape, including mechanical draft cooling towers, 65 ft (20 m) in height, and a power block, 160 ft (50 m) in height. These could result in avian (bird) collisions. In addition, bats, including bats of the federally and State-listed species noted in Sections 3.6.3 and 3.8.1.2 of this SEIS, could collide with the towers and die. However, the staff expects that bird and bat populations would eventually become accustomed to the presence of the towers and avoid them. Once the SMR cluster is built, operational impacts on terrestrial resources would likely remain as expected for the proposed action. Based on the preceding analysis, the NRC staff concludes that impacts on terrestrial resources from the new nuclear alternative would be SMALL.

3.6.8 Natural Gas Combined-Cycle Alternative

The natural gas combined-cycle alternative assumes that NextEra would build a new natural gas facility on the Point Beach site on available land parcels either to the north or the south of the power block. An additional 120 acres (49 ha) of offsite land would be required for a right-of-way to build a 10-mi (16-km) natural gas pipeline to the nearest natural gas supply line in Two Rivers, WI. This impact would be partially offset by the elimination of land used for uranium mining to supply fuel to Point Beach.

During construction, impacts to terrestrial habitats and species on the Point Beach site are likely to be similar to the impacts described for the new nuclear alternative in Section 3.6.7 but smaller in magnitude because of the smaller footprint of the natural gas facility (at 60 acres (24 ha) it is only 55 percent the footprint of the small modular reactor nuclear option). The construction of the 120-acre (49-ha) right-of-way and 10-mi (16-km) natural gas pipeline would have a greater effect on the terrestrial resources in and near the right-of-way. Once the pipeline route is chosen, NextEra would have to perform wetland delineations of affected lands and apply for permits for any wetland fill from the USACE and the WDNR. Terrestrial species could experience habitat loss or fragmentation, loss of food resources, and altered behavior due to noise and construction-related disturbances. Erosion and sedimentation from clearing and excavating land to create the right-of-way and lay the pipeline could affect nearby riparian and wetland habitats. The use of BMPs would minimize such effects.

The GEIS (NRC 2013a: 4-119) concludes that many of the impacts to terrestrial resources from the operation of fossil energy alternatives would be essentially similar to those from continued operation of the nuclear plant. However, some impacts particular to a natural gas plant would be air emissions of greenhouse gases such as nitrogen oxide, carbon dioxide, and methane. Such greenhouse gases can lead to consequences like climate change. Section 3.15.3.2 in this SEIS discusses the effects of climate change on terrestrial resources. Despite these emissions, operating the natural gas alternative power plant would not likely destabilize any important attribute of the terrestrial environment.

As the natural gas facility would use existing Point Beach transmission lines, the NRC staff expects no increased potential in wildlife injury from transmission lines. However, the natural gas plant will require adding new, tall structures to the landscape, including mechanical draft cooling towers, 70 ft (20 m) in height, and a power block, 150 ft (46 m) in height. These could result in avian (bird) collisions. In addition, bats, including bats of the federally and State-listed species noted in Sections 3.6.3 and 3.8.1.2 of this SEIS, could collide with the towers and die. However, the staff expects that bird and bat populations would eventually become accustomed to the presence of the towers and avoid them. Once the natural gas facility is built, operational impacts on terrestrial resources would likely remain as expected for the proposed action. Based on the preceding analysis, the NRC staff concludes that impacts on terrestrial resources from the natural gas alternative would be SMALL to MODERATE, primarily due to the possible loss and fragmentation of forested habitat and wetlands from the construction and maintenance of a natural gas pipeline and right-of-way.

3.6.9 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

<u>New Nuclear (Small Modular Reactor)</u>

The terrestrial impacts for the construction and operation of two SMRs as part of the combination alternative would be similar to but less than the terrestrial impacts described above (in Section 3.6.7) for the new nuclear alternative of three SMRs. The operation of two SMRs would require a smaller footprint of 72 acres (29 ha), which is approximately 65 percent of the footprint for the three-SMR cluster. A smaller area of land and wildlife habitat would be temporarily or permanently disturbed during construction, and there would likely be a shorter period of construction noise and activity to disturb wildlife. Construction of new tall structures at Point Beach; namely, a new mechanical draft cooling tower and power block, would result in increased avian and bat collisions. Noise from the operation of the cooling tower could also disturb wildlife. However, based on the above information and the conclusion reached in Section 3.6.7 of this SEIS, the NRC staff concludes that terrestrial impacts from construction and operation of two SMRs as part of the combination alternative would be SMALL.

<u>Solar Photovoltaic</u>

Impacts on terrestrial habitats and biota from the construction and operation of solar PV plants as part of the combination alternative would depend largely on the amount of land required and the location of the land. The NRC staff estimates that the solar portion of the combination alternative would require 3,200 acres (1,300 ha) of cleared land for four utility-scale solar PV plants in the Point Beach region of influence. If the lands chosen for the plants were previously cleared and used for industrial activity, the impacts on terrestrial resources would be less significant than if the lands were virgin forest containing important species and habitats. Vegetation clearing and tree removal would displace wildlife to nearby habitats though some species would return at the end of construction when temporarily disturbed land is restored. Once in operation, solar PV plants pose special hazards to birds through collisions with PV equipment and transmission lines, electrocution from substation and distribution lines, and predation when injured after collision (Hathcock 2019). Another less understood cause for bird collisions is known as the lake effect theory. Birds, especially migrating waterfowl and shorebirds, perceive the horizontally polarized light of PV solar panels as bodies of water and are injured or killed when they attempt to land on the panels as if they were water (Horváth et al. 2009). Water-seeking insects can also collide with the panels for the same reasons. In large enough numbers, such insect deaths may affect food webs. The Multiagency Avian-Solar Collaborative Working Group is a collection of Federal and state agencies identifying information needs and best practices for reducing avian impacts from solar energy. Collaboration with government agencies on best practices in the construction and siting of the solar installations can mitigate their impacts on birds. The NRC staff concludes that the impacts on terrestrial resources would be MODERATE to LARGE because the solar plants require large areas of land and clearing the land could result in the significant loss of wildlife, habitats, and vegetation.

Onshore Wind

The onshore wind portion of the combination alternative would require large areas of offsite land to build three wind farms in the Point Beach region of influence. In total, the NRC staff estimates 31,000 acres (12,000 ha) of land for 150 turbines. However, only 310 acres (125 ha) would be permanently disturbed and 610 acres (248 ha) temporarily disturbed. The temporarily disturbed land can be restored to reduce impacts to terrestrial resources. Use of BMPs can also mitigate impacts.

Impacts to terrestrial resources would vary depending on the location of the land chosen and the quality of habitats. During construction of the wind farms, wildlife could be disturbed by drilling and other operational noise and human activity. However, this disturbance would be temporary, and after construction, land used for equipment laydown and turbine erection could be returned to its original state. Much of the required land around the turbines would return to being unaffected by the operation of the turbines and could return to original uses.

During operations, wind turbines can affect terrestrial species through mechanical noise, collision with turbines and meteorological towers, and interference with migratory behavior. Bird and bat collision and mortality are a major concern. Avian mortality rates at onshore wind turbines have been extensively studied and are estimated as an average of 5.3 birds killed per turbine per year (Loss et al. 2013). With the estimated 150 turbines needed for the onshore wind portion of the combination alternative, an average of 795 birds could be killed per year. In addition to direct bird mortality from collision, wind farms can disrupt bird flight formations and create barriers between ecologically linked areas, such as between roosting and feeding sites, breeding and wintering sites, and migration routes (Exo et al. 2003).

Based on the above analysis, the impact on terrestrial resources from construction and operation of an onshore wind facility as part of the combination alternative would be MODERATE.

Combination Alternative Conclusion

Based on the above discussion of its SMR, solar, and onshore wind portions, the NRC staff concludes that the overall impacts on terrestrial resources from the combination alternative could range from MODERATE to LARGE, mainly due to the large area of land and the types of land that could be used for the solar portion and the operational impacts on birds and bats from the onshore wind portion of the alternative.

3.7 Aquatic Resources

3.7.1 Lake Michigan

This section describes the aquatic resources of Lake Michigan. The NRC staff has previously characterized these resources in detail in Section 2.2.5 of the Point Beach initial license renewal SEIS (NRC 2005a). Section 3.7.1 of NextEra's ER (NextEra 2020b) also describes aquatic resources. This information is incorporated here by reference, with key, new, and updated information summarized below in the following subsections. Following the description of the aquatic environment, the staff analyzes the potential impacts on these resources that would occur because of the proposed action (subsequent license renewal) and alternatives.

Point Beach lies on the central western shore of Lake Michigan, the third largest of the Great Lakes. Lake Michigan covers 22,300 mi^2 (35,900 km^2), is 307 mi (494 km) long from north to south and has an average width of 70 mi (113 km). Lake water level depends primarily on drainage from surrounding watersheds. Average depth is 325 ft (99 m), and maximum depth is 923 ft (281 m). Lake Michigan is hydrologically connected to Lake Huron through the Straights of Mackinac. The lake supports cool and cold-water communities of native and stocked fish within the main basin, bays and harbors, and tributary streams. Commercial and recreational fishing pressure is a major influencer on the aquatic community. Among the most highly sought-after species are lake trout (*Salvelinus namaycush*), yellow perch (*Perca flavescens*), lake sturgeon (*Acipenser fulvescens*), lake whitefish (*Coregonus clupeaformis*), and muskellunge (*Esox masquinongy*). Several introduced species are also of commercial and recreational importance, including chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), rainbow trout (*O. mykiss*), and brown trout (*Salmo trutta*). Invasive species and water quality impairment have also significantly affected the composition and health of Lake Michigan's ecosystem.

Lake Michigan's lakebed is primarily glacier-scraped flat and substrate is mostly rocky. Sculpins, including mottled sculpin (*Cottus bairdi*) and slimy sculpin (*C. cognatus*) are strongly associated with this bottom type. Rocky substrates also provide shelter for prey species of fish, crayfish (*Orconectes virgilis* and *O. propinquus*), and other invertebrates, including amphipods, isopods, oligochaetes, chironomids, mayflies, caddisflies, and snails. The lake also includes areas of rock outcroppings, such as the rock reefs of the Mid-Lake Plateau, which is an important spawning habitat for indigenous lake trout. Numerous shipwrecks also provide shelter and forage habitat for predatory and prey fish (ONMS 2020).

The trophic structure of Lake Michigan includes primary producers (plankton, macrophytes, and periphyton), primary consumers (zooplankton and benthic macroinvertebrates), and bottom-feeding, planktivorous, and piscivorous fish that serve as secondary and tertiary consumers. Primary producers are organisms that capture solar energy and synthesize organic compounds from inorganic chemicals. They form the trophic structure's foundation by producing the organic nutrients and energy that consumers use. Primary producers in lake systems include phytoplankton, aquatic macrophytes, and periphyton. Of the three, phytoplankton are the major producers in all but very shallow lakes. Figure 3-6 illustrates the trophic structure of Lake Michigan.

<u>Plankton</u>

Plankton are small and often microscopic organisms that drift or float in the water column. Phytoplankton are single-celled plant plankton and include diatoms (single-celled yellow algae) and dinoflagellates (a single-celled organism with two flagella). Phytoplankton live suspended in the water column and occur in the limnetic (open water) zone of a lake. Diatoms, including species of *Synedra*, *Fragilaria*, *Tabellaria*, *Asterionella*, *Melosira*, *Cyclotella*, and *Rhizosolenia*, are Lake Michigan's dominant phytoplankton (WDNR 2019b). Planktonic algae include *Cladophora*, *Ulothrix*, *Tetraspora*, *Stigeoclonium*, and red algae *Asterocytis* species (WDNR 2019b). Plankton concentrations fluctuate during the year depending on sunlight, water temperatures, and the bioavailability of silicon. In recent years, increased growth of the nuisance algae *Cladophora* has occurred along the shoreline (WDNR 2019b).

Zooplankton are animals that either spend their entire lives as plankton (holoplankton) or exist as plankton for a short time during development (meroplankton). Zooplankton include rotifers, isopods, protozoans, marine gastropods, polychaetes, small crustaceans, and the eggs and larval stages of insects and other aquatic animals. The primary zooplankton in Lake Michigan are copepods, cladocerans, and rotifers. All Great Lakes fish feed solely on zooplankton at some point in their life cycle, which makes zooplankton a vital component of the food web.

Since the early 2000s, summer zooplankton communities have declined in numbers and biomass in Lake Michigan. Populations of calanoid copepods, considered oligotrophic indicators, have increased, while cladoceran populations have declined. Cladocerans are easily caught prey for many fish, so declines decrease food availability for many fish and have cascading effects on commercial and recreational fisheries (EPA 2021c).

Table 3-8 lists phytoplankton and zooplankton taxa commonly found in Lake Michigan.

Table 3-8 Common Phytoplankton and Zooplankton Taxa of Lake Michigan

Phytoplankton	
Ankistrodesmus falcatus var. mirabilis	*Gyrosigma nodiferum*
Asterionella Formosa	*Navicula tripunctata*
Aulacoseira ambigua	*Nitzchia acicularis*
Aulacoseira distans	*Nitzschia lauenburgiana*
Aulacoseira granulate	*Oocystis borgei*
Aulacoseira islandica	*Oscillatoria limnetica*
Aulacoseira italica	*Oscillatoria minima*
Crucigenia quadrata	*Rhodomonas lens*
Cryptomonas erosa	*Rhodomonas minuta*
Cryptomonas pyrenoidifera	*Stephanodiscus alpinus*
Cryptomonas reflexa	*Stephanodiscus binderanus*
Crytomonas rostratiformis	*Stephanodiscus hantzchii*
Cyclotella atomus	*Stephanodiscus niagarae*
Cyclotella comensis	*Stephanodiscus parvus*
Cyclotella comta	*Stephanodiscus subtransylvanicus*
Cyclotella ocellate	*Surirella ovata*
Cyclotella operculate	*Synedra delicatissima*
Cymatopleura solea	*Synedra filiformis*
Diatoma tenue var. elongatum	*Synedra ostenfeldii*
Diatoma vulgare	*Synedra radians*
Fragilaria crotonensis	*Synedra ulna var. biceps*
Fragilaria pinnata	*Synedra ulna var. chaseana*
Gymnodinium helveticum	*Tabellaria flocculosa*
Zooplankton	
Bosmina longirostris	*Keratella cochlearis*
Bythotrephes cederstroemi	*Keratella crassa*
Conochilus unicornis	*Polyartha remata*
Kellicottia longispina	*Polyartha vulgaris*

Sources: Gannon et al. 1982; NextEra 2020b; Reavie et al. 2014; Vanderploeg et al. 2012

Macrophytes and Periphyton

Aquatic macrophytes are large plants, both emergent and submerged, that inhabit shallow water areas. Periphyton consists of single-celled or filamentous species of algae that attach to benthic or macrophytic surfaces. Macrophytes and periphyton occur in the littoral (nearshore and shallow) zone. They tend to be highly productive because they have more access to nutrients through their roots than do phytoplankton. Macrophytes within Lake Michigan include sago pondweed (*Stuckenia pectinata*), coontail (*Ceratophyllum demersum*), Eurasian watermilfoil (*Myriophyllum spicatum*), elodea (*Elodea canadensis*), and curly-leaf pondweed (*Potamogeton crispus*) (WDNR 2019b).

Benthic Invertebrates

Benthic invertebrates inhabit the bottom of the water column and its substrates. They include macroinvertebrates (clams, crabs, oysters, and other shellfish) as well as certain zooplankton, such as polychaetes (described previously).

In 1998, Barbiero et al. (2000) identified 20 taxa of benthic macroinvertebrates in Lake Michigan with an average of about 7 taxa per sampling site. Overall, the amphipod *Diporeia*, tubificid oligochaetes, and sphaeriid snails dominated collections. In nearshore areas, oligochaetes were the dominant taxa. Benthic macroinvertebrate density typically ranged from 1,500 to 6,500 organisms per square meter. In 2002, surveys performed near the Great Lakes Water Institute in Milwaukee revealed that oligochaetes and chironomidae are present, as are freshwater sponges, *Ectoprocta*, mayflies, leeches, isopods, and amphipods (WDNR 2019b).

Diporeia was once the dominant organism within Lake Michigan's benthic invertebrate community. It served as an important energy pathway between lower and upper trophic levels. However, over the past several decades, the proliferation of zebra mussels (*Dreissena polymorpha*) and quagga mussels (*D. bugensis*) have caused major changes in nutrient cycling within Lake Michigan. The increase in these dreissenid mussels has coincided with the near disappearance of *Diporeia* caused by reduced food availability and general competition for resources (Nalepa et al. 1998, Nalepa et al. 2009). As of 2009, *Diporeia* have disappeared to depths of 300 ft (90 m), and trends at that time indicated that populations at greater depths were in a state of decline. Dreissenid mussels have also reduced the density of other benthic macroinvertebrate fauna, particularly oligochaetes and snails. As a result, the benthic community has become a major energy sink rather than a pathway to the upper trophic levels (Nalepa et al. 2009).

Ichthyoplankton

Local ichthyoplankton data is available from several entrainment studies conducted in connection with Point Beach WPDES permit requirements. Rainbow smelt (*Osmerus mordax*) juveniles and alewife eggs have consistently been the most entrained taxa and life stage groups, followed by burbot (*Lota lota*) yolk sac larvae (YSL).

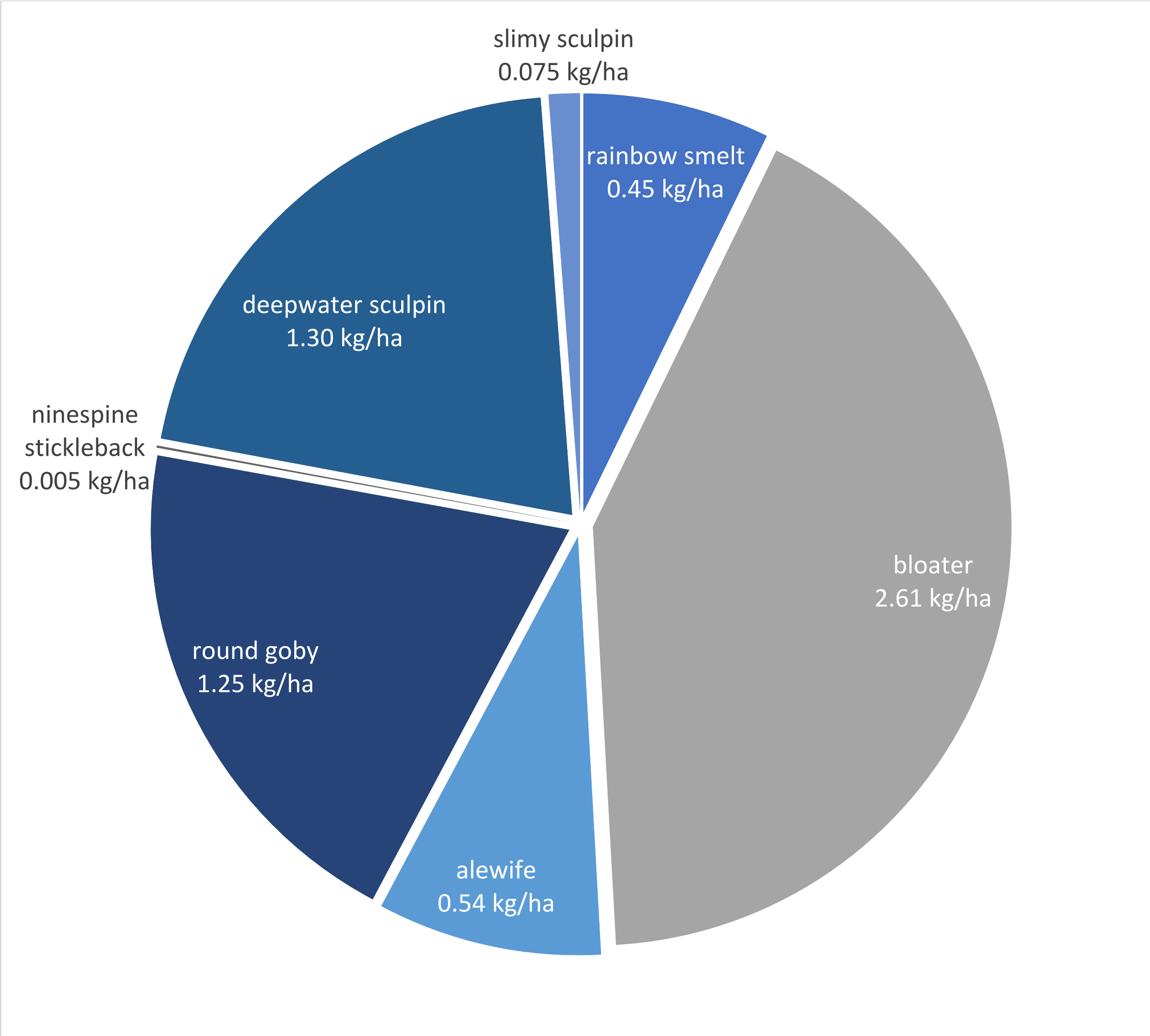
In 2006, researchers collected ambient ichthyoplankton samples near Point Beach along three contours at multiple depths (EA Engineering 2007). Alewife and alewife type eggs were common along the nearshore (6-8 ft) contour. Collectively, these taxa groups comprised 73.7 percent of collections at this location. Rainbow smelt post-yolk sac larvae (PYSL) and larvae, Clupeidae species YSL, *Alosa* species YSL, and yellow perch YSL dominated the 18 ft contour. Rainbow smelt PYSL and yellow perch YSL comprised most of the 30-ft contour (39.4 percent and 16.9 percent, respectively). Section 3.7.2 of this SEIS further describes entrainment study results.

Fish

Lake Michigan’s fish community has changed significantly over the past several decades as a result of fishing pressure, management (i.e., stocking), and the proliferation of non-native fish (e.g., alewife (*Alosa pseudoharengus*), round goby (*Neogobius melanostomus*), sea lamprey (*Petromyzon marinus*)) and dreissenid mussels). Data on the health and status of the aquatic community is available from several sources, including peer reviewed literature, U.S. Geological Survey (USGS) trawl surveys, WDNR angler surveys, National Marine Fisheries Service (NMFS) commercial landings data, and Point Beach impingement and entrainment studies.

In 2018, researchers estimated total Lake Michigan prey fish biomass to be 6.22 kg/ha, representing a five-fold increase over the record-low estimate in 2015 (USGS 2019b). Relative to the long-term average of 36.9 kg/ha, however, the 2018 estimate indicates that Lake Michigan continues to exhibit low prey fish biomass densities. The reduced biomass is attributed to numerous factors, including a prolonged period of poor bloater (*Coregonus hoyi*) recruitment from 1992–2015 and an intensified predation of alewives by salmonids during the 2000s and 2010s. Additionally, the lake is experiencing bottom-up effects, such as reductions in biomass of the food web base in connection with long-term declines in phosphorus inputs and the proliferation of dreissenid mussels. For instance, the decline of *Diporeia* species described previously in this section has led to reductions in growth, condition, or energy density of lake whitefish, alewives, bloaters, and deepwater sculpins (*Myoxocephalus thompsonii*) during the 1990s and 2000s. The literature reports recent species-specific trends of important prey fish to be as follows (USGS 2019b; Warner et al. 2015, Warner et al. 2008). Figure 3-5 depicts lake-wide biomass densities by species in 2018.

- Round goby populations have continued to increase since 2006 to a point where they contribute significantly to lake-wide estimates of forage biomass.
- Deepwater sculpin are a dominant component of the forage base, but populations have experienced decline since 2006.
- Alewife populations were relatively low throughout the 1990s and 2000s, peaked to historic highs in the 2010s, and have again decreased in recent years.
- Bloater populations have declined significantly since 1992 and remain at low levels.
- Rainbow smelt numbers have declined lake-wide since 1998.



Source: USGS 2019b

Figure 3-5 Lake-wide Biomass Density of Lake Michigan Prey Fish, 2018

Available survey data includes USGS long-term benthic trawl data, summaries of NMFS commercial landings, and WDNR survey reports. In general, all data sets exhibit annual variation with an overall declining trend in forage populations in a variety of metrics, including abundance, catch per unit effort, and catch in pounds. Game fish populations and catch rates appear to be more stable.

Since 1973, the USGS Great Lakes Science Center has conducted yearly trawls of Lake Michigan's fish community. Transects consist of standard 39-ft (12-m) bottom trawls towed along contours at depths of 30-330 ft (9-100 m) at seven index transects across the lake. Two transects, Port Washington and Sturgeon Bay, are within Wisconsin and located north and south of Point Beach. As part of NextEra's CWA Section 316(b) Compliance Submittal, Environmental Consulting & Technology, Inc. (ECT) et al. (2020) analyzed the USGS's trawl data from each of the two Wisconsin transects from 1973–2019. ECT et al. (2020) ranked the abundances of key species surveyed by the USGS near Point Beach during 2005–2006 and 2017, which correlates with the periods over which EA Engineering and ECT performed entrainment studies at the plant (see Table 3-11).

The three most abundant species within the Wisconsin transects across all years are ninespine stickleback (*Pungitius pungitius*), deepwater sculpin, and bloater (ECT et al. 2020). Ninespine stickleback abundance increased in the late 1990s to mid-2000s and then declined thereafter. Round goby abundance increased dramatically beginning in 2011, although abundance has been variable since with some periods of sharp decline. As its abundance has increased, this species has become an important source of prey for many Lake Michigan fish, including lake trout, burbot, lake whitefish, smallmouth bass (*Micropterus dolomieu*), and yellow perch (Bunnell et al. 2019). Rainbow smelt and alewife, both of which have been dominant components of Point Beach entrainment collections, have shown variable but declining population densities near Point Beach in USGS trawl data over the period of record.

The NMFS makes available data on Great Lakes commercial fishery landings reported as the live weight of all landed finfish captured by U.S. commercial anglers. These data include finfish landed by commercial fishing operations, whether sold or not. Commercial landings data are only an indirect measure of fish populations in the lake because they are not adjusted for level of capture effort. However, it is reasonable to assume that landings are directly, although imperfectly, related to Lake Michigan's fish stocks and can approximate population trends. Reported live weights of all landed finfish have generally trended downward since the early 2000s with the exception of lake trout, burbot, lake whitefish, yellow perch, and lake herring (*Coregonus artedi*) (ECT et al. 2020; NOAA 2020). The three most commonly entrained species at Point Beach (alewife, burbot, and rainbow smelt) and the two most commonly impinged species (alewife and rainbow smelt) have experienced declines in commercial landings within Wisconsin waters in the last several years, as follows (ECT et al. 2020; NMFS 2020):

- Alewife commercial landings fell sharply from 2005 to 2011 and rebounded in 2012. However, live weights fell beginning in 2013 and have remained low.
- Burbot commercial landings have remained relatively consistent between the late 2000s and late 2010s with one peak in 2013 and an overall slight decline.
- Rainbow smelt commercial landings have decreased substantially since 2006 and likely reflect the longer-term declines in several populations. These trends mimic those found in the USGS trawl survey data.

The WDNR reports annual totals of commercially and recreationally harvested game fish in Wisconsin waters. Data from this source, which primarily consist of trout and salmonids, indicate that these fisheries are relatively stable (WDNR 2019c).

Table 3-10 lists fish taxa commonly found in Lake Michigan in the vicinity of Point Beach.

<u>State-Protected Aquatic Species of Lake Michigan</u>

The state of Wisconsin enacted the Wisconsin Endangered Species Law (Wisconsin State Statute 29.604 and Administrative Rule Chapter NR 27) in 1972 to protect Wisconsin-endemic species from possible extinction throughout all or a significant part of those species' native ranges. Under the authority of this act, the WDNR lists animals and plants as State-endangered or threatened. Additionally, under the Wisconsin Wildlife Action Plan (WDNR 2016b), the WDNR identifies additional species as Species of Greatest Conservation Need. The distribution and abundance of such species are indicative of the greater diversity and health of wildlife within the State.

Table 3-9 identifies the State-protected aquatic species that occur in Lake Michigan and its tributaries and that are most likely to occur in the vicinity of Point Beach. According to the results of a 2005–2006 impingement study (EA Engineering 2007), lake sturgeon are rarely impinged at Point Beach. During the 12-month study, researchers collected three lake sturgeon in impingement samples, which accounted for less than 0.005 percent of impingement by both abundance and biomass. Lake sturgeon spawn along the shorelines of freshwater lakes, and eggs are adhesive and demersal and, therefore, unlikely to be susceptible to entrainment. No lake sturgeon have been collected in Point Beach entrainment studies. None of the three freshwater mussel species identified in the table below have been collected in Point Beach impingement or entrainment studies. Due to Point Beach's offshore intake location, freshwater mussels are unlikely to be susceptible to impingement. However, these species could be affected when their host species are impinged. Of the known host species, only the mottled sculpin has been collected in impingement samples. In 2005–2006, mottled sculpin accounted for less than 0.005 percent of impingement by abundance and 0.1 percent by biomass.

Table 3-9 State-Protected Aquatic Species in Lake Michigan and Its Tributaries

Common Name	Species	State Status[(a)]	Habitat and Spawning
Fish			
lake sturgeon	*Acipenser fulvescens*	SC/H	Shoal waters of the Great Lakes; deep mid-river areas and inland pools. Spawns late April through early June in cold, shallow fast water.
Freshwater Mussels			
ellipse	*Venustaconcha ellipsiformis*	ST	Shallow, flowing, clean small streams with stable substrate in the eastern and southern part of the state. Host fish are mostly small stream species including the rainbow darter, Johnny darter, and mottled sculpin.
elktoe	*Alasmidonta marginata*	SC/P	Various-sized streams with flowing water, sand, gravel or rock substrates that are stable. Known host fish include redhorse, sucker species, and rockbass.
slippershell	*Alasmidonta viridis*	ST	Small to medium-sized streams with flowing hard water, sand, or gravel bottoms. Presently found only in the eastern and southern parts of Wisconsin. Known hosts are banded and mottled sculpins and johnny darter.

[(a)] SC/H = species of special concern; take regulated by establishment of open closed seasons. SC/P = species of special concern; protected wild animal. ST = State-threatened.

Source: WNHI 2021a

Invasive and Nuisance Species of Lake Michigan

Non-native species are those species that are present only because of introduction and that would not naturally occur either currently or historically in an ecosystem. Invasive species are those non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health (64 FR 6183). For purposes of this discussion, nuisance species are non-native species that alter the environment but that don’t rise to the level of invasive. Lake Michigan has numerous invasive and nuisance species. Major species within these categories are briefly discussed below.

Over the past several decades, the proliferation of zebra and quagga mussels within the Great Lakes have caused major changes in nutrient cycling within Lake Michigan. The increase in these dreissenid mussels has coincided with the near disappearance of the native zooplankton *Diporeia* and significantly reduced densities of benthic macroinvertebrate fauna, particularly oligochaetes and snails. As a result, Lake Michigan’s benthic community has become a major energy sink rather than a pathway to the upper trophic levels (Nalepa et al. 2009). Dense colonies of these mussels can also affect the spawning rates of fish that lay eggs in the crevices of rocks, boulders, and other substrate features. Zebra and quagga mussels can also damage power and water facility intake pipes and other in-water structures.

The Asian clam (*Corbicula fluminea*), which is now ubiquitous in many major U.S. freshwater systems, is capable of surviving in relatively cold waters and reproduces rapidly. Once established, Asian clams can alter benthic substrates, outcompete other native benthic invertebrates, and cause the decline or local disappearance of native mussel and clam populations. Asian clams are particularly damaging to intake pipes for power and water facilities when large numbers of the clams, either dead or alive, clog the pipes. Individuals will also biofoul the pipes by attaching themselves to pipe walls where they incrementally obstruct more flow as they grow.

In the 1950s and 1960s, alewife populations were one of the dominant fish in Lake Michigan. Alewife have caused the decline of many native fish because they disproportionately consume prey and have altered the zooplankton and phytoplankton populations. Alewife have contributed to the disappearance of lake whitefish and bloaters and to the decline of chub species (*Couesius* spp.). Alewife predation of native fish larvae has contributed to the decline of yellow perch, deepwater sculpin, emerald shiner (*Notropis atherinoides*), and lake trout. Alewife contain high levels of an enzyme that can cause thiamine deficiency and early mortality in species that prey on it. Pacific salmon species were recently introduced into the Great Lakes and have helped to control the alewife population (Fuller et al. 2020a).

The common carp (*Cyprinus carpio*) is native to Eurasia and was first introduced in the United States in the 1800s. The species has a wide range of habitat tolerances and can live in waters that have a range of oxygen, salinity, and turbidity level. Preferred habitats include shallow water with lots of vegetation and little current. Common carp can destroy aquatic vegetation and increase the turbidity of the water. This adversely affects the quality of the habitat, reduces spawning habitat, and reduces water clarity. Common carp also feed on the eggs of other fish, reducing populations of native species (Nico et al. 2020).

The round goby is native to the Black and Caspian seas and was introduced to the Great Lakes via ballast water from transatlantic vessels. Round gobies prefer habitat with rocky substrate near the shore but can migrate and survive to deeper waters during the winter. However, they are capable of surviving in degraded water conditions. The round goby is known to outcompete native species, particularly the mottled sculpin, for spawning sites and food resources. They have also negatively impacted lake trout by preying on eggs, larvae, and juveniles (Fuller et al. 2020b).

The sea lamprey is native to the Atlantic Ocean. Sea lampreys have had a dramatic negative impact on commercial fisheries. Common prey/host species for sea lamprey in the Great Lakes include large native fish species such as lake trout and walleye (*Sander vitreus*), but they also prey on burbot, yellow perch, and white sucker (*Catostomus commersonii*), among other species. The sea lamprey has also contributed to the extinction of three native species: the longjaw cisco (*Coregonus alpenae*), the deepwater cisco (*C. johannae*), and the blackfin cisco (*C. nigripinnis*). The reduction in large predatory species also facilitated the alewife invasion. States began using lampricide in the 1950s to combat the invasion of sea lampreys. Unfortunately, it requires continual application to keep the population under control and has negative effects on native fish and non-parasitic lamprey species (Fuller et al. 2020c).

The spiny water flea is a tiny crustacean native to northern Europe and Asia. Spiny water fleas are voracious predators and can eat up to 75 percent of their body weight in zooplankton each day. This species has contributed to declines of native zooplankton species. They also directly compete with larval fish who rely on zooplankton for food. Although spiny water fleas provide a food source for some fish, native species are often unable to eat them because of their long tails and spines (Liebig et al. 2020).

Table 3-10 Common Fish Taxa of Lake Michigan

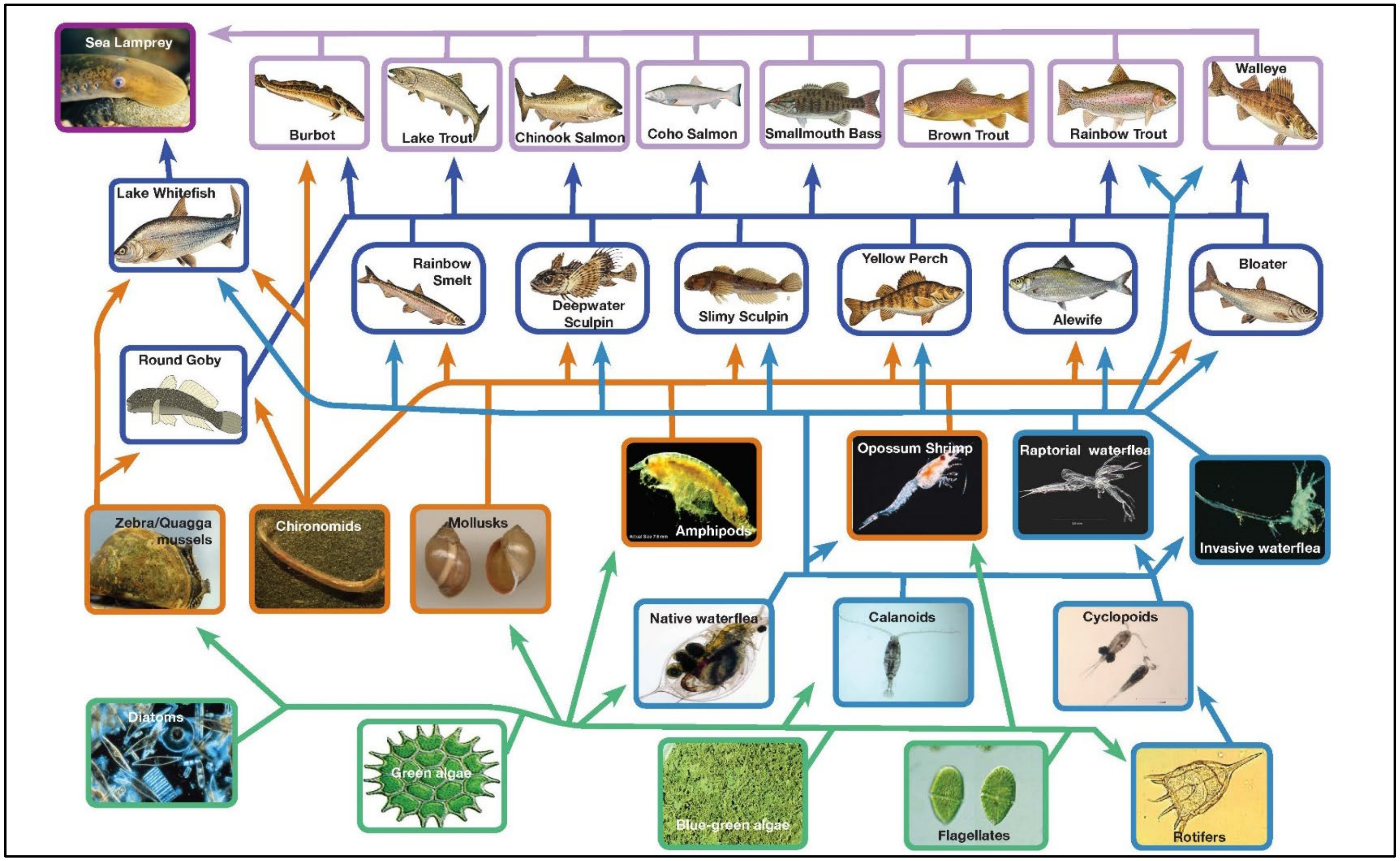
Species	Common Name[(a)]
Acipenser fulvescens	lake sturgeon[I]
Alosa pseudoharengus	alewife[I,E]
Ameiurus melas	black bullhead[I]
Aplodinotus grunniens	freshwater drum[I]
Catostomus catostomus	longnose sucker[I]
Catostomus commersonii	white sucker[I]
Coregonus artedi	lake herring
Coregonus clupeaformis	lake whitefish[I]
Coregonus hoyi	bloater[I]
Cottus bairdii	mottled sculpin[I]
Cottus cognatus	slimy sculpin[I,E]
Couesius plumbeus	lake chub
Culaea inconstans	brook stickleback[I]
Cyprinus carpio	common carp[I,E]
Dorosoma cepedianum	gizzard shad[I]
Esox lucius	northern pike
Gasterosteus aculeatus	threespine stickleback[I,E]
Ictalurus punctatus	channel catfish[I]
Lepomis cyanellus	green sunfish[I]
Lepomis gibbosus	pumpkinseed[I]
Lepomis macrochirus	bluegill[I]
Lota lota	burbot[I,E]
Luxilus cornutus	common shiner[I]
Micropterus dolomieu	smallmouth bass[I]
Micropterus salmoides	largemouth bass
Morone americana	white perch[I]
Myoxocephalus thompsonii	deepwater sculpin[I]
Neogobius melanostomus	round goby[I,E]
Notemigonus crysoleucas	golden shiner[I]
Notropis atherinoides	emerald shiner[I]

Table 3-10 Common Fish Taxa of Lake Michigan (cont.)

Species	Common Name[a]
Notropis hudsonius	spottail shiner[I]
Oncorhynchus gorbuscha	pink salmon
Oncorhynchus keta	chum salmon
Oncorhynchus kisutch	coho salmon[I]
Oncorhynchus masou	cherry salmon
Oncorhynchus mykiss	rainbow trout
Oncorhynchus nerka	sockeye salmon
Oncorhynchus tshawytscha	chinook salmon[I]
Osmerus mordax	rainbow smelt[I,E]
Perca flavescens	yellow perch[I]
Percopsis omiscomaycus	trout perch[I]
Pimephales promelas	fathead minnow[I]
Pomoxis nigromaculatus	black crappie[I]
Prosopium cylindraceum	round whitefish[I,E]
Pungitius pungitius	ninespine stickleback[I]
Rhinichthys cataractae	longnose dace[I]
Salmo salar	Atlantic salmon
Salmo trutta	brown trout[I]
Salvelinus fontinalis	brook trout
Salvelinus namaycush	lake trout[I]
Umbra limi	central mudminnow[I]

[a] I = collected in Point Beach impingement study samples.
E = collected in Point Beach entrainment study samples.

Sources: EA Engineering 2007; ECT 2018a; NextEra 2020a; NRC 2005a



Source: GLERL 2020

Figure 3-6 Trophic Structure of Lake Michigan

Table 3-11 Abundance Ranking of Key Species in USGS Surveys Near Point Beach, 2006 and 2017

	2006[a]			2017[a]			Total		
Species	No./hectare	%	Rank	No./hectare	%	Rank	No./hectare	%	Rank
ninespine stickleback	16,243	68.1	1	2	0.2	7	9,072	71.2	1
deepwater sculpin	2,854	12.0	2	804	49.5	1	1,421	11.2	2
bloater	132	0.6	6	177	10.9	3	967	7.6	3
slimy sculpin	2,493	10.4	3	133	8.2	4	678	5.3	4
rainbow smelt	1,335	5.6	4	410	25.2	2	392	3.1	5
round goby	10	0.0	8	83	5.1	5	154	1.2	6
alewife	772	3.2	5	13	0.8	6	48	0.4	7
yellow perch	18	0.1	7	–	–	11	8	0.1	8
lake whitefish	6	0.0	9	–	–	11	3	0.0	9
lake trout	4	0.0	10	–	–	8	2	0.0	10
burbot	3	0.0	11	–	–	9	1	0.0	11
threespine stickleback	–	–	12	–	–	11	–	0.1	12

[a] Averaged results from Port Washington and Sturgeon Bay, WI.

Source: ECT et al. 2020, Table 4-1

3.7.2 Proposed Action

As described in the GEIS (NRC 2013a) and as cited in Table 3-1 of this SEIS, the impacts of all Category 1 (generic) aquatic resource issues would be SMALL. Table 3-2 identifies two Category 2 issues applicable to Point Beach that require site-specific analysis for each proposed license renewal to determine whether impacts would be SMALL, MODERATE, or LARGE. These issues are (1) impingement and entrainment of aquatic organisms and (2) thermal impacts on aquatic organisms. The sections below analyze these issues in detail.

3.7.2.1 Impingement and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

For plants with once-through cooling systems or cooling ponds such as Point Beach, the NRC has determined in the GEIS that impingement and entrainment of aquatic organisms is a Category 2 issue that requires site-specific evaluation (NRC 2013a). In 2005, the NRC evaluated the impacts of the Point Beach initial license renewal on aquatic organisms as two issues: "impingement of fish and shellfish" and "entrainment of fish and shellfish in early life stages." For both issues, the NRC determined that the impacts of continued operation of Point Beach would be SMALL during the initial license renewal term (i.e., 2010–2030 for Unit 1 and 2013–2033 for Unit 2) (NRC 2005a). In 2013, the NRC issued Revision 1 of the GEIS (NRC 2013a). In the revised GEIS, the NRC staff combined the two aquatic issues into a single site-specific issue: "impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)." This section evaluates this consolidated issue as it applies to the continued operation of Point Beach for the proposed subsequent license renewal term (i.e., 2030–2050 for Unit 1 and 2033–2053 for Unit 2).

Impingement occurs when organisms are trapped against the outer part of an intake structure's screening device (79 FR 48300). The force of the intake water traps the organisms against the screen, and individuals are unable to escape. Impingement can kill organisms immediately or cause exhaustion, suffocation, injury, and other physical stresses that contribute to later mortality. The potential for injury or death is generally related to the amount of time an organism is impinged, its fragility (susceptibility to injury), and the physical characteristics of the screen wash and fish return systems of the intake structure. The EPA has found that impingement mortality is typically less than 100 percent if the cooling water intake system includes fish return or backwash systems (79 FR 48300). Because impingeable organisms are typically fish with fully formed scales and skeletal structures and well-developed survival traits, such as behavioral responses to avoid danger, many impinged organisms can survive under proper conditions (79 FR 48300).

Entrainment occurs when organisms pass through the screening device and travel through the entire cooling system, including the pumps, condenser or heat exchanger tubes, and discharge pipes (79 FR 48300). Organisms susceptible to entrainment are of smaller size, such as ichthyoplankton, larval stages of shellfish and other macroinvertebrates, zooplankton, and phytoplankton. During travel through the cooling system, entrained organisms experience physical trauma and stress, pressure changes, excess heat, and exposure to chemicals (Mayhew et al. 2000). Because entrainable organisms generally consist of fragile life stages (e.g., eggs, which exhibit poor survival after interacting with a cooling water intake structure, and early larvae, which lack a skeletal structure and swimming ability), the EPA has concluded that for purposes of assessing the impacts of a cooling water intake system on the aquatic environment, all entrained organisms die (79 FR 48300).

Entrainment susceptibility is highly dependent upon life history characteristics. For example, broadcast spawners with non-adhesive, free-floating eggs that drift with water current may become entrained in a cooling water intake system. Nest-building species or species with adhesive, demersal eggs are less likely to be entrained in early life stages. Susceptibility of larval life stages to entrainment depends on body morphometrics and swimming ability.

If several life stages of a species occupy the source water, that species can be susceptible to both impingement and entrainment. For instance, adults and juveniles of a given species of fish may be impinged against the intake screens, while larvae and eggs may pass through the screening device and be entrained through the cooling system. The susceptibility to either impingement or entrainment relates to the size of the individual relative to the size of the mesh on the screening device. The EPA considers aquatic organisms that can be collected or retained on a sieve with 0.56-in. (1.4-cm) diagonal openings to be susceptible to impingement (79 FR 48300). This equates to screen device mesh openings of 1/2-in. by 1/4-in. (1.3-cm by 0.635-cm), which is slightly larger than the openings on the typical 3/8-in. (0.95-cm) square mesh found at many nuclear power plants. Organisms smaller than the 0.56-in. (1.4-cm) mesh are considered susceptible to entrainment.

The magnitude of impact that impingement and entrainment creates on the aquatic environment depends on plant-specific characteristics of the cooling system as well as characteristics of the local aquatic community. Relevant plant characteristics include location of the cooling water intake structure, intake velocities, withdrawal volumes, screening device technologies, and presence or absence of a fish return system. Relevant characteristics of the aquatic community include species present in the environment, life history characteristics, population abundances and distributions, special species statuses and designations, and regional management objectives.

<u>Point Beach Cooling Water Intake System</u>

Point Beach's cooling water intake system impinges and entrains aquatic organisms as it withdraws water from the source water of Lake Michigan. Section 2.1.3 of this SEIS describes Point Beach's cooling and auxiliary water systems in detail. Features relevant to the impingement and entrainment analysis are summarized below.

Fish and other aquatic organisms within the source water first interact with the cooling water intake system at an intake crib that lies 1,750 ft (533 m) offshore at an approximate depth of 22 ft (7 m) below the lake's surface. The intake crib is 110 ft (34 m) in diameter and consists of two annular rings of steel piles driven into the lakebed. The annulus is filled with limestone blocks, and the inner diameter of the intake crib is 60 ft (18 m). As the source water flows into the intake crib, organisms that cannot swim fast enough to escape the flow of water are swept into the intake. To enter the intake crib, organisms and debris must pass through either plastic mesh grating on the top of the intake crib or interstitial spaces between the limestone blocks. Approximately half of the withdrawn water flows through the intake crib's cab, and the other half flows through the intake crib limestone block walls (ECT 2018a). Approach velocity in the vicinity of the intake crib has been measured as high as 2.0 fps (0.6 m/s), but most velocities are much lower (ECT 2018a). Organisms within the source water that cannot resist or escape this flow are drawn into the intake structure along with the water. During normal full power operation of both units, the average intake volume is 697 mgd in the winter and 1,104.4 mgd in the summer (NextEra 2020c). The maximum design intake volume is 1,108 mgd (NextEra 2020c).

The outer circumference of the intake crib contains an array of 16 evenly spaced acoustic assemblies that help reduce alewife impingement. Alewife is an invasive species in Lake Michigan. Under certain conditions, large schools can become impinged in large enough densities to threaten safe plant operation. The acoustic array broadcasts deterrent signals consisting of high frequency broad band (122-128 kHz) pulses, a sound frequency that has been effective at deterring alewife impingement at a cooling water intake structure on Lake Ontario (Ross et al. 1993). NextEra installed this technology in 2002 under a compliance agreement with the FWS (NRC 2005a).

Once within the intake crib, source water then travels to the pumphouse through two 14-ft (4.3-m) diameter, corrugated galvanized structural steel pipes buried beneath the lakebed. Water passes through vertical bar racks (3/8-in. by 4-in. (0.95-cm by 10-cm) with 2.25-in. (5.7-cm) spacing at center) in the onshore forebay followed by eight traveling screens (3/8-in. (0.95-cm) mesh and 11-ft (3.4-m) wide with a total area of 1,544 ft^2 (471 m^2)) at the pumphouse (NextEra 2020c). Through-screen velocity at the traveling screens is 2.0 fps (0.6 m/s) (NextEra 2020c). Organisms that are too large to pass through the traveling screen mesh, such as juvenile and adult fish and shellfish, become impinged on the screens. Screen wash pumps (80 psi) wash impinged organisms and other debris off the traveling screens and into debris baskets. The baskets empty into a trough that returns organisms and debris back to Lake Michigan.

Organisms small enough to pass through the traveling screen mesh, such as fish eggs, larvae, and other zooplankton, are entrained into the cooling water system. Entrained organisms pass through the entire cooling system and re-enter Lake Michigan along with heated effluent through discharge flumes consisting of steel sheet piling driving into the lakebed and protected by riprap. Water re-enters the lake approximately 200 ft (61 m) from the shoreline.

Point Beach's water intake cooling system is designed to allow reversible flow during winter to recirculate warm condenser discharge water to the intake to prevent the formation of needle ice within the intake structure and freezing of other intake system components. NextEra reverses flow on an as-needed basis during severe cold weather.

Clean Water Act Section 316(b) Requirements for Existing Facilities

Section 316(b) of the Clean Water Act (CWA) addresses the adverse environmental impacts caused by the intake of cooling water from waters of the United States. This section of the act grants the EPA the authority to regulate cooling water intake structures to minimize adverse impacts on the aquatic environment. Pursuant to CWA Section 316(b), the EPA has promulgated regulations for existing facilities, such as Point Beach, at 40 CFR Part 122 and 40 CFR Part 125, Subpart J. Existing facilities include power generation and manufacturing facilities that are not new facilities as defined at 40 CFR 125.83 and that withdraw more than 2 mgd of water from waters of the United States and use at least 25 percent of the water they withdraw exclusively for cooling purposes.

Under the CWA Section 316(b) regulations, the location, design, construction, and capacity of cooling water intake structures of regulated facilities must reflect the best technology available (BTA) for minimizing impingement mortality and entrainment. The EPA, or authorized States and Tribes, imposes BTA requirements through National Pollutant Discharge Elimination System (NPDES) permitting programs. In Wisconsin, the WDNR administers the WPDES program and issues WPDES permits to regulated facilities.

With respect to impingement mortality, the BTA standard requires that existing facilities comply with one of the following seven alternatives (40 CFR 125.94(c)):

(1) operate a closed-cycle recirculating system as defined at 40 CFR 125.92(c)

(2) operate a cooling water intake structure that has a maximum design through-screen intake velocity of 0.5 fps (0.15 m/s)

(3) operate a cooling water intake structure that has a maximum through-screen intake velocity of 0.5 fps (0.15 m/s)

(4) operate an offshore velocity cap as defined at 40 CFR 125.92(v) that was installed on or before October 14, 2014

(5) operate a modified traveling screen that the NPDES Permit Director determines meets the definition at 40 CFR 125.92(s) and that the NPDES Permit Director determines is the best technology available for impingement reduction at the site

(6) operate any other combination of technologies, management practices, and operational measures that the NPDES Permit Director determines is the best technology available for impingement reduction

(7) Achieve the specified impingement mortality performance standard

Options (1), (2), and (4) above are essentially pre-approved technologies requiring no demonstration or only a minimal demonstration that the flow reduction and control measures are functioning as EPA envisioned. Options (3), (5), and (6) require that more detailed information be submitted to the permitting authority before the permitting authority may specify it as BTA for a given facility. Under Option (7), the permitting authority may also review site-specific data and conclude that a de minimis rate of impingement exists and, therefore, no additional controls are warranted to meet the BTA impingement mortality standard.

With respect to entrainment, the CWA Section 316(b) regulations do not prescribe a single nationally applicable entrainment performance standard because the EPA did not identify a technology for reducing entrainment that is effective, widely available, feasible, and does not lead to unacceptable non-water quality impacts (79 FR 48300). Instead, the permitting authority must establish the BTA entrainment requirement for each facility on a site-specific basis. In establishing site-specific requirements, the regulations direct the permitting authority to consider the following factors (40 CFR 125.98(f)(2)):

(i) numbers and types of organisms entrained, including, specifically, federally listed species and designated critical habitat (e.g., prey base)

(ii) impact of changes in particulate emissions or other pollutants associated with entrainment technologies

(iii) land availability inasmuch as it relates to the feasibility of entrainment technology

(iv) remaining useful plant life

(v) quantified and qualitative social benefits and costs of available entrainment technologies

In support of entrainment BTA determinations, facilities must conduct site-specific studies and provide data to the permitting authority to aid in its determination of whether site-specific controls would be required to reduce entrainment and which controls, if any, would be necessary.

<u>Analysis Approach</u>

When available, the NRC staff relies on the expertise and authority of the NPDES permitting authority with respect to the impacts of impingement and entrainment. Therefore, if the NPDES permitting authority has made BTA determinations for a facility pursuant to CWA Section 316(b) in accordance with the current regulations at 40 CFR Part 122 and 40 CFR Part 125, which were promulgated in 2014 (79 FR 48300), and that facility has implemented any associated requirements or those requirements would be implemented before the proposed subsequent license renewal period, then the NRC staff assumes that adverse impacts on the aquatic environment will be minimized (see 10 CFR 51.10(c); 10 CFR 51.53(c)(3)(ii)(B); 10 CFR 51.71(d)). In such cases, the NRC staff concludes that the impacts of either impingement, entrainment, or both would be SMALL for the proposed subsequent license renewal term.

In cases where the NPDES permitting authority has not made BTA determinations, the NRC staff analyzes the potential impacts of impingement, entrainment, or both using a weight of evidence approach. In this approach, the staff considers multiple lines of evidence to assess the presence or absence of ecological impairment (i.e., noticeable or detectable impact) on the aquatic environment. For instance, as its lines of evidence, the staff might consider characteristics of the cooling water intake system design, the results of impingement and entrainment studies performed at the facility, and trends in fish and shellfish population abundance indices. The staff then considers these lines of evidence together to predict the level of impact (SMALL, MODERATE, or LARGE) that the aquatic environment is likely to experience over the course of the proposed subsequent license renewal term.

<u>Baseline Condition of the Resource</u>

For the purposes of this analysis, the NRC staff assumes that the baseline condition of the resource is the Lake Michigan aquatic community as it occurs today, which is described in Section 3.7.1 of this SEIS. While species richness, evenness, and diversity within the community may change or shift between now and when the proposed subsequent license renewal period would begin, the NRC staff finds the present aquatic community to be a reasonable surrogate in the absence of fishery- and species-specific projections.

<u>Impingement Mortality BTA</u>

The WDNR has not made an impingement mortality BTA determination for Point Beach. Point Beach's current WPDES permit (issued in 2016) represents interim BTA (WDNR 2016a). The WDNR made its interim BTA determination in accordance with its 2009 guidance for evaluating cooling water intake structures using best professional judgement. Because Point Beach's previous WPDES permit (issued in 2004) expired before the effective date of the 2014, final rule establishing CWA Section 316(b) regulations for existing facilities, the 2014 requirements did not yet apply to Point Beach during the last WPDES permit renewal.

Point Beach's current WPDES permit expires on June 30, 2021. NextEra submitted a renewal application to the WDNR on December 18, 2020 (NextEra 2020c). In its application, NextEra selected a combination of technologies, management practices, and operational measures under 40 CFR 125.94(c)(6) as its chosen method of complying with the impingement mortality BTA standard. As assessed in NextEra's CWA Section 316(b) compliance submittal (ECT 2018a), this option consists of an offshore intake location, acoustic deterrent system, and cooling water flow reductions. ECT (2018a) made the following conclusions regarding each component of this option:

- The offshore intake reduces impingement by an estimated 79 percent compared to an onshore location.
- Seasonal operation of the acoustic deterrent system reduces impingement by an estimated 82.2 percent based on comparisons with similar systems at other Lake Michigan facilities.
- Flow reductions from a combination of scheduled refueling outages and the use of a single intake pump in the winter reduce flow by approximately 16 percent, which equates to a reduction in impingement mortality of 2.5 percent.

In combination, ECT (2018a) estimates that these three measures reduce impingement mortality by a total of 96.1 percent. If the WDNR agrees that this option complies with the impingement mortality BTA standard, implementation would effectively be immediate because each of these features are already in place and functioning to reduce impingement. No further cooling water intake system upgrades or modifications would take place. However, NextEra would be required to perform a 2-year impingement characterization study to evaluate the effectiveness of this option.

As an alternative compliance option, NextEra evaluated installing modified traveling water screens (MTWS) and an organism return system under 40 CFR 125.94(c)(5). MTWS is a common approach to impingement mortality reduction for non-fragile species. If the WDNR were to select this option as impingement mortality BTA, NextEra would replace the existing traveling water screens with MTWS. The MTWS would be made of smooth mesh to reduce descaling and other damage to impinged organisms. A low-pressure wash would precede a high-pressure wash so that impinged organisms would be less likely to be damaged during screen wash-off, and buckets at the lower edge of the screen panel would collect fish washed off the screens. Other components of the system would be replaced to allow for continuous or near-continuous operation. A 400-ft (122-m) long fish return would return impinged organisms to Lake Michigan. In its assessment of this compliance option, ECT (2018a) noted that the fish return would need to be placed beyond the surf zone and designed to deal with seasonal icing. Placing the fish return between the two thermal discharges could reduce ice concerns, but an ice barrier would still be necessary.

The MTWS option would generally not result in a high live return rate of the fragile species alewife, rainbow smelt, and gizzard shad, which comprise 99 percent of impingement at Point Beach (ECT 2018a). Survival of these species upon return to the source water is estimated to be 15 percent. If survival of the remaining (non-fragile) impinged species is conservatively assumed to be 100 percent, this option would result in an overall estimated impingement mortality reduction of 15.2 percent. Importantly, this number is based on the relative numbers of fish impinged in the 2006–2007 impingement sampling effort, most of which were fragile species. Under the 2014 CWA Section 316(b) final rule, the performance and optimization standard for MTWS does not extend to any fragile species. Because most fish impinged at Point Beach are fragile, implementation of this option would not result in significant additional protection of the most commonly impinged species. This option would require NextEra to perform an optimization study to assess the effectiveness of the MTWS, including the survival of non-fragile species. NextEra (2020c) would complete installation of the new technology in summer 2023 and would perform the optimization study by summer 2025.

As one component of issuing a renewed WPDES permit, the WDNR will review the above-described compliance options and make an impingement mortality BTA determination. When the WDNR makes this determination, it may impose additional requirements to reduce or mitigate the effects of impingement mortality at Point Beach. Such requirements would be incorporated as conditions of the renewed WPDES permit, which would be issued and take effect prior to the subsequent license renewal period. The NRC staff assumes that any additional requirements that the WDNR imposes would minimize the impacts of impingement mortality over the course of the proposed subsequent license renewal term in accordance with CWA Section 316(b) requirements.

Because the WDNR's impingement mortality BTA determination is currently pending, the NRC staff also considers results of impingement and entrainment studies and finfish monitoring trends below to more fully evaluate the magnitude of impact that impingement and entrainment would represent during the proposed subsequent license renewal period.

Impingement Studies

Two impingement studies have been undertaken at Point Beach. Wisconsin Electric Power Company (WEPCO) conducted the first study from 1975–1976, and EA Engineering, Science, and Technology (EA Engineering) conducted the second study in 2005–2006. This section summarizes the results of each study.

Impingement Sampling, 1975–1976

From March 1975 through February 1976, WEPCO performed impingement sampling in accordance with requirements of its WPDES permit. Researchers collected impinged organisms from the cooling water intake system's debris collection baskets over 24-hour periods. In total, WEPCO collected 88 samples roughly every fourth day of operation.

The majority of collected fish were alewife (84 percent) and rainbow smelt (15 percent). All other species combined comprised the remaining 1 percent. WEPCO estimated annual entrainment to be 1,056,724 fish. Monthly estimates ranged from 113 (March 1975) to 467,869 (June 1975) fish. Table 3-12 shows estimated impingement by numbers and biomass.

WEPCO found that impingement accounted for a very small proportion of the lakewide populations of alewife and rainbow smelt: 0.005 percent of adult alewives and 0.07 percent of adult rainbow smelt. With respect to alewife, it is a marine species that has been introduced to the freshwater Great Lakes system. In Lake Michigan, it is easily stressed from a combination of freshwater conditions and temperature changes. Large die-offs occur every year in the summer. Based on the seasonality of alewife impingement, WEPCO assumed that most of the impinged alewife were dead or dying individuals associated with the annual die-off. Section 4.1.2 of the Point Beach initial license renewal SEIS (NRC 2005a) describes the results of this study in further detail, and that discussion is hereby incorporated by reference. Based on a combination of this study and trends in fish and shellfish population abundance indices, the NRC staff concluded in that SEIS that impingement during the Point Beach initial license renewal period would result in negligible impacts on the Lake Michigan fish community.

Impingement Sampling, 2005–2006

From December 2005 through November 2006, EA Engineering (2007) conducted an impingement study to support compliance with EPA's 2004 CWA Section 316(b) final rule, which has since been remanded and replaced by the 2014 final rule. Researchers collected impinged organisms from the cooling water intake system debris collection baskets over 24-hour periods. Prior to each sample period, plant personnel rotated and washed the traveling screens to ensure that shellfish and finfish collected in the trash baskets were only those that were impinged during the sample period. The collection baskets were made of 3/8-in. (0.95-cm) square mesh and were placed where the screen wash discharges to a 24-in. (61-cm) pipe leading to the Unit 2 discharge flume. Impinged organisms were classified as alive or dead and identified to the lowest possible taxonomic level. Specimens determined to be dead at least 24 hours prior to impingement were tallied but not further processed. When more than 50 individuals of a species occurred in a sample, researchers counted and batch weighed the remaining individuals. Alewife were routinely processed in this manner. Gizzard shad, spotttail shiner, rainbow smelt, white sucker, ninespine stickleback, yellow perch, and mottled sculpin were also processed in this manner, although infrequently. Notably, between the 1975–1976 study and the 2005–2006 study, WEPCO installed a fish-deterrent system around the intake crib, the configuration of which was previously described in this section under "Point Beach Cooling Water Intake System." In total, EA Engineering performed 80 sampling events that averaged 22.2 hours in duration during the 12-month study period. Results of this effort are reported in EA Engineering's Impingement Mortality and Entrainment Characterization Study report (EA Engineering 2007). The information in this section is summarized from that report unless otherwise cited.

During the study period, EA Engineering collected 1.6 million finfish and shellfish weighing approximately 3,602 lbs (6,134 kg). Researchers collected 44 finfish taxa. Alewife accounted for over 99 percent of total impingement and almost 93 percent of total biomass. Rainbow smelt and spottail shiner were the next most impinged species at 0.6 percent and 0.1 percent of total collections. Gizzard shad was the fourth most prevalent species, although it accounted for less than 0.1 percent of total collections. Yellow perch was the most abundant sportfish but accounted for less than 0.005 percent of total collections. The only shellfish collected were Great Lakes crayfish (Faxonius rusticus), of which 167 individuals appeared in collections.

Total biomass rankings were different than numerical rankings because only the most abundant species (alewife and rainbow smelt) also had high total biomass. The biomass of seven species, including white sucker, burbot, and freshwater drum, was high relative to these species' numerical rankings because of their larger average size compared to other forage fish.

Most species were infrequently impinged during the study period. Only eight species occurred in more than half of the sampling events, and none occurred in all 80 sampling events. Alewife were collected in 62 events, and rainbow smelt were collected in 67 events. Other species that commonly occurred in sampling events included mottled sculpin (71 events), threespine stickleback (50 events), white sucker (46 events), spottail shiner (45 events), and ninespine stickleback (43 events). Overall, 29 of the 44 impinged finfish taxa occurred in fewer than 16 sampling events, and 11 taxa occurred in only one or two sampling events.

With respect to seasonality, approximately 95 percent of estimated impingement occurred from April 23, 2006, through August 5, 2006. Total impingement estimates mirrored the seasonal impingement of alewife because this species accounted for more than 99 percent of total annual impingement and was the most abundant species in 58 of 62 sampling events in which researchers collected this species. Alewife impingement ranged from none for the first 18 weeks of the study period (December 2005 through early April 2006) to 1.8 million individuals during a 4-day period in early June 2006. The absence of alewife in winter and early spring collections is consistent with the annual die-offs of this species in Lake Michigan as well as the species' offshore/onshore movement patterns. Rainbow smelt occurred in highest numbers in early fall (October 2006) and lowest numbers in the summer (mid-June through September 2006). Yellow perch impingement was highest in winter (December 2005 through early March 2006).

In comparison with the 1975–1976 study, alewife and rainbow smelt accounted for 98.6 to 99.7 percent of the total number of organisms collected in each study. However, 2005–2006 collections yielded more alewife and fewer rainbow smelt and slimy sculpin. Alewife biomass was lower in 2005–2006 collections than in 1975–1976 collections, although the number impinged was higher in 2005–2006. This suggests that impingement of alewife in 2005–2006 was generally of smaller individuals than during the previous study. Overall, 2005–2006 annual impingement estimates were eight times higher than 1975–1976 estimates (see Table 3-12). This increase is largely attributable to the 10-fold increase in alewife impingement between the two studies.

Table 3-12 Estimated Annual Impingement of Finfish, 1975–1976 and 2005–2006

Taxa[a]	Estimated No.		Estimated Biomass (kg)	
	2005-2006	1975-1976	2005-2006	1975-1976
alewife	8,624,384	886,394	30,249	41,907
rainbow smelt	38,709	161,389	221	973
forage fish	24,096	7,285	854	152

Table 3-12 Estimated Annual Impingement of Finfish, 1975–1976 and 2005–2006 (cont.)

	Estimated No.		Estimated Biomass (kg)	
Taxa[a]	**2005-2006**	**1975-1976**	**2005-2006**	**1975-1976**
game & food fish	4,444	979	348	86
rough fish	992	209	280	57
trout	147	452	124	776
salmon	41	16	10	2
TOTAL	**8,692,813**	**1,056,724**	**32,086**	**43,954**

[a] Presented in order of abundance in 2005–2006 entrainment collections.

Source: EA Engineering 2007, summarized from Table 4-5

EA Engineering used its annual impingement results (see Table 3-14) to calculate baseline impingement. Baseline impingement is the impingement that would occur in the source water in the absence of design and construction technologies or operational measures that a facility may employ to reduce impingement. Historical impingement data from other Lake Michigan power plants indicates that offshore intakes, such as at Point Beach, likely impinge fewer fish than onshore intakes. However, impingement rates can vary considerably depending on stock abundance, seasonal habitat selection, substrates and other microhabitat considerations, and withdrawal rates. EA Engineering developed its baseline impingement calculations using actual impingement data combined with results from other Lake Michigan facilities with onshore and offshore intakes. EA Engineering calculated a baseline entrainment of 42.4 million shellfish and finfish compared to the 8.7 million study estimate. Under these calculations, impingement of alewife and rainbow smelt is 80 percent and 67 percent lower, respectively, than if Point Beach's intake were located on the shoreline. In contrast, five times more yellow perch are impinged off shore than would have been impinged on shore. EA Engineering noted that there are likely other onshore/offshore differences in impingement rates for other species, especially catfishes, sunfishes, and others associated with onshore habitats. However, because alewife and rainbow smelt account for over 99 percent of impingement at Point Beach, the offshore location of the intake alone nearly meets (79 percent) the performance standard under the 2004 CWA Section 316(b) final rule of an 80 to 90 percent reduction in impingement mortality.

Synthesis of Impingement Study Results

The above-described impingement studies indicate that alewife are by far the most susceptible species to impingement at Point Beach by both total numbers and total biomass. Seasonal impingement peaks during both studies generally correlate with alewife impingement numbers. Rainbow smelt are the second most impinged species followed by forage fish as a group. Impingement of all other taxa is minimal.

This line of evidence alone does not provide a complete enough picture for the NRC staff to evaluate whether impingement is measurably affecting these species' populations. The potential effects of impingement on these taxa are further evaluated under "Finfish Monitoring Trends" below.

Entrainment BTA

The WDNR has not made an entrainment BTA determination for Point Beach. As explained in Section 3.7.2.1.1 under "Impingement Mortality BTA," the WDNR will make BTA determinations as one component of issuing a renewed WPDES permit. Point Beach's current WDPES permit expires in 2021, and NextEra submitted a renewal application to the WDNR in 2020.

In its WPDES permit renewal application, NextEra assesses several options that could potentially reduce entrainment at Point Beach. These options are: (a) closed-cycle cooling retrofit, (b) fine-mesh screen retrofit, and (c) use of alternative cooling water sources to replace some or all the water used in the once-through cooling system. NextEra determined that these three options were the most appropriate to evaluate based on conversations with the WDNR. With respect to the first two options, NextEra found certain construction and operational factors to make these options infeasible, impractical, or both. However, NextEra performed a detailed assessment of the implementation, cost, and efficiency of each. With respect to the third option, NextEra did not identify any reasonable alternative water supplies, including Ranney-type wells, that could replace even a small fraction of the intake flow.

As one component of issuing a renewed WPDES permit, the WDNR will make an entrainment BTA determination. The CWA Section 316(b) regulations direct the permitting authority to establish BTA entrainment requirements for each facility on a site-specific basis. When the WDNR makes this determination, it may impose additional requirements to reduce or mitigate the effects of entrainment at Point Beach. Such requirements would be incorporated as conditions of the renewed WPDES permit, which would be issued and take effect before the subsequent license renewal period. The NRC staff assumes that any additional requirements that the WDNR imposes would minimize the impacts of entrainment over the course of the proposed subsequent license renewal term in accordance with CWA Section 316(b) requirements.

Because the WDNR's entrainment BTA determination is currently pending, the NRC staff also considers results of entrainment studies and finfish monitoring trends below to more fully evaluate the magnitude of impact that entrainment would represent during the proposed subsequent license renewal period.

Entrainment Studies

Three entrainment studies have been undertaken at Point Beach. WEPCO conducted the first study in 1975, EA Engineering conducted the second study in 2006, and ECT conducted the third study in 2017. This section summarizes the results of each study.

Entrainment Sampling, 1975

From April through October 1976, WEPCO performed entrainment sampling in accordance with requirements of its WPDES permit. Researchers collected entrainment samples from Point Beach's intake forebay at a single depth with an electric pump rated at 240 gpm (0.02 m^3/s) that discharged into half-meter 335-micron mesh plankton nets. A single depth was selected based on the assumption that the water column in the forebay would be well mixed due to turbulence. Each sampling event was 24 hours segregated into four 6-hour intervals, and each sample consisted of the organisms contained in approximately 100 m^3 (26,417 gal) of water. All samples were collected and preserved and then later processed in a laboratory for identification, enumeration, and further analysis.

The zooplankton genera *Mysis* and *Diporeia* were collected in high numbers. Both are shrimp-like crustaceans that are important components of the Great Lakes food web and provide prey for sculpin, burbot, and whitefish, among other finfish. Abundance of these taxa in entrainment collections was four-fold that of finfish.

The majority of collected ichthyoplankton (69.1 percent) were alewife eggs. No other species of eggs were collected. Larvae accounted for the remaining 30.9 percent of ichthyoplankton collections. Larvae taxa included rainbow smelt (62.6 percent of all larvae), alewife (18.7 percent), sculpin (16.5 percent), and longnose sucker (2.2 percent). WEPCO estimated total annual entrainment to be 6.7 million organisms (see Table 3-13). Section 4.1.1 of the Point Beach initial license renewal SEIS (NRC 2005a) describes the results of this study in further detail, and that discussion is hereby incorporated by reference. Based on a combination of this study, trends in fish and shellfish population abundance indices, and operational features, the NRC staff concluded in that SEIS that entrainment during the Point Beach initial license renewal period would result in minimal impacts on the Lake Michigan fish community.

Entrainment Sampling, 2006

From April through September 2006, EA Engineering (2007) conducted an entrainment study to support compliance with the EPA's 2004 final rule implementing CWA Section 316(b). Researchers collected samples from the intake forebay using the same methods as described above for the 1975 study. Over the study period, researchers collected 96 samples (one depth x four diel sampling periods x 24 sampling events).

Over the same period, EA Engineering (2007) also collected offshore ambient ichthyoplankton and shellfish samples along three contours at multiple depths to represent conditions near the Point Beach intake. Each contour was located south of the plant but outside of the thermally influenced waters. Researchers collected samples at multiple depths by towing two 1-meter 335-micron mesh plankton nets equipped with flow meters. The nets were towed at a speed and duration to sample approximately 26,417 gal (100 m^3) of source water per sample. Over the study period, researchers collected a total of 448 samples (28 samples per sampling event x 16 sampling events). Figure 2-5 in EA Engineering (2007) depicts the ambient sample locations.

Results of this sampling effort are reported in EA Engineering's Impingement Mortality and Entrainment Characterization Study report (EA Engineering 2007). The information in this section is summarized from that report unless otherwise cited.

In total, EA Engineering collected 3 distinct shellfish taxa and 19 distinct finfish taxa of five life stages (i.e., egg, YSL, PYSL, larvae, and juveniles) in its 2006 samples. Of these, 2 shellfish taxa and 13 finfish taxa appeared in entrainment samples. Table 3-15 lists the total numbers and relative abundances of collected organisms by taxa and life stage at each collection location.

Gammarus, a genus of amphipod crustacean, constituted the majority of organisms collected (both finfish and shellfish) in both entrainment and ambient samples. Gammarids effectively constituted all shellfish in entrainment samples except for one *Hyalella azteca* individual. Similarly, almost all shellfish in ambient samples were Gammarids except for three unidentified amphipods in the 6-8 ft contour and two *Mysis relicta* in each of the 18 ft and 30 ft contours. Gammarids represent important keystone species in aquatic ecosystems because they play a central role in the detritus cycle and are prey for secondary consumers.

During the development of the 2006 study plan, the WDNR had expressed interest in entrainment of the zooplankton genera *Diporeia* and *Mysis*, both of which were abundant in the 1975 study. However, researchers collected no *Diporeia* and only four *Mysis* individuals in 2006. In its report, EA Engineering noted that these absences paralleled documented population-level, lakewide declines within Lake Michigan. EA Engineering attributed the high occurrence of Gammarids to the likely local colonization of these crustaceans within the rocky substrates of the offshore intake crib and intake forebay.

With respect to finfish, entrainment samples yielded slightly less diversity than ambient samples. Thirteen distinct finfish taxa appeared in entrainment samples versus 19 taxa in ambient samples. Eighteen distinct finfish taxa groups (taxa and life stage combinations) appeared in entrainment samples versus 34 taxa groups in ambient samples. The number of organisms collected in ambient sample density was also much higher than in entrainment samples; ambient sample density was more than 10 times that of entrainment samples.

In entrainment samples, rainbow smelt juveniles were the most abundant (59.1 percent of collected finfish organisms). The next most abundant taxa groups were alewife type eggs (18.1 percent), unidentified eggs (4.7 percent), juvenile alewife (3.1 percent), rainbow smelt larvae (2.4 percent), Coregoninae (freshwater whitefish) YSL (1.6 percent), and stickleback YSL (2.4 percent). All other taxa groups accounted for less than 1 percent.

In ambient samples, alewife type eggs were the most prevalent taxa group in the 6-8 ft contour (73.7 percent of collected finfish organisms). Within the 18 ft contour, YSL and PYSL of rainbow smelt (16.6 percent PYSL), *Alosa* species (16.5 percent YSL), freshwater whitefish (13.5 percent YSL), Clupeidae species (11.6 percent YSL), and yellow perch (11.0 percent YSL) were the most abundant. Rainbow smelt PYSL (39.4 percent) and yellow perch YSL (16.9 percent) dominated the 30 ft contour collections.

With respect to life stages, YSL dominated all samples (entrainment and ambient combined) (42.3 percent of collected finfish organisms) followed by eggs (31.1 percent), PYSL (23.1 percent), juveniles (2.4 percent), and larvae (1.2 percent). YSL were most abundant in the 18 ft and 30 ft contours and consisted primarily of yellow perch, *Alosa* species, and Clupeidae species. Eggs were most abundant in the 6-8 ft contour and consisted primarily of alewife and alewife type eggs. PSYL consisted primarily of rainbow smelt collected in the 18 ft and 30 ft contours. Table 3-16 lists the total numbers and relative abundances of finfish life stages at each collection location.

With respect to seasonality, finfish ichthyoplankton were entrained in highest densities from early June to early August. Peak entrainment occurred during the week of July 23–29, 2006, when an estimated 4.4 million organisms were entrained, representing 41 percent of annual entrainment. Rainbow smelt accounted for 90 percent of this peak. Collection trends indicated that most resident species in the vicinity of Point Beach spawn primarily from April through August. Limited numbers of unidentified freshwater whitefish and burbot appeared in late April and May. Both species are early spawners in Lake Michigan.

In comparison to the 1975 study, the 2006 study contained a higher diversity of taxa. Common carp, burbot, stickleback, and the taxa groups *Lepomis* species (sunfishes), Coregoninae species (freshwater whitefish), cyprinids (minnows and carps), and catastomids (suckers) were reported in 2006 but not in 1975. The relative abundances of early life stages of rainbow smelt and alewife were similar between the two studies. However, alewife eggs were more abundant in 2006, whereas alewife larvae were more abundant in 1975. In both studies, entrainment samples yielded low taxa diversity relative to ambient samples and to the number of fish species known to occur in Lake Michigan.

Using entrainment sampling data and actual cooling water flow volumes, EA Engineering calculated annual estimated entrainment for each entrained finfish and shellfish taxon. In total, Point Beach entrained an estimated 10.7 million finfish eggs and larvae in 2006 (see Table 3-13). Early life stages of alewife (eggs and larvae, including eggs identified as alewife type) and rainbow smelt (larvae only) collectively accounted for 83.4 percent of annual estimated finfish entrainment. Sculpin larvae accounted for 2.4 percent of entrainment. Eggs and larvae of all other taxa combined accounted for the remaining 4.2 and 10.0 percent of entrained finfish, respectively.

The estimated 2006 entrainment value of 10.7 million organisms was about 60 percent higher than WEPCO's 1975 estimate of 6.7 million organisms. This increase is largely attributable to a four-fold increase in the number of entrained rainbow smelt between the two sample years. The majority of rainbow smelt entrained in 2006 were juveniles (94 percent), whereas only larvae were identified in 1975 collections. Alewife larvae were also entrained in much higher numbers in 2006 than in 1975 (1.1 million in 2006 versus 0.41 million in 1975). In contrast, alewife egg entrainment was 50 percent lower in 2006 than in 1975, and sculpin entrainment was 35 percent lower in 2006 than in 1975.

Table 3-13 Estimated Annual Entrainment of Shellfish and Finfish, 1975 and 2006

		2006		1975	
Taxa[a]	Life Stage	Total No.	%	Total No.	%
Gammarus	—	4,057,474,137	99.9	—	—
Mysis	—	62,838	<0.1	10,180,200	42.4
Diporeia	—	—	—	13,851,400	57.6
Total Shellfish	**—**	**4,057,536,975**	**100**	**24,031,600**	**100**
rainbow smelt	larvae	5,663,807	52.7	1,272,080	18.9
alewife	eggs	2,197,300	20.5	4,661,410	69.1
alewife	larvae	1,091,888	10.2	416,311	6.2
other[b]	larvae	1,076,867	10.0	44,617	0.7
other[b]	eggs	450,888	4.2	—	—
sculpin[c]	larvae	258,213	2.4	349,517	5.2
Total Finfish	**—**	**10,738,963**	**100**	**6,743,935**	**100**

[a] Presented in order of abundance in 2006 entrainment collections.

[b] "Other" represents all finfish taxa grouped minus rainbow smelt, alewife, and sculpin.

[c] Sculpin includes deepwater sculpin, slimy sculpin, and unidentified sculpin species.

Source: EA Engineering 2007, summarized from Table 4-1

EA Engineering used its annual entrainment results to calculate baseline entrainment. Baseline entrainment is the entrainment that would occur in the source water in the absence of design and construction technologies or operational measures that a facility may employ to reduce entrainment. Under the 2004 CWA Section 316(b) final rule, the EPA required existing facilities to demonstrate a 60 to 90 percent reduction in entrainment from the baseline calculation (69 FR 41576). Under baseline conditions, the intake is assumed to be located at the shoreline. Because nearshore ichthyoplankton densities are often higher, shoreline intakes generally entrain more organisms than offshore intakes at the same location. Using the results of its ambient sampling, EA Engineering determined that the operation of Point Beach's offshore intake reduces entrainment by 89 percent relative to baseline conditions. EA Engineering therefore concluded that Point Beach met the performance standard in the 2004 rule. Notably, Federal courts remanded the 2004 rule to the EPA for revision, and the EPA replaced it with a new rule in 2014 (79 FR 48300). Under the new rule, the 2004 rule's entrainment standard no longer applies.

Entrainment Sampling, 2017

From April through September 2017, ECT (2018a) conducted an entrainment study to support compliance with the EPA's 2014 CWA Section 316(b) final rule. Researchers collected entrainment samples from the intake forebay using the same methods as described above for the 1975 and 2006 studies.

Results of this sampling effort are reported in EA Engineering's Entrainment Characterization Study Report (EA Engineering 2018), ECT's Source Water Body Status and Entrainment Characterization Study report (ECT 2018a), and NextEra's CWA Section 316 40 CFR 122.21(r)(2) through (13) submittal (ECT et al. 2020). The information in this section is summarized from these reports unless otherwise cited.

In 2017 samples, shellfish were again far more numerous than finfish. No *Mysis* or *Diporeia* were entrained. The invasive amphipod *Echinogammarus ischnus* and mysid *Hemimysis anomala*, which were introduced into Lake Michigan in the 2010s, constituted 71.7 percent of 2017 shellfish collections, and *Gammarus* species constituted 27.8 percent. The non-native mysid shrimp (*Hemimysis anomala*) accounted for less than 1 percent of entrained shellfish. Researchers collected a single native opossum shrimp (*Mysis diluviana*).

ECT collected six distinct finfish taxa of six life stages (egg, YSL, PYSL, larvae, juveniles, and adults) in 2017 samples. Rainbow smelt were the dominant taxa (41.7 percent of total). Burbot comprised a larger proportion of samples (26.4 percent) than in the 2006 study, while alewife comprised a smaller proportion (11.1 percent) than in 2006. Round goby accounted for 8.3 percent of entrained organisms, and unidentified fish eggs and larvae accounted for 3 percent and 7 percent, respectively. In terms of life stages, larvae were most abundant (41 percent) followed by PYSL (24 percent), YSL (18 percent), adults (5 percent), and eggs (3 percent). Table 3-17 shows estimated flow-weighted entrainment in 2006 and 2017 samples.

With respect to seasonality, finfish ichthyoplankton were again entrained in highest densities from early June to early August. Rainbow smelt larvae dominated the early sample period of late April through early July. This species was also collected during more sampling events (seven) than any other taxa. Round goby were present in April and then absent until August. Burbot YSL and PYSL appeared in samples from early May through early July and were absent during the remaining sampling season. Other taxa were present once or twice throughout the entire sampling period and in low numbers.

In comparison to the 2006 study, both the 2006 and 2017 samples yielded essentially the same species. In both studies, rainbow smelt and alewife were the dominant entrained taxa. ECT (2018a) made the following important trend observations concerning the two data sets:

- Rainbow smelt and alewife dominated entrainment collections in both study years. The two species comprised nearly 70 percent of entrained organisms in the combined data set. Alewife was entrained less often in 2017 than in 2006. Rainbow smelt was also entrained less often in 2017 than 2006, but the differential between the two years was less extreme. Entrainment rates for both taxa follow lakewide population trends between the two years.
- Burbot was the third most entrained taxa in both study years. It comprised a larger proportion of entrained organisms in 2017. Reductions in alewife occurring in the lake may strengthen the recovery of burbot, which the entrainment data may reflect.

- Interannual variation in both dominant and less dominant taxa is considerable. Eight taxa, comprising 8.4 percent of 2006 entrainment collections, were not collected in 2017. The source of the variation, whether actual changes in the stock or simple variation in the sampling results, is unclear.
- Most of the entrained finfish were forage fish or rough fish that are not a major component of the Lake Michigan sport fishery. No salmonids or species of major commercial importance were entrained. However, two Coregoninae subfamily YSL were entrained in 2006. These were likely *Coregonus* species (i.e., cisco, whitefish, or bloater).
- While shellfish numbers were similar between the two sample years, 2017 showed a marked shift towards invasive species. The 2006 study concluded that shellfish numbers were driven by colonization of the intake structure rather than populations in the water column. Researchers found that conclusion to remain reasonable in 2017 based on the habitat preferences of the dominantly entrained shellfish.

ECT et al. (2020) used the entrainment data sets to estimate total annual foregone fishery yield. In total, commercial and recreational fisheries are estimated to lose 16,327 lbs (7,406 kg) in biomass due to Point Beach entrainment losses. This number includes both direct entrainment and production foregone from forage. ECT et al. (2020) assumed 100 percent mortality for all entrained organisms. Therefore, this number is likely an overestimate. Using 2015–2018 fishery data, ECT et al. (2020) estimated this loss to represent 0.60 percent of the average annual commercial yield with Wisconsin waters of the Great Lakes.

Synthesis of Entrainment Study Results

The above-described entrainment studies indicate that shellfish are the most entrained group. Shellfish entrainment numbers are likely primarily correlated with colonization of the intake structure by native amphipods in the genus *Gammarus* amphipods and the invasive amphipod *Echinogammarus ischnus*. Rainbow smelt juveniles and alewife eggs are the most entrained taxa and life stage groups, followed by burbot YSL. The increase in entrainment abundance of burbot between 2006 and 2017 may be attributable to this species' lakewide recovery in connection with recent alewife population declines. Entrainment of all other taxa is minimal, and major commercially important species are not entrained.

This line of evidence alone does not provide a complete enough picture for the NRC staff to evaluate whether entrainment is measurably affecting these species' populations. The potential effects of entrainment on these taxa are further evaluated under "Finfish Monitoring Trends" below.

<u>Finfish Monitoring Trends</u>

Section 3.7.1 of this SEIS summarizes current Lake Michigan finfish sampling data and trends. Many recent declines in fish abundance, density, or catch rates in Lake Michigan are attributable to the introduction of invasive zebra and quagga mussels. These species have decreased water clarity in the Great Lakes, which has adversely affected native amphipods and other crustaceans, the main food source for many native prey fish. This bottom-up effect has resulted in lower abundances of both native prey fish and predatory fish.

Alewife and rainbow smelt, the two most impinged and entrained species, have exhibited variable but declining populations according to USGS trawl data near Point Beach. In 2006, when researchers performed the most recent impingement sampling, alewife and rainbow smelt densities were low compared to historical values at USGS trawl sampling sites near Point Beach (ECT et al. 2020). However, these trends mirror longer-term lakewide declines. In its review of finfish trends for species most susceptible to impingement, ECT et al. (2020) did not attribute alewife or rainbow smelt impingement or entrainment to observed local or population-level trends in either species. ECT (2018a) found that because these species have high fecundity, high natural mortality rates, and low economic value, the impacts to Lake Michigan fisheries are low. The remaining impinged and entrained species comprise a very small component of total impingement or entrainment, and the NRC staff identified no information indicating that Point Beach water withdrawals are measurably affecting these species' populations.

This line of evidence provides no indication that impingement and entrainment at Point Beach is causing noticeable or detectable impacts on Lake Michigan's aquatic populations. Because water withdrawals, and the associated risk of impingement and entrainment, would remain the same under the proposed action, the NRC staff anticipates similar (i.e., non-detectable) effects during the proposed subsequent license renewal period.

Impingement and Entrainment Conclusion

Impingement and entrainment studies indicate that alewife and rainbow smelt are most affected by impingement and entrainment at Point Beach. These species have exhibited variable but declining population densities according to USGS trawl data near Point Beach. However, these declines appear to mirror long-term lakewide declines. Impingement and entrainment alone does not appear to create observable effects on the local populations. The remaining impinged and entrained species comprise a very small component of total impingement or entrainment, and the NRC staff identified no information indicating that Point Beach water withdrawals are measurably affecting these species' populations.

Because water withdrawals, and the associated risk of impingement and entrainment, would remain the same under the proposed action, the NRC staff anticipates similar (i.e., non-detectable) effects during the proposed subsequent license renewal period. Further, the WDNR will make BTA determinations for impingement mortality and entrainment as part of issuing a renewed WPDES permit. This new permit would be issued and take effect before the subsequent license renewal period. The NRC staff assumes that any additional requirements that the WDNR imposes would further minimize the impacts of impingement mortality and entrainment over the course of the proposed subsequent license renewal term in accordance with CWA Section 316(b) requirements. For these reasons, the NRC staff concludes that the impacts of impingement and entrainment of aquatic organisms resulting from the proposed Point Beach subsequent license renewal would be SMALL.

Table 3-14 Estimated Annual Impingement of Shellfish and Finfish by Taxa, 2005–2006

Taxa[a]	Estimated Abundance		Estimated Weight	
	No.	%[b]	Kg	%[b]
Great Lakes crayfish	707	100	—	—
TOTAL SHELLFISH	**707**	**100**	**—**	**—**
alewife	8,624,384	99.2	30,249.1	94.3
rainbow smelt	38,709	0.4	221.1	0.7
alewife type	6,335	0.1	18.9	0.1
spottail shiner	4,864	0.1	31.9	0.1
yellow perch	3,262	0.0	41.7	0.1
gizzard shad	3,105	0.0	65.1	0.2
threespine stickleback	2,823	0.0	3.9	0.0

Table 3-14 Estimated Annual Impingement of Shellfish and Finfish by Taxa, 2005–2006 (cont.)

Taxa[a]	Estimated Abundance		Estimated Weight	
	No.	%[b]	Kg	%[b]
mottled sculpin	2,763	0.0	16.2	0.1
ninespine stickleback	2,713	0.0	6.2	0.0
slimy sculpin	758	0.0	4.6	0.0
white sucker	756	0.0	759.7	2.4
bloater	381	0.0	1.7	0.0
burbot	303	0.0	125.8	0.4
round whitefish	225	0.0	107.5	0.3
longnose dace	220	0.0	2.2	0.0
longnose sucker	190	0.0	93.5	0.3
channel catfish	182	0.0	38.0	0.1
black bullhead	172	0.0	28.2	0.1
brown trout	116	0.0	71.1	0.2
freshwater drum	96	0.0	105.5	0.3
smallmouth bass	74	0.0	23.8	0.1
common carp	47	0.0	0.8	0.0
round goby	39	0.0	2.1	0.0
lake trout	31	0.0	52.7	0.2
pumpkinseed	31	0.0	0.4	0.0
chinook salmon	27	0.0	9.7	0.0
brook stickleback	26	0.0	0.0	0.0
bluegill	25	0.0	0.3	0.0
white perch	22	0.0	2.2	0.0
lake whitefish	21	0.0	0.5	0.0
deepwater sculpin	19	0.0	0.2	0.0
Alosa spp.	15	0.0	0.0	0.0
coho salmon	14	0.0	0.1	0.0
fathead minnow	14	0.0	0.1	0.0
common shiner	10	0.0	0.3	0.0
trout perch	10	0.0	0.1	0.0
Cottus spp.	8	0.0	0.0	0.0
central mudminnow	7	0.0	0.0	0.0
lake sturgeon	3	0.0	0.7	0.0
golden shiner	3	0.0	0.0	0.0
emerald shiner	3	0.0	0.0	0.0
green sunfish	3	0.0	0.0	0.0

Table 3-14 Estimated Annual Impingement of Shellfish and Finfish by Taxa, 2005–2006 (cont.)

Taxa[a]	Estimated Abundance		Estimated Weight	
	No.	%[b]	Kg	%[b]
Lepomis spp.	3	0.0	0.0	0.0
black crappie	3	0.0	0.0	0.0
FINFISH TOTAL	**8,692,815**	**100**	**32,086**	**100**
COMBINED TOTAL	**8,693,522**			

[a] Presented in decreasing order of abundance.

[b] 0.0 denotes values of less than 0.005

Source: EA Engineering 2007, Table 4-5

Table 3-15 Total Numbers and Relative Abundance of Shellfish and Finfish Collected in Entrainment and Ambient Samples by Taxa Group, 2007

		Onshore		Offshore					
		Entrainment		6-8 ft Contour		18 ft Contour		30 ft Contour	
Taxa[a]	Life Stage[b]	Total No.	%	Total No.	%	Total No.	%	Total No.	%
Gammarus spp.	—	37,974	100.0	1,509	99.8	1,784	99.9	1,871	99.9
Hyalella azteca	—	1	0.0	—	—	—	—	—	—
Amphipoda spp.	—	—	—	3	0.2	—	—	—	—
Mysis relicta	—	—	—	—	—	2	0.1	2	0.1
TOTAL SHELLFISH		**37,975**	**100**	**1,512**	**100**	**1,786**	**100**	**1,873**	**100**
rainbow smelt	juvenile	75	59.1	6	0.4	4	0.3	2	0.2
alewife type	egg	23	18.1	1,148	73.7	49	3.7	—	—
unidentified spp.	egg	6	4.7	12	0.8	1	0.1	7	0.6
alewife	juvenile	4	3.1	1	0.1	—	—	—	—
rainbow smelt	larvae	3	2.4	—	—	—	—	1	0.1
Coregoninae spp.[c]	YSL	2	1.6	60	3.9	179	13.5	10	0.8
stickleback spp.	YSL	2	1.6	—	—	47	3.6	28	2.4
common carp	YSL	1	0.8	72	4.6	13	1.0	7	0.6
rainbow smelt	PYSL	1	0.8	16	1.0	220	16.6	469	39.4
unidentified spp.	larvae	1	0.8	10	0.6	10	0.8	11	0.9
burbot	YSL	1	0.8	1	0.1	62	4.7	110	9.3
slimy sculpin	PYSL	1	0.8	1	0.1	15	1.1	15	1.3
Cyprinid spp.[d]	YSL	1	0.8	1	0.1	1	0.1	—	—
Catostomidae spp.[e]	egg	1	0.8	—	—	39	3.0	5	0.4
Clupeidae spp.	larvae	1	0.8	—	—	8	0.6	—	—
sculpin spp.	PYSL	1	0.8	—	—	—	—	9	0.8
Cyprinidae spp.[d]	larvae	1	0.8	—	—	—	—	—	—
stickleback spp.	larvae	1	0.8	—	—	—	—	—	—
Lepomis spp.[f]	PYSL	1	0.8	—	—	—	—	—	—
Clupeidae spp.	YSL	—	—	104	6.7	153	11.6	58	4.9

Table 3-15 Total Numbers and Relative Abundance of Shellfish and Finfish Collected in Entrainment and Ambient Samples by Taxa Group, 2007 (cont.)

		Onshore		Offshore					
		Entrainment		6-8 ft Contour		18 ft Contour		30 ft Contour	
Taxa[a]	Life Stage[b]	Total No.	%	Total No.	%	Total No.	%	Total No.	%
Alosa spp.	YSL	—	—	65	4.2	218	16.5	66	5.6
yellow perch	YSL	—	—	15	1.0	146	11.0	201	16.9
rainbow smelt	YSL	—	—	13	0.8	54	4.1	71	6.0
Alosa spp.	PYSL	—	—	10	0.6	10	0.8	—	—
Alosa spp.	juvenile	—	—	7	0.4	1	0.1	—	—
Clupeidae spp.	PYSL	—	—	5	0.3	30	2.3	40	3.4
alewife	egg	—	—	5	0.3	—	—	7	0.6
stickleback spp.	PYSL	—	—	3	0.2	37	2.8	60	5.0
Pimephales type	YSL	—	—	2	0.1	5	0.4	1	0.1
unidentified spp.	YSL	—	—	1	0.1	—	—	—	—
Coregoninae spp.[c]	PYSL	—	—	—	—	13	1.0	—	—
alewife	PYSL	—	—	—	—	3	0.2	2	0.2
Percid spp.	larvae	—	—	—	—	2	0.2	—	—
alewife	YSL	—	—	—	—	1	0.1	3	0.3
Catostomidae spp.	YSL	—	—	—	—	1	0.1	—	—
burbot	PYSL	—	—	—	—	—	—	5	0.4
deepwater sculpin	PYSL	—	—	—	—	—	—	1	0.1
TOTAL FINFISH		**127**	**100**	**1,558**	**100**	**1,322**	**100.0**	**1,189**	**100**

(a) Presented in order of abundance in entrainment collections.
(b) PYSL = post-yolk sac larvae; YSL = yolk sac larvae
(c) Commonly referred to as freshwater whitefish.
(d) Commonly referred to as minnows and carps.
(e) Commonly referred to as suckers.
(f) Commonly referred to as sunfishes.

Source: EA Engineering 2007: Table 3-6

Table 3-16 Total Numbers and Relative Abundance of Finfish Collected in Entrainment and Ambient Samples by Life Stage, 2007

	Onshore		Offshore						TOTAL	
	Entrainment		6-8 ft Contour		18 ft Contour		30 ft Contour			
Life Stage[a]	Total No.	%	Total No.	%	Total No.	%	Total No.	%	Total No.	%
egg	30	23.6	1,165	74.8	89	6.7	19	1.6	1,303	31.1
YSL	7	5.5	334	21.4	880	66.6	555	46.7	1,776	42.3
PYSL	4	3.1	35	2.2	328	24.8	601	50.5	968	23.1
larvae	7	5.5	10	0.6	20	1.5	12	1.0	49	1.2
juvenile	79	62.2	14	0.9	5	0.4	2	0.2	100	2.4
TOTAL	**127**	**100%**	**1,558**	**100%**	**1,322**	**100.0%**	**1,189**	**100%**	**4,196**	**100%**

[a] PYSL = post-yolk sac larvae; YSL = yolk sac larvae

Source: EA Engineering 2007: Table 3-6

Table 3-17 Estimated Annual Flow-Weighted Entrainment by Taxa, 2006 and 2017

	2006		2017		Total	
Taxa[a]	No.	%	No.	%	No.	%
rainbow smelt	5,663,806	52.7	4,273,710	42.5	9,937,516	47.8
alewife	3,418,449	31.8	1,141,218	11.4	4,559,667	21.9
burbot	243,137	2.3	2,663,186	26.5	2,906,323	14.0
unidentified	451,516	4.2	970,347	9.7	1,421,863	6.8
round goby	—	—	713,006	7.1	713,006	3.4
Clupeidae spp.	64,740	0.6	291,625	2.9	356,365	1.7
stickleback	192,288	1.8	—	—	192,288	0.9
sculpin	129,437	1.2	—	—	129,437	0.6
Cyprinidae spp.	128,826	1.2	—	—	128,826	0.6

Table 3-17 Estimated Annual Flow-Weighted Entrainment by Taxa, 2006 and 2017 (cont.)

Taxa[a]	2006		2017		Total	
	No.	%	No.	%	No.	%
slimy sculpin	128,775	1.2	—	—	128,775	0.6
Coregoninae spp.	125,676	1.2	—	—	125,676	0.6
common carp	64,740	0.6	—	—	64,740	0.3
Catostomidae spp.	63,786	0.6	—	—	63,786	0.3
Lepomis spp.	63,786	0.6	—	—	63,786	0.3
Total Ichthyoplankton	**10,738,962**	**100**	**10,053,092**	**100**	**20,792,054**	**100**
Gammarus spp.	4,057,474,137	100.0	1,307,295,469	28.0	5,364,769,606	61.5
Echinogammarus ischnus	—	—	3,349,193,628	71.7	3,349,193,628	38.4
Hemimysis anomala	—	—	12,863,458	0.3	12,863,458	0.1
Gammaridae	—	—	2,189,783	0.0	2,189,783	0.0
Mysis diluviana	—	—	141,929	0.0	141,929	0.0
Hyalella azteca	62,838	0.0	62,838	0.0	125,676	0.0
Total Shellfish	**4,057,536,975**	**100**	**4,671,747,105**	**100**	**8,729,284,080**	**100**

[a] Presented in order of total abundance of 2006 and 2017 collections combined.

Source: ECT et al. 2020

3.7.2.2 Thermal Impacts on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

For plants with once-through cooling systems such as Point Beach, the NRC has determined in the GEIS (NRC 2013a) that thermal impacts on aquatic organisms is a Category 2 issue that requires site-specific evaluation. In 2005, the NRC evaluated the thermal impacts of the Point Beach initial license renewal on aquatic organisms under the issue "heat shock." The NRC determined that the impacts of continued operation of Point Beach would be SMALL during the initial license renewal term (i.e., 2010–2030 for Unit 1 and 2013–2033 for Unit 2) (NRC 2005a). In 2013, the NRC issued Revision 1 of the GEIS (NRC 2013a). In the revised GEIS, the NRC staff renamed the issue of "heat shock" to "thermal impacts on aquatic organisms." The renaming did not affect the scope of the issue for license renewal. This section evaluates thermal impacts on aquatic organisms as they apply to continued operation of Point Beach during the proposed subsequent license renewal term (i.e., 2030–2050 for Unit 1, and 2033–2053 for Unit 2).

The primary form of thermal impact of concern at Point Beach is heat shock. Heat shock is when the water temperature meets or exceeds the thermal tolerance of an aquatic species for some duration of exposure (NRC 2013a). In most situations, fish can move out of an area that exceeds their thermal tolerance limits, although some aquatic species lack such mobility. Heat shock is typically observable only for fish, particularly those that float when dead. In addition to heat shock, thermal plumes resulting from thermal effluent can create barriers to fish passage, which is of particular concern for migratory species. Thermal plumes can also reduce the available aquatic habitat or alter habitat characteristics in a manner that results in cascading effects on the local aquatic community.

<u>Point Beach Effluent Discharge</u>

Point Beach discharges heated effluent to Lake Michigan approximately 200 ft (60 m) from the shoreline via two discharge flumes (one for each unit). The flumes are made of steel sheet piling driven 40 ft (12 m) into the lakebed and protected by riprap.

Point Beach's cooling water system is designed to allow for the discharge of a combined maximum of 979.2 mgd (680,000 gpm; 43 m^3/s) of heated effluent. Within the past 6 years (2015–2020), NextEra reports the maximum annual average discharge for Outfall 001 to be 492.5 mgd (342,013 gpm; 21.6 m^3/s) and for Outfall 002 to be 485.7 mgd (337,292 gpm; 21.3 m^3/s) (NextEra 2020c). Current mean discharge temperature is 24.3 °F (13.5 °C) above ambient lake temperatures (EA Engineering 2008). Point Beach's WPDES permit limits waste heat rejected to Lake Michigan to 8,273 MBtu/hr (WDNR 2014). Within the past 5 years of available monitoring data (2015–2019), Point Beach has remained within this authorized limit (NextEra 2020b).

Point Beach's thermal plume tends to remain either close to the shoreline or it extends in a northeasterly direction outward from the discharge plume. During onshore winds, southward lake current, or the thermal bar that occurs in the lake during spring, the plume remains near the shoreline. During reduced along-shore current, onshore winds, or stable stratification or mixed lake conditions of summer or fall, the plume extends in a northeasterly direction (EA Engineering 2008).

In 2008, EA Engineering modeled Point Beach's thermal plume under extended power uprate (EPU) conditions (EA Engineering 2008). The plant is currently operating under these conditions and would continue to do so during the proposed subsequent license renewal period. Point Beach effluent discharges are of highest mean temperatures in August and September (see Table 3-18).

The surface area of the plume varies depending on Point Beach power level, water currents, and ambient temperatures. Seasonally, the thermal plume is generally largest in the spring and autumn. EA Engineering (2008) found that at a 0.2 fps (0.6 m/s) along-shore current, the surface area of the 6.0 °C (10.8 °F) thermal contour is 39 acres (16 ha), the surface areas of the 4.0 °C (7.2 °F) contour is 105 acres (43 ha), and the surface of the 2.0 °C (3.6 °F) contour is 390 acres (158 ha).

The vertical extent of the plume is generally small. The plume stays near the surface of the water column during all seasons; however, it stratifies more in the summer and sinks more in the winter. Maximum delta temperatures at a 4-ft (1.2-m) depth decreased from 2.4 °C (4.3 °F) at 500 ft (150 m) downlake to 1.7 °C (3.0 °F) at 4,500 ft (1,370 m) downlake. Temperature differences of more than 1.0 °C (1.8 °F) are never present at or below a lake depth of 6 ft (1.8 m) (EA Engineering 2008).

Figures 4-8 and 4-9 in EA Engineering (2008) depict the surface plume temperature contours under present conditions based on 0.2 fps (0.6 m/s) and 0.3 fps (0.9 m/s) along-shore currents. As these figures illustrate, the thermal plume extends south from the discharge and forms an oblong oval. The plume is skinnier and stays closer to shore under a 0.3 fps (0.9 m/s) along-shore current than under a 0.2 fps (0.6 m/s) along-shore current. These figures are hereby incorporated by reference.

Table 3-18 Mean and Maximum Daily Point Beach Discharge Temperatures by Month

Month	Mean (in °C)[a]	Max (in °C)[a]
Jan	23.5	27.7
Feb	24.5	27.5
Mar	23.8	27.9
Apr	20.7	26.8
May	21.3	25.4
Jun	22.8	28.0
Jul	25.7	29.9
Aug	32.3	35.7
Sept	26.9	35.5
Oct	23.8	29.3
Nov	19.2	26.8
Dec	24.1	28.0
Annual	23.7	35.7

[a] Values calculated based on actual daily average discharge temperatures measured over the period November 2004–May 2008 plus the temperature delta under extended power uprate conditions.

Source: EA Engineering 2008, Table 4-5

<u>Clean Water Act Section 316(a) Requirements for Point Source Discharges</u>

Section 316(a) of the CWA addresses the adverse environmental impacts associated with thermal discharges into waters of the United States. This section of the act grants the EPA the authority to impose alternative, less-stringent, facility-specific effluent limits (called “variances”) on the thermal component of point source discharges. In order to be eligible, facilities must demonstrate, to the satisfaction of the NPDES permitting authority, that facility-specific effluent limitations will assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving body of water. CWA Section 316(a) variances are valid for the term of the NPDES permit (i.e., 5 years). Facilities must reapply for variances with each NPDES permit renewal application. The EPA has promulgated regulations pursuant to CWA Section 316(a) at 40 CFR 125, Subpart H.

Analysis Approach

When available, the NRC staff relies on the expertise and authority of the NPDES permitting authority with respect to thermal impacts on aquatic organisms. Therefore, if the NPDES permitting authority has made a determination under CWA Section 316(a) that thermal effluent limits are sufficiently stringent to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the receiving body of water, and the facility has implemented any associated requirements or those requirements would be implemented before the proposed license renewal period, then the NRC staff assumes that adverse impacts on the aquatic environment will be minimized (see 10 CFR 51.10(c); 10 CFR 51.53(c)(3)(ii)(B); 10 CFR 51.71(d)). In such cases, the NRC staff concludes that thermal impacts on aquatic organisms would be SMALL for the proposed subsequent license renewal term.

In cases where the NPDES permitting authority has not granted a 316(a) variance, the NRC staff analyzes the potential impacts of thermal discharges using a weight of evidence approach. In this approach, the staff considers multiple lines of evidence to assess the presence or absence of ecological impairment (i.e., noticeable or detectable impact) on the aquatic environment. For instance, as its lines of evidence, the staff might consider characteristics of the cooling water discharge system design, the results of thermal studies performed at the facility, and trends in fish and shellfish population abundance indices. The staff then considers these lines of evidence together to predict the level of impact (SMALL, MODERATE, or LARGE) that the aquatic environment is likely to experience over the course of the proposed subsequent license renewal term.

Baseline Condition of the Resource

For the purposes of its thermal analysis, the NRC staff assumes that the baseline condition of the resource is the Lake Michigan aquatic community as it occurs today, which is described in Section 3.7.1 of this SEIS. While species richness, evenness, and diversity within the community may change or shift between now and when the proposed subsequent license renewal period would begin, the NRC staff finds the present aquatic community to be a reasonable surrogate in the absence of fishery- and species-specific projections.

CWA 316(a) Thermal Variance

In October 1975, NextEra submitted to the WDNR the results of a CWA Section 316(a) demonstration study conducted from 1972–1973. Based on its request and the study results, the WDNR granted NextEra a CWA Section 316(a) variance, which supported a determination that Point Beach operation had caused no appreciable harm to the aquatic community. WDNR granted NextEra successive CWA Section 316(a) variances in successive WPDES permits on the basis that operational conditions had not changed.

In connection with the 2012 EPU at Point Beach, NextEra sought, and the WDNR granted, a new CWA Section 316(a) variance based on a demonstration that the calculated effluent temperature limits under EPU operating conditions are more stringent than necessary to protect fish and aquatic life. In making its CWA Section 316(a) determination, the WDNR reviewed the results of EA Engineering's (2008) thermal plume modeling. In its report associated with this modeling effort, EA Engineering concluded that:

- The historic heat load of 7,094 MBTU/hr discharged from Point Beach did not cause appreciable harm to the balanced indigenous community of shellfish, fish, and wildlife in and on Lake Michigan.
- Although the current heat load of 8,273 MBTU/hr increased the areal extent of the thermal plume, elevated temperatures remain confined to the upper 6 ft (1.8 m) of the water column except in the immediate vicinity of the discharge.
- The current heat load will assure the protection and propagation of the representative important species (i.e., gizzard shad, channel catfish, common carp, spottail shiner, yellow perch, burbot, alewife, mottled sculpin, lake trout, lake whitefish, bloater, and rainbow smelt).

The WDNR also reviewed additional biological data that compared the current biological condition of Lake Michigan to the biological monitoring results from the previously approved study (i.e., the 1972–1973 thermal study).

The WDNR found that portions of the mixing zone will not be suitable for all life stages of the representative important species. However, the WDNR determined that any negative effects would be localized to the immediate area surrounding the discharge and would result in minimal adverse impacts to representative fish and invertebrates. The WDNR concluded that the EPU heat load of 8,273 MBTU/hr is protective of the balanced, indigenous community of shellfish, fish, and wildlife in and on Lake Michigan and that no temperature limits are needed in the WPDES permit pursuant to CWA Section 316(a). The WDNR's CWA Section 316(a) variance is included as Attachment B of Point Beach's current WPDES permit (WDNR 2016a).

In its 2020 WDPES permit renewal application, NextEra requested continuance of its current CWA Section 316(a) variance on the basis that thermal discharges and other effluent characteristics have not changed since the State granted this CWA Section 316(a) variance. As part of its WPDES permit renewal application review, the WNR will consider this request. The WDNR may determine that the previous CWA Section 316(a) demonstration is sufficient to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on Lake Michigan. Alternately, the WDNR may require additional mitigation or monitoring in the renewed WPDES permit.

<u>Thermal Impacts Conclusion</u>

Because the WDNR has granted NextEra multiple, sequential variances under CWA Section 316(a), the NRC staff finds that the adverse impacts on the aquatic environment associated thermal effluent are minimized. Because the characteristics of the thermal effluent would remain the same under the proposed action, the NRC staff anticipates similar effects during the proposed subsequent license renewal period. Further, the WDNR will continue to review the CWA Section 316(a) variance with each successive WDPES permit renewal and may require additional mitigation or monitoring in a future renewed WPDES permit if it deems such actions to be appropriate to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on Lake Michigan. The NRC staff assumes that any additional requirements that the WDNR imposes would further reduce the minimal impacts of Point Beach's thermal effluent over the course of the proposed subsequent license renewal term. For these reasons, the NRC staff finds that thermal impacts during the proposed subsequent license renewal period would neither destabilize nor noticeably alter any important attribute of the aquatic environment and would, therefore, result in SMALL impacts on aquatic organisms.

3.7.3 No-Action Alternative

If Point Beach were to permanently cease operating, impacts on the aquatic environment would decrease or stop following reactor shutdown. Some withdrawal of water from Lake Michigan would continue during the shutdown period to provide cooling to spent fuel in the spent fuel pool until that fuel could be transferred to dry storage. The amount of water withdrawn for this purpose would be a small fraction of water withdrawals during operations, would decrease over time, and would likely end within the first several years following shutdown. The reduced demand for cooling water would substantially decrease the effects of impingement, entrainment, and thermal effluent on aquatic organisms, and these effects would wholly cease following the transfer of spent fuel to dry storage. Effects from cold shock would be unlikely, given the small area of Lake Michigan affected by thermal effluent under normal operating conditions, combined with the phased reductions in withdrawal and discharge of lake water that would occur following shutdown.

Based on the above, the NRC staff concludes that the impacts of the no-action alternative on aquatic resources during the subsequent license renewal term would be SMALL.

3.7.4 Replacement Power Alternatives: Common Impacts

Construction impacts for many components of the replacement power alternatives would be qualitatively and quantitatively similar. Construction could result in aquatic habitat loss, alteration, or fragmentation; disturbance and displacement of aquatic organisms; mortality of aquatic organisms; and increase in human access. For instance, construction-related chemical spills, runoff, and soil erosion could degrade water quality in Lake Michigan by introducing pollutants and increasing sedimentation and turbidity. Dredging and other in-water work could directly remove or alter the aquatic environment and disturb or kill aquatic organisms. Because construction effects would be short term, associated habitat degradation would be relatively localized and temporary. Effects could be minimized by the use of existing infrastructure, such as the Point Beach intake and discharge systems, as well as the use of existing transmission lines, roads, parking areas, and certain existing buildings and structures on the site. Aquatic habitat alteration and loss could be minimized by siting components of the alternatives farther from waterbodies and away from drainages and other aquatic features.

Water quality permits required through Federal and state regulations would control, reduce, or mitigate potential effects on the aquatic environment. Through such permits, the permitting agencies could include conditions requiring NextEra to follow BMPs or to take certain mitigation measures if adverse impacts are anticipated. For instance, USACE oversees CWA Section 404 permitting for dredge and fill activities, and WDNR oversees WPDES permitting and general stormwater permitting. NextEra would likely be required to obtain each of these permits to construct a new replacement power alternative on the Point Beach site. Notably, the EPA final rule under Phase I of the CWA Section 316(b) regulations applies to new facilities and sets standards to limit intake capacity and velocity to minimize impacts on fish and other aquatic organisms in the source water (40 CFR 125.83). Any new replacement power alternative subject to this rule would be required to comply with the associated technology standards.

With respect to operation of a new replacement power alternative, operational impacts for the replacement power alternatives would be qualitatively similar but would vary in intensity, based on each alternative’s water use and consumption. The alternatives would involve new nuclear power generation, in the form of SMRs, or new natural gas combined-cycle power generation. These new facilities would use mechanical draft cooling towers to dissipate waste heat. The NRC staff analyzed the impacts of operation of nuclear facilities with cooling towers on the aquatic environment in the GEIS (NRC 2013a) and determined that this would result in SMALL impacts on the aquatic environment, including those impacts resulting from impingement, entrainment, and thermal effluents. This is due to the relatively low volume of makeup water withdrawal for plants with cooling towers and the minimal heated effluent that would be discharged. Water use conflicts would be unlikely, given that any new power alternative would be sited on the existing Point Beach site and would consume a small fraction of Lake Michigan's flow past the plant.

3.7.5 New Nuclear (Small Modular Reactor) Alternative

The types of impacts that the aquatic environment would experience from this alternative are characterized in the previous section discussing impacts common to all replacement power alternatives. In that section, construction impacts are sufficiently addressed as they would apply to the new nuclear alternative. Based on that discussion, the NRC staff finds that the impacts of construction on aquatic resources would be SMALL because construction effects would be of limited duration, the new plant would use some of the existing site infrastructure and buildings, and required Federal and state water quality permits would likely include conditions requiring BMPs and mitigation strategies to minimize environmental effects.

With respect to operation, Federal and state water quality permits would control and mitigate many of the potential effects on the aquatic environment, including water withdrawal and discharge, such that the associated effects would be unlikely to noticeably alter or destabilize any important attribute of the aquatic environment. Therefore, the NRC staff finds that the impacts of operation on aquatic resources would be SMALL.

Based on the above, the NRC staff concludes that the impacts on aquatic resources from construction and operation of a new nuclear (SMR) alternative would be SMALL.

3.7.6 Natural Gas Combined-Cycle Alternative

The types of impacts that the aquatic environment would experience from this alternative are characterized in the previous section discussing impacts common to all replacement power alternatives. This alternative would also involve the construction of a new pipeline and associated utility corridors that would run approximately 10 mi (16 km) south to Two Rivers, WI. No waterways exist between the two locations, so aquatic resources would not be affected. Implementation of BMPs would minimize potential effects to any minor drainage areas or other isolated aquatic features that may be present. The NRC staff finds that the impacts of construction on aquatic resources would be SMALL because construction effects would be of limited duration, the new plant would use some of the existing site infrastructure and buildings, and required Federal and state water quality permits would likely include conditions requiring BMPs and mitigation strategies to minimize environmental effects.

With respect to operation, Federal and state water quality permits would control and mitigate many of the potential effects on the aquatic environment, including water withdrawal and discharge, such that the associated effects would be unlikely to noticeably alter or destabilize any important attribute of the aquatic environment. Therefore, the NRC staff finds that the impacts of operation on aquatic resources would be SMALL.

Based on the above, the NRC staff concludes that the impacts on aquatic resources from construction and operation of a natural gas alternative would be SMALL

3.7.7 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

The types of impacts that the aquatic environment would experience from the SMR portion of the combination alternative are characterized in the previous two sections discussing impacts common to all alternatives and impacts of the new nuclear alternative. Construction and operation impacts of this portion of the combination alternative would be qualitatively similar. Because the nuclear portion of the combination alternative would involve construction and operation of a smaller SMR facility, less cooling water would be required, which would result in fewer impacts on the aquatic environment. Therefore, the NRC staff finds that the impacts of construction and operation of the SMR portion of the combination alternative on aquatic resources would be SMALL.

Impacts of constructing the solar PV portion of the combination alternative are also addressed in the previous section discussing impacts common to all alternatives. These impacts would be SMALL to MODERATE, depending on the site(s) selected, the aquatic habitats present, and the extent to which construction would degrade, modify, or permanently alter those habitats. Operation of the solar PV portion would have no discernable effects on the aquatic environment.

Impacts of constructing the onshore wind portion of the combination alternative are also addressed in the previous section discussing impacts common to all alternatives. Generally, onshore wind projects are sited away from waterways. Therefore, construction would be unlikely to disturb or otherwise affect aquatic habitats or features. Operation of the onshore wind portion would not require cooling or consumptive water use and, thus, would not affect aquatic resources. Therefore, the NRC staff finds that the impacts of construction and operation of the onshore wind portion of the combination alternative on aquatic resources would be SMALL.

Based on the above, the NRC staff concludes that the impacts on aquatic resources from construction and operation of a combination alternative would be SMALL to MODERATE during construction and SMALL during operation.

3.8 Special Status Species and Habitats

This section addresses species and habitats that are federally protected under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA), and the Magnuson–Stevens Fishery Conservation and Management Reauthorization Act, as amended (16 U.S.C. 1801–1884) (MSA). Before taking a Federal action, such as the issuance of the proposed subsequent renewed licenses for Point Beach, the NRC has direct responsibilities under these statutes. Sections 3.6 and 3.7 of this SEIS address terrestrial and aquatic species and habitats protected by other Federal statutes and the State of Wisconsin under which the NRC does not have such responsibilities.

3.8.1 Endangered Species Act: Federally Listed Species and Critical Habitats

The U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) jointly administer the ESA. The FWS manages the protection of, and recovery effort for, listed terrestrial and freshwater species, and the NMFS manages the protection of, and recovery effort for, listed marine and anadromous species. The following sections describe the Point Beach action area and the species and habitats that may occur in the action area under the FWS's and the NMFS's jurisdictions.

3.8.1.1 Endangered Species Act: Action Area

The implementing regulations for ESA Section 7(a)(2) define "action area" as all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area effectively bounds the analysis of federally listed species and critical habitats because only species and habitats that occur within the action area may be affected by the Federal action.

For the purposes of assessing the potential impacts of Point Beach subsequent license renewal on federally listed species and critical habitats, the NRC staff considers the action area to consist of the following.

Point Beach Site: The terrestrial region of the action area consists of the 1,260-acres (510-ha) Point Beach site in Manitowoc County, WI. The site is situated on the shoreline of Lake Michigan in the northeastern corner of the county. Local terrain is gently rolling to flat with elevations that vary from 3 to 58 ft (1 to 18 m) above mean sea level (MSL). It includes developed land to support power plant operations (125 acres (55 ha)); cultivated land and pasture (959 acres (388 ha)), woody wetlands (89 acres (36 ha)), mixed forest (33 acres (13 ha)), and deciduous forest (20 acres (8 ha)). Shoreline habitat consists of sand beach, dunes, and gravel shore. Tides, erosion, and deposition affect the quantity of exposed shoreline. Based on observations recorded in recent piping plover breeding census reports, this habitat has varied from approximately 0.4–2.4 mi (0.6–3.9 km) in length and 20–82 ft (6-–25 m) in width over the period 2015–2020 (NextEra 2021a). Sections 3.2 and 3.6 of this SEIS describe the developed and natural features of the site and the characteristic vegetation and habitats and include figures of the site layout and surrounding area.

Lake Michigan: The aquatic region of the action area encompasses the area of Lake Michigan influenced by the cooling water intake system (described in Section 3.7.2.1 of this SEIS) and the area of Lake Michigan that experiences increased temperatures from discharge of heated effluent (described in Section 3.7.2.3 of this SEIS).

The NRC staff recognizes that although the described action area is stationary, federally listed species can move in and out of the action area. For instance, a migratory bird could occur in the action area seasonally as it forages or breeds within the action area. Thus, in its analysis, the NRC staff considers not only those species known to occur directly within the action area, but those species that may passively or actively move into the action area. The NRC staff then considers whether the life history and habitat requirements of each species makes it likely to occur in the action area where it could be affected by the proposed subsequent license renewal. The following sections first discuss listed species and critical habitats under the FWS's jurisdiction followed by those under the NMFS's jurisdiction.

3.8.1.2 Endangered Species Act: Federally Listed Species and Critical Habitats under U.S. Fish and Wildlife Service Jurisdiction

This section primarily evaluates two federally listed species that may be present in the action area:

- northern long-eared bat (*Myotis septentrionalis*)
- piping plover (Charadrius melodus)

The NRC staff determined that these species were relevant to this review based on desktop analysis of the Point Beach action area, available scientific literature and studies, and the results of past ESA Section 7 consultations in connection with the Point Beach site. No candidate species, proposed species, or critical habitats (proposed or designated) occur within the action area (FWS 2021a). However, critical habitat of the piping plover occurs outside of the action area but within Manitowoc County along the coastline approximately 3 mi (5 km) south of the action area. This critical habitat is described in further detail below.

In 2004, the NRC staff evaluated the effects of Point Beach operation on federally listed species as part of the staff's environmental review for the Point Beach initial license renewal term. The NRC staff prepared a biological assessment that evaluated Pitcher's thistle (*Cirsium pitcheri*), dwarf lake iris (*Iris lacustris*), piping plover, and the bald eagle (*Haliaeetus leucocephalus*)

(NRC 2004). The NRC staff concluded that continued operation would have no effect on either plant species because neither had been identified on the site and suitable habitat does not exist. The NRC staff concluded that continued operation during the initial license renewal term may affect but is not likely to adversely affect the piping plover and bald eagle. Effects to these species were expected to consist of occasional habitat disturbances associated with plant operation and maintenance activities or transmission line maintenance. The FWS concurred with the NRC staff's findings in letters dated January 31, 2005, and May 5, 2005 (FWS 2005a, FWS 2005b). The FWS's concurrence, in part, relied upon the applicant's development and implementation of a piping plover monitoring framework during the initial license renewal license term. This framework is further described within the piping plover discussion below.

With respect to the Pitcher's thistle and dwarf lake iris, the NRC staff identified no new information during its review of the proposed subsequent license renewal indicating occurrences of these species or of suitable habitat within the action area. Accordingly, these species are not considered in any further detail in this SEIS.

With respect to the bald eagle, the FWS delisted this species in 2007 due to recovery. The bald eagle remains federally protected under the Bald and Golden Eagle Protection Act, which is discussed in Section 3.6.4 of this SEIS.

The NRC staff has not evaluated the northern long-eared bat during any previous environmental reviews related to Point Beach because the FWS did not list the species under the ESA until 2015. Accordingly, the NRC staff addresses this species in this SEIS and evaluates the potential effects of subsequent license renewal on this species.

NextEra's environmental report addresses two additional federally listed species—rusty patched bumblebee (*Bombus affinis*) and Hine's emerald dragonfly (*Somatochlora hineana*). However, the Wisconsin Natural Heritage Inventory identifies no occurrences of these species within 6 mi (10 km) of the Point Beach action area (WNHI 2021a), and the action area does not contain habitat features closely associated with either species. Accordingly, the NRC staff does not consider these species in any further detail in this SEIS.

<u>Northern Long-eared Bat (*Myotis septentrionalis*)</u>

The FWS listed the northern long-eared bat as threatened throughout its range in 2015 (80 FR 17974). In 2016, the FWS determined that designating critical habitat for the species was not prudent because such designation would increase threats to the species resulting from vandalism and disturbance and could potentially increase the spread of the fungal white-nose syndrome (81 FR 24707). Information in this section is organized according to the description of the species in the FWS's *Federal Register* notice associated with the final rule to list the species (80 FR 17974) and draws from this source unless otherwise cited.

Taxonomy and Species Description

Although there have been few genetic studies on the northern long-eared bat, the FWS describes it as a monotypic species (i.e., having no subspecies). This species has been recognized by different common names, including Keen's bat, northern Myotis, and the northern bat.

The northern long-eared bat is a medium-sized bat that is distinguished from other *Myotis* species by its long ears, which average 0.7 in. (17 mm) in length. Adults weigh 0.2 to 0.3 oz (5 to 8 g), and females tend to be slightly larger than males. Individuals are medium to dark brown on the back, dark brown on the ears and wing membranes, and tawny to pale brown on the ventral side. Within its range, the northern long-eared bat can be confused with the little brown bat (*Myotis lucifugus*) or the western long-eared myotis (*M. evotis*).

Distribution and Relative Abundance

Species Range. The northern long-eared bat is found across much of the eastern and north-central United States and all Canadian provinces from the Atlantic coast west to the southern Northwest Territories and eastern British Columbia. Its range includes 37 U.S. states. The species is widely distributed within the eastern portion of its range, which includes Delaware, Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, Pennsylvania, Vermont, Virginia, West Virginia, New York, Rhode Island, and the District of Columbia. Prior to documentation of white-nose syndrome, northern long-eared bats were consistently captured during summer mist-net and acoustic surveys within this region. However, as white-nose syndrome has spread, growing gaps exist within the eastern region where bats are no longer being captured or detected. In other areas, occurrences are sparse. Frick et al. (2015) documented the local extinction of northern long-eared bats from 69 percent of 468 sites where white-nose syndrome has been present for at least 4 years in Vermont, New York, Pennsylvania, Maryland, West Virginia, and Virginia, which was by far the highest extinction rate among six species of North American hibernating bats considered during the study.

Status Within Wisconsin. As of 2016, the FWS reports 67 known northern long-eared bat hibernacula and 84 known occupied maternity roost trees in Wisconsin (FWS 2016c). Historically, the species has been captured in both summer and winter surveys within the State. However, since the appearance of white-nose syndrome in Wisconsin (2013–2014), winter and summer survey captures have sharply declined. In its 2016 programmatic biological opinion associated with the northern long-eared bat final rule under ESA Section 4(d), the FWS made the following estimates of Wisconsin's northern long-eared bat population (FWS 2016c):

- 537,810 total adults
- 286,905 total pups
- 6,895 maternity colonies of an average size of 39 individuals
- 44.9 percent occupancy of Wisconsin's available forested habitat

Habitat

Winter Habitat. Northern long-eared bats predominantly overwinter in hibernacula of various sizes that include underground caves and abandoned mines. Preferred hibernacula have relatively constant, cool temperatures with very high humidity and no air currents. Individuals most often roost in small crevices or cracks in cave or mine walls or ceilings but are also infrequently observed hanging in the open. Less commonly, northern long-eared bats overwinter in abandoned railroad tunnels, storm sewers, aqueducts, attics, and other non-cave or mine hibernacula with temperature, humidity, and air flow conditions resembling suitable caves and mines.

Summer Habitat. In summer, northern long-eared bats typically roost individually or in colonies underneath bark or in cavities or crevices of both live trees and snags. Males and nonreproductive females may also roost in cooler locations, including caves and mines. Individuals have also been observed roosting in colonies in buildings, barns, on utility poles, and in other manmade structures. The species has been documented to roost in many species of trees, including black oak (*Quercus velutina*), northern red oak (*Q. rubra*), silver maple (*Acer saccharinum*), black locust (*Robinia pseudoacacia*), American beech (*Fagus grandifolia*), sugar maple (*A. saccharum*), sourwood (*Oxydendrum arboreum*), and shortleaf pine (*Pinus echinata*). Foster and Kurta (1999) found that rather than being dependent on particular tree species, northern long-eared bats are likely to use a variety of trees if they form suitable cavities or retain bark. Owen et al. (2002) found that tree-roosting maternal colonies chose roosting sites in larger trees that were taller than the surrounding stand and in areas with abundant snags. Carter and Feldhamer (2005) indicate that resource availability drives roost tree selection more than the actual tree species. However, several studies have shown that the species more often roosts in shade-tolerant deciduous trees rather than conifers. Additionally, the FWS concludes in its final listing that the tendency for northern long-eared bats to use healthy live trees for roosting is low.

Northern long-eared bats actively form colonies in the summer, but such colonies are often in flux because members will frequently depart to be solitary or to form smaller groups and later return to the main unit. This behavior is described as "fission-fusion," and it also results in individuals often switching tree roosts (typically every 2 to 3 days). Roost trees are often close to one another within the species' summer range with various studies documenting distances between roost trees ranging from 20 ft (6.1 m) to 2.4 mi (3.9 km).

Spring Staging. Spring staging is the period between winter hibernation and spring migration to summer habitat when bats begin to gradually emerge from hibernation. Individuals will exit the hibernacula to feed but re-enter the same or alternative hibernacula to resume periods of physical inactivity. The spring staging period is believed to be short for the northern long-eared bat and may last from mid-March through early May with variations in timing and duration based on latitude and weather.

Fall Swarming. Fall swarming is the period between the summer and winter seasons and includes behaviors such as copulation, introduction of juveniles to hibernacula, and stopovers at sites between summer and winter regions. Both males and females are present together at swarming sites, and other bat species are often present as well. For northern long-eared bats, the swarming period may occur between July and early October, depending on latitude within the species' range. Northern long-eared bats may use caves and mines during swarming. Little is known about roost tree selection during this period, but some studies suggest that a wider variation in tree selection may occur during swarming than during the summer.

Roost Trees. Northern long-eared bats roost in cavities, crevices, hollows, or under the bark of live and dead trees and snags of greater than 3-in. (8-cm) diameter at breast height. Isolated trees may be considered suitable habitat when they exhibit these characteristics and are less than 1,000 ft (300 m) from the next nearest suitable roost tree within a wooded area. Northern long-eared bats appear to choose roost trees based on structural suitability rather than exhibiting a preference for specific species of trees.

Biology

Hibernation. Northern long-eared bats hibernate during winter months. Individuals arrive at hibernacula in August or September, enter hibernation in October and November, and emerge from hibernacula in March or April. The species has shown a high degree of repeated hibernaculum use, although individuals may not return to the same hibernacula in successive seasons. Northern long-eared bats often inhabit hibernacula in small numbers with other bat species, including little brown bats, big brown bats (*Eptesicus fuscus*), eastern small-footed bats (*Myotis leibii*), tri-colored bats (*Perimyotis subflavus*), and Indiana bats (*M. sodalis*). Northern long-eared bats have been observed moving among hibernacula during the winter hibernation period, but individuals do not feed during this time, and the function of this behavior is not well understood.

Migration and Homing. Northern long-eared bats migrate relatively short distances (between 35 and 55 mi (56 and 89 km)) from summer roosts and winter hibernacula. The spring migration period typically occurs from mid-March to mid-May, and fall migration typically occurs between mid-August and mid-October.

Reproduction. Northern long-eared bats mate from late July in northern regions to early October in southern regions. Hibernating females store sperm until spring, and ovulation takes place when females emerge from hibernacula. Gestation is estimated to be 60 days, after which time females give birth to a single pup in late May or early June. Females raise their young in maternity colonies, which generally consist of 30 to 60 individuals (females and young). Roost tree selection changes depending on reproductive stage with lactating females roosting higher in tall trees with less canopy cover. Young are capable of flight as early as 3 weeks following birth. Maximum lifespan for northern long-eared bats is estimated to be up to 18.5 years, and the highest rate of mortality occurs during the juvenile stage.

Foraging Behavior. Northern long-eared bats are nocturnal foragers that use hawking and gleaning in conjunction with passive acoustic cues to collect prey. The species' diet includes moths, flies, leafhoppers, caddisflies, beetles, and arachnids. Individuals forage 3 to 10 ft (1 to 3 m) above the ground between the understory and canopy of forested hillsides and ridges with peak foraging activity occurring within 5 hours after sunset.

Home Range. Northern long-eared bats exhibit site fidelity to their summer home range, during which time individuals roost and forage in forests. Studies indicate a variety of home range sizes—from as little as 21.3 acres (8.6 ha) to as large as 425 acres (172 ha). Some studies indicate differences in ranges between sexes, while others find no significant differences.

Factors Affecting the Species

The FWS identifies white-nose syndrome, a disease caused by the fungus *Pseudogymnoascus destructans*, to be the predominant threat to the northern long-eared bat's continued existence. Other factors include human disturbance of hibernacula and loss of summer habitat due to forest conversion and forest management.

Occurrence Within the Action Area

The Point Beach action area falls within the general range of the northern long-eared bat. The action area does not contain caves, mines, or other features suitable for hibernating. Therefore, the NRC staff concludes that northern long-eared bats are not present in the action area in the winter. The action area's forested areas contain suitable habitat to support foraging, mating, and sheltering. Because no surveys have been conducted to determine the species' presence, the NRC staff conservatively assumes that the northern long-eared bat could occur within the action area in the spring, summer, and fall. If present during these seasons, individuals would only occur very occasionally and in very low numbers.

Piping Plover (*Charadrius melodus*)

The FWS listed the Great Lakes distinct population segment of the piping plover as endangered within the Great Lakes watershed in the States of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin and Ontario, Canada in 1985. The FWS has since published several rules designating critical habitat throughout the species' range, including one critical habitat unit within Manitowoc County, WI. Information in this section is drawn from the FWS's 2016 draft revised recovery plan for the species (FWS 2016a) unless otherwise cited.

Taxonomy and Species Description

The piping plover is a small migratory shorebird with a short, stout bill, pale underparts and orange legs. Adults are approximately 6.7 in. (17 cm) in length and have a 15-in. (38-cm) wingspan. During breeding season, mature individuals develop a black band across the forehead, a single black neckband, and a black tip on the bill. Chicks have speckled gray, buff, brown, and white down. Juveniles resemble adults in winter and acquire adult plumage the spring after the fledge. Two subspecies are recognized: *Charadrius melodus melodus* occurs along the Atlantic coast and *Charadrius melodus circumcinctus* occurs within the interior of the continent. Within *C. m. circumcinctus*, the FWS recognizes two distinct population segments—Northern Great Plains and Great Lakes Watershed. The three breeding populations are recognized and treated separately in the final rule listing the species.

Distribution and Relative Abundance

Species Range. The Great Lakes population of piping plovers breed and raise young on the shores of the Great Lakes. Birds typically arrive on breeding grounds in late April, and most nests are initiated by mid to late May. Breeding adults depart nesting grounds as early as mid-July, but the majority depart by mid-August. Juveniles usually depart a few weeks later than adults. Historically, the species nested within Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario, Canada. By the late 1970s, piping plovers were extirpated from Great Lakes beaches in Illinois, Indiana, New York, Ohio, Pennsylvania, and Ontario, although occasional nesting in these regions is observed. In 1977, the Great Lakes population was estimated at 31 nesting pairs, and in 1986, the population had declined to 17 pairs. The population has gradually increased and expanded its range since that time.

In winter, piping plovers migrate to the Atlantic and Gulf coasts of southern North American and Central America where they spend up to 10 months of the year. The wintering ranges of the species' three populations overlap and extend from North Carolina to Florida on the Atlantic Coast and from the Florida Gulf Coast west to Texas into Mexico, the West Indies, and the Bahamas.

Status Within Wisconsin. In the late 1800s, the FWS estimated that 500 to 800 pairs of piping plovers nested on Great Lakes beaches with 100 pairs nesting on Lake Michigan and Lake Superior shorelines in Wisconsin (FWS 2020b). By the 1970s, few piping plovers remained in Wisconsin, and no nests were found in the State between 1983 and 1997. In 2002, only one nesting pair was observed. In recent years, the Great Lakes population has gradually increased and has expanded its nesting range to the west in Wisconsin. Currently, the Wisconsin Natural Heritage Inventory identifies piping plovers as occurring in seven counties (WNHI 2021b). Manitowoc County is not one of these counties, although critical habitat is designated within the county, as described below.

Habitat

Throughout their breeding range, piping plovers select open, sparsely vegetated sandy habitats for nesting, foraging, and rearing young. On Lake Michigan, piping plovers nest on sand spits or sand beaches associated with wide, unforested systems of dunes and swales or in the flat pans behind primary dunes. Plants associated with these habitats include marram grass (*Ammophila breviligulata*), bearberry (*Arctostaphylos uva-ursi*), sand cherry (*Prunus pumila*), willow (*Salix* spp.), and creeping (*Juniperus horizontalis*) and common (*J. communis*) juniper. Nests often occur near rivers or ephemeral ponds that function as alternate feeding sites for chicks. Beach width also appears to affect nesting habitat. Several studies indicate that piping plovers select areas with a mean beach width of greater than 100 ft (30 m).

On wintering grounds, piping plovers are associated with beaches, mud flats, sand flats, algal flats, and washover passes with no or very sparse emergent vegetation. Individual birds tend to return to the same wintering sites year after year.

Biology

Breeding and Behavior. Piping plovers mate from late April through May. Nests consist of shallow sand depressions lined with light-colored pebbles and shell fragments. Females lay one egg every other day until they have laid a clutch of three to four eggs. Both sexes actively defend nest territories and share incubation duties. Eggs hatch in 25 to 31 days from late May to late July. If nests are destroyed or unsuccessful, adults may re-nest several times per season. Chicks fledge in 21 to 30 days.

Foraging and Diet. Piping plovers forage on exposed beach substrates by pecking for invertebrates near the surface of the sand. Diets consist of various invertebrates, including insects, marine worms, crustaceans, and mollusks. On wintering grounds, piping plovers prey on polychaete marine worms, various crustaceans, insects, and occasionally bivalve mollusks.

Migration. Piping plovers depart breeding areas from mid-July to early September and begin arriving on wintering grounds in late July to late September. Adult females typically arrive first, followed by unpaired males, males with fledglings, and unaccompanied young. Migration is not well understood, but researchers believe that individuals likely migrate non-stop from interior breeding grounds to wintering areas. Birds begin departing winter grounds in mid-February, although peak migration departure occurs in March. Males and females migrate separately but arrive at breeding grounds simultaneously. Migration stopover sites are currently unknown.

Factors Affecting the Species

The FWS believes that hunting in the late 19th and early 20th centuries likely led to the piping plover's initial decline. Habitat loss and alteration, predation, and surface water contamination have contributed to further population declines. Shoreline development, specifically, has reduced available breeding grounds along the Great Lakes and wintering grounds along the Atlantic coast. For instance, the extirpation of piping plovers from formerly occupied Great Lakes states has been associated with development that permanently converted shoreline to developed or recreational land uses that altered the physical nature of the beaches in a manner that made the habitat no longer suitable for the species. Inlet dredging and artificial structures, such as breakwalls and groins, can also eliminate breeding and wintering areas and alter sedimentation patterns leading to the loss of nearby habitat.

Occurrence Within the Action Area

The Point Beach action area falls within the general range of the piping plover. However, the WDNR does not currently have records of this species occurring in Manitowoc County. Suitable habitat for the species exists within the action area along the shoreline of Lake Michigan. Additionally, the FWS has designated critical habitat for the species approximately 3 mi (5 km) south of the Point Beach site along the shoreline and within Point Beach State Forest. During the NRC's review of the Point Beach initial license renewal, the FWS noted that the Great Lakes population may expand into areas of suitable beach habitat within this critical habitat or within the Point Beach action area during the initial license renewal term (FWS 2005a). During the ESA Section 7 consultation associated with that Federal action, NextEra committed to performing piping plover breeding censuses in June of each year as part of a piping plover monitoring framework. NextEra began these surveys in 2005, and no piping plover individuals or nests have been identified on the Point Beach site since that time (NextEra 2021a). Nonetheless, the NRC staff conservatively assumes that piping plovers may occur in the action area from March to early September within areas of suitable beach habitat of sufficient width to support nesting and foraging. If present, individuals would occur very occasionally and in very low numbers.

Designated Critical Habitat of the Piping Plover

Critical habitat represents the habitat that contains the physical or biological features (PBFs) essential to conservation of the listed species and that may require special management considerations or protection (78 FR 53058). Critical habitat may also include areas outside the geographical area occupied by the species if the FWS determines that the area itself is essential for conservation.

The FWS designated 35 critical habitat units for the Great Lakes breeding population of piping plover in 2001 (66 FR 22938). All unit boundaries extend 1640 ft (500 m) inland from the normal high-water line, although the inland edge of the area that contains the primary constituent elements may vary depending on the extent of the open dune system. This area is needed to provide foraging habitat as well as incorporate cobble pans between the dunes where piping plover occasionally nest. Primary constituent elements are those habitat components that are essential for successful foraging, nesting, rearing of young, intra-specific communication, genetic exchange, roosting, dispersal, or sheltering (see Table 3-19). These elements are found on Great Lakes islands and mainland shorelines that support open, sparsely vegetated sandy habitats, such as sand spits or sand beaches, that are associated with wide, unforested systems of dunes and inter-dune wetlands.

Table 3-19 Primary Constituent Elements of Piping Plover Critical Habitat

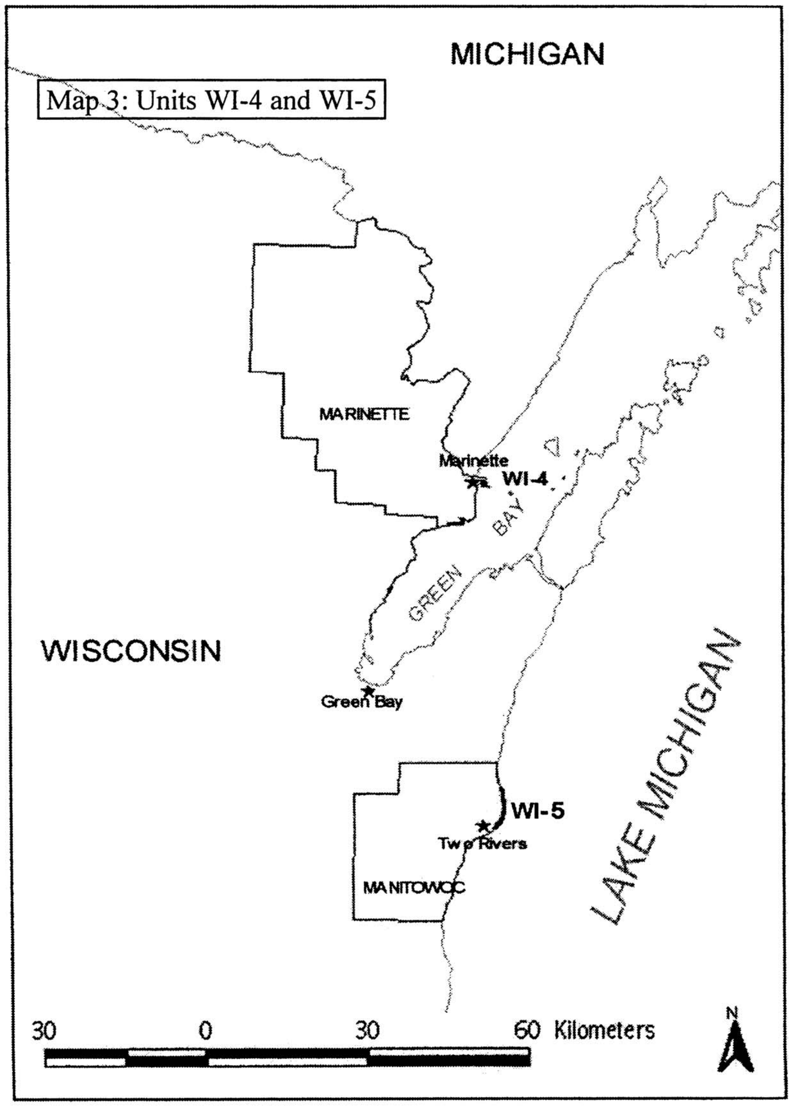
PCE[a]	Description
PCE 1	Total shoreline length of at least 0.12 mi (0.2 km) of gently sloping, sparsely vegetated (less than 50 percent herbaceous and low woody cover) sand beach with a total beach area of at least 5 acres (2 ha).
PCE 2	At least 164 ft (50 m) in length where the beach width is more than 23 ft (7 m).
PCE 3	At least 164 ft (50 m) in length where there is protective cover for nests and chicks.
PCE 4	At least 164 ft (50 m) in length where the distance from the normal high-water line to where the forest begins is more than 164 ft (50 m).

[a] The primary constituent elements (PCEs) identified in this table are specific to the Great Lakes nesting population of piping plover.

Source: 66 FR 22938

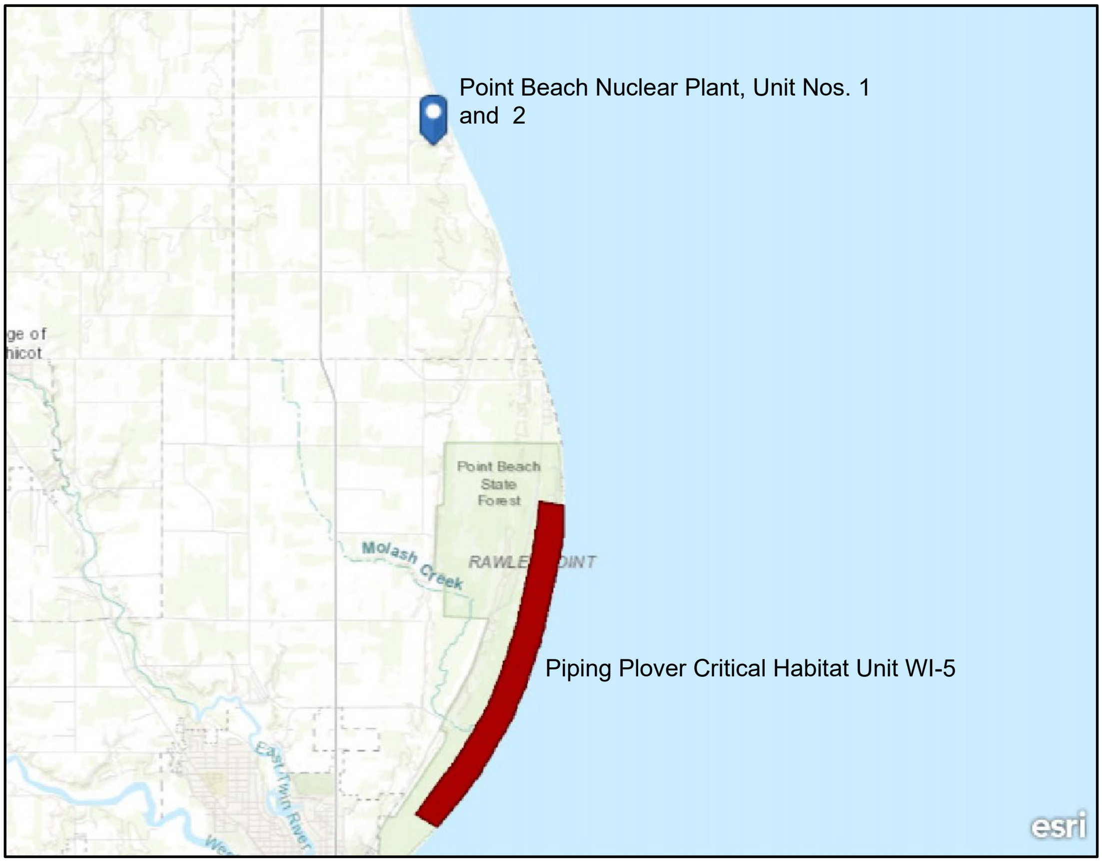
Within Manitowoc County, the FWS designated critical habitat from 1,640 ft (500 m) inland from the normal high-water line from the southwest property boundary of Point Beach State Forest near Neshotah Park in the city of Twin Rivers (T20N R25E Section 31) northwestward along the Lake Michigan shoreline to the south boundary of Section 9, T20N R25E, at Rawley Point (50 CFR 17.95(b)). This unit is designated as Unit WI-5. Its length is approximately 5 mi (8 km) (66 FR 22938). Figure 3-7 depicts the regulatory map of the unit, and Figure 3-8 shows a screen capture of the critical habitat unit at a larger scale from the FWS's online critical habitat mapping tool.

Critical habitat Unit WI-5 lies approximately 3 mi (5 km) south of the Point Beach action area. It is contained wholly within Point Beach State Forest and is, therefore, state owned and managed. The FWS identifies piping plover use of the unit as "suitable," meaning that there are no known records of use, but habitat appears suitable for nesting and is within the historic range of the piping plover (66 FR 22938).



Source: 50 CFR 17.95(b), “Piping Plover (*Charadrius melodus*),” Map 3: Units WI-4 and WI-5

Figure 3-7 Piping Plover Great Lakes Population Critical Habitat Units WI-4 and WI-5



Source: FWS 2021b

Figure 3-8 Piping Plover Great Lakes Population Critical Habitat Mapper Results

Summary of Potential Species Occurrence in the Action Area

Table 3-20 below summarizes the potential for each federally listed species and critical habitat discussed in this section to occur in the action area for the proposed Point Beach subsequent license renewal.

Table 3-20 Occurrences of Federally Listed Species and Critical Habitats in the Action Area under U.S. Fish and Wildlife Jurisdiction

Species	Type of and Likelihood of Occurrence in Action Area
dwarf lake iris	Not present.
Hine's emerald dragonfly	Not present.
northern long-eared bat	Seasonal presence in spring, summer, and fall possible in very low numbers in action area forests of sufficient size to support foraging, mating, and sheltering.
piping plover	Seasonal presence in spring and summer possible in very low numbers in action area beaches of sufficient width for nesting and foraging.
Pitcher's thistle	Not present.
rusty patched bumblebee	Not present.

Table 3-20 Occurrences of Federally Listed Species and Critical Habitats in the Action Area under U.S. Fish and Wildlife Jurisdiction (cont.)

Species	Type of and Likelihood of Occurrence in Action Area
Critical Habitat	
piping plover	Not present. Great Lakes population Critical Habitat Unit WI-5 lies 3 mi (5 km) south of the action area, but no critical habitat is present within the action area itself.

3.8.1.3 Endangered Species Act: Federally Listed Species and Critical Habitats under National Marine Fisheries Service Jurisdiction

No federally listed species or designated critical habitats under NMFS's jurisdiction occur in Lake Michigan. Therefore, this section does not contain a discussion of any such species or habitats.

3.8.1.4 Magnuson–Stevens Act: Essential Fish Habitat

Under the provisions of the MSA, the Fishery Management Councils and the NMFS have designated essential fish habitat (EFH) for certain federally managed species. EFH is defined as the waters and substrate necessary for spawning, breeding, feeding, or growth to maturity (16 U.S.C. 1802(10)). For each federally managed species, the Fishery Management Councils and the NMFS designate and describe EFH by life stage (i.e., egg, larva, juvenile, adult).

No EFH occurs within Lake Michigan. Therefore, this section does not contain a discussion of any species or habitats protected under the MSA.

3.8.1.5 National Marine Sanctuaries Act: Sanctuary Resources

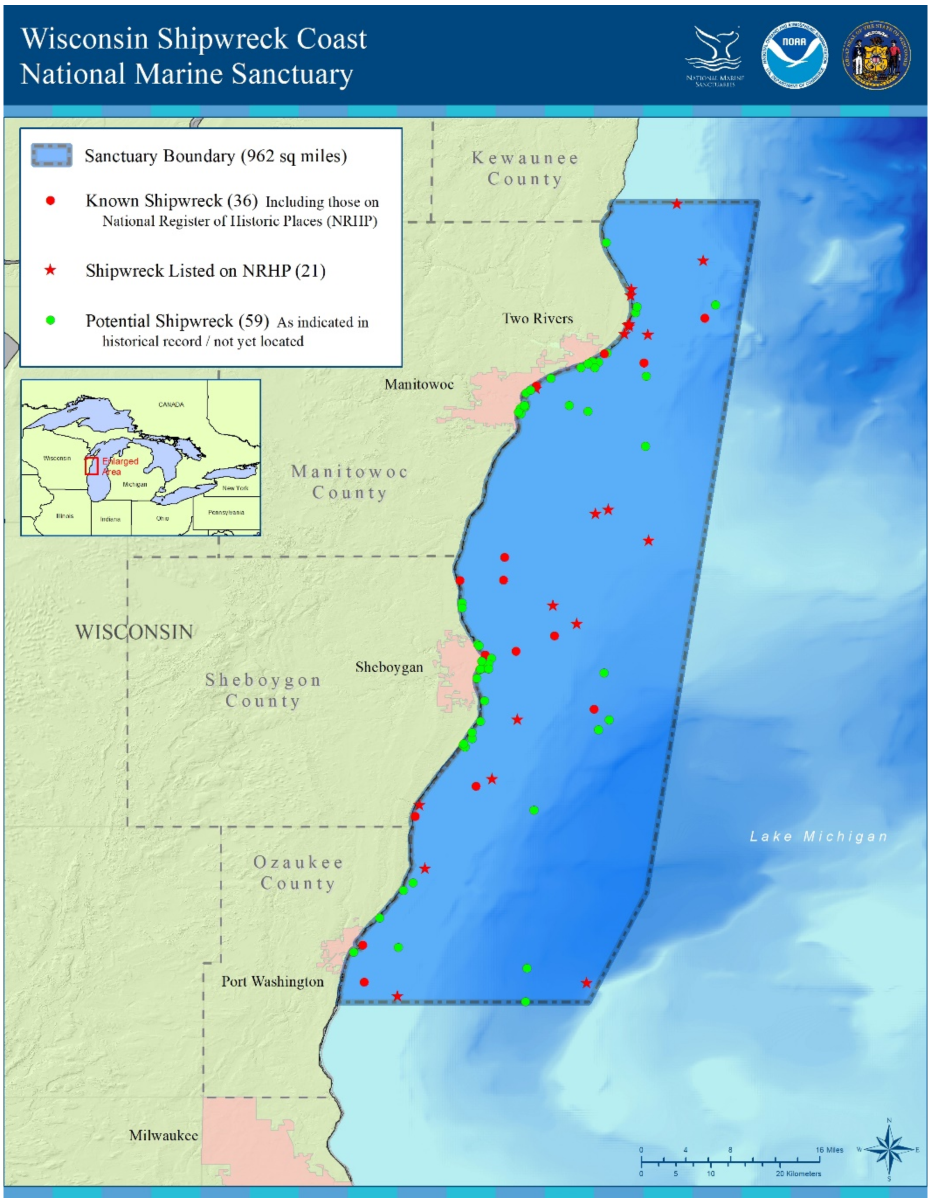
The National Marine Sanctuaries Act of 1966, as amended (16 U.S.C. 1431 et seq.) (NMSA) authorizes the Secretary of Commerce to designate and protect areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, or aesthetic qualities as national marine sanctuaries. The NMSA protects nationally significant aquatic and marine resources and delegates authority to the National Oceanic and Atmospheric Administration (NOAA) to designate and administer marine sanctuaries. The NMSA defines "sanctuary resources" as any living or nonliving resource of a national marine sanctuary that contributes to the conservation, recreational, ecological, historical, educational, cultural, archaeological, scientific, or aesthetic value of the sanctuary (16 U.S.C. 1432(8)).

In June 2021, NOAA designated a 962-mi^2 (1550-km^2) area of Lake Michigan as the Wisconsin Shipwreck Coast National Marine Sanctuary (86 FR 32737). The sanctuary protects 36 known shipwrecks that possess exceptional historic, archaeological, and recreational value. NOAA and the state of Wisconsin co-manage the sanctuary for research, resource protection, educational programming, and community engagement. Additional shipwrecks may be present; the Wisconsin Historical Society indicates that an additional about 59 historic shipwrecks are potentially present. Figure 3-9 depicts the boundary of the sanctuary (ONMS 2020).

Lakebed habitats within the proposed sanctuary designation are mostly rocky. Fish associated with these bottom habitats include sculpins and the introduced round goby. Rocky bottoms also provide shelter for fish prey species, such as the crayfish species *Orconectes virilis* and *O. propinquus*. Other invertebrate prey species may include amphipods, isopods, oligochaetes, chironomids, mayflies, caddisflies, and snails. Although much of the lakebed is glacier-scraped flat, numerous rock outcroppings are another important habitat type. The rock reefs of the

Mid-Lake Plateau provide vertical relief, which is important spawning habitat for indigenous lake trout. This feature of the sanctuary area would include the State-managed Southern Refuge and the largest spawning population of lake trout. The structures of the shipwrecks themselves also provide shelter habitat for prey species and foraging habitat for predatory fish. (ONMS 2020)

The area supports a diverse assemblage of aquatic life. Lake Michigan contains a variety of important sport and commercial fish species, including the native lake trout, as well as the introduced chinook salmon, coho salmon, rainbow trout, and brown trout. Smallmouth bass and rock bass are mostly found in or near bays and harbors. Section 3.7.1 of this SEIS describes the aquatic community in detail.



Source: ONMS 2021

Figure 3-9 Wisconsin Shipwreck Coast National Marine Sanctuary Boundary

3.8.2 Proposed Action

As identified in Table 3-2 of this SEIS, threatened, endangered, and protected species and EFH is a Category 2 issue that requires site-specific analysis for each proposed license renewal to determine whether impacts would be SMALL, MODERATE, or LARGE. This issue is analyzed below.

3.8.2.1 Endangered Species Act: Federally Listed Species and Critical Habitats under U.S. Fish and Wildlife Jurisdiction

In Section 3.8.1.2, the NRC staff establishes that two listed species may occur in the action area—the northern long-eared bat and the piping plover. Section 3.8.1.2 includes relevant information on the habitat requirements, life history, and regional occurrence of these species. In the sections below, the NRC staff analyzes the potential impacts of the proposed Point Beach subsequent license renewal on these species. Table 3-21 identifies the NRC staff's ESA effect determination that resulted from the staff's analysis. In Section 3.8.1.2, the NRC staff also describes several other federally listed species that were addressed in previous NRC environmental reviews for Point Beach. The staff explains that these species do not occur in the action area; therefore, the staff does not address these species any further because subsequent license renewal would have no effect on these species. Similarly, Section 3.8.1.2 describes critical habitat of the Great Lakes population of piping plover. However, this critical habitat is outside of the action area; therefore, subsequent license renewal would have no effect on this critical habitat.

Table 3-21 Effect Determinations for Federally Listed Species Under U.S. Fish and Wildlife Service Jurisdiction

Species	Federal Status[(a)]	Potentially Present in the Action Area?	Effect Determination[(b)]
Northern long-eared bat	FT	Yes	May affect but is not likely to adversely affect
Piping plover[(c)]	FE	Yes	May affect but is not likely to adversely affect

(a) Under the ESA, species may be designated as federally endangered (FE) or federally threatened (FT).

(b) The NRC staff makes its effect determinations for federally listed species in accordance with the language and definitions specified in the FWS and NMFS Endangered Species Consultation Handbook (FWS and NMFS 1998).

(c) Great Lakes population.

<u>Northern Long-Eared Bat (*Myotis septentrionalis*)</u>

In Section 3.8.1.2 of this SEIS, the NRC staff concludes that northern long-eared bats may inhabit the action area's forests in spring, summer, and fall. Northern long-eared bats are expected to occur rarely and in low numbers.

The potential stressors that northern long-eared bats could experience from operation of a nuclear power plant (generically) are:

- mortality or injury from collisions with plant structures and vehicles
- habitat loss, degradation, disturbance, or fragmentation, and associated effects
- behavioral changes resulting from refurbishment or other site activities

This section addresses each of these stressors below.

Mortality or Injury from Collisions with Plant Structures and Vehicles

Several studies have documented bat mortality or injury resulting from collisions with manmade structures. Saunders (1930) reported that five bats of three species—eastern red bat, hoary bat (*L. cinereus*), and silver-haired bat—were killed when they collided with a lighthouse in Ontario, Canada. In Kansas, Van Gelder (1956) documented five eastern red bats that collided with a television tower. In Florida, Crawford and Baker (1981) collected 54 bats of seven species that collided with a television tower over a 25-year period; Zinn and Baker (1979) reported 12 dead hoary bats at another television tower in the state over an 18-year period; and Taylor and Anderson (1973) reported 1 dead yellow bat (*Lasiurus intermedius*) at a third Florida television tower. Bat collisions with communications towers have been reported in North Dakota, Tennessee, and Saskatchewan, Canada; with convention center windows in Chicago, IL; and with powerlines, barbed wire fences, and vehicles in numerous locations (Johnson and Strickland 2003).

More recently, bat collisions with wind turbines have been of concern in North America. Bat fatalities have been documented at most wind facilities throughout the United States and Canada (USGS 2015). For instance, during a 1996–1999 study at the Buffalo Ridge wind power development project in Minnesota, Johnson et al. (2003) reported 183 bat fatalities, most of which were hoary bats and eastern red bats. The U.S. Geological Survey's Fort Collins Science Center estimates that tens to hundreds of thousands of bats die at wind turbines in North America each year (USGS 2015).

Bat collisions with manmade structures at nuclear power plants are not well documented but are likely rare based on the available information. In an assessment of the potential effects of operation of the Davis-Besse Nuclear Power Station in Ohio, the NRC (NRC 2014c) noted that four dead bats were collected at the plant during bird mortality studies conducted from 1972 through 1979. Two red bats (*Lasiurus borealis*) were collected at the cooling tower, and one big brown bat and one tri-colored bat were collected near other plant structures. The NRC (NRC 2014c) found that future collisions of bats would be extremely unlikely and, therefore, discountable given the small number of bats collected during the study and the marginal suitable habitat that the plant site provides. The FWS (FWS 2014a) concurred with this determination. In a 2015 assessment associated with Indian Point Nuclear Generating Unit Nos. 2 and 3, in New York, the NRC (NRC 2015) determined that bat collisions were less likely to occur at Indian Point than at Davis-Besse because Indian Point does not have cooling towers or similarly large obstructions. The tallest structures on the Indian Point site are 134-ft (40.8-m) tall turbine buildings and 250-ft (76.2-m) tall reactor containment structures. The NRC (NRC 2015) concluded that the likelihood of bats colliding with these and other plant structures on the Indian Point site during the license renewal period was extremely unlikely and, therefore, discountable. The FWS (2015) concurred with this determination. In 2018, the NRC (NRC 2018c) determined that the likelihood of bats colliding with site buildings or structures on the Seabrook Station, Unit No. 1, site in New Hampshire would be extremely unlikely. The tallest structures on that site are a 199-ft (61-m) tall containment structure and 103 ft (31 m)-tall turbine and heater bay building. The FWS (2018) concurred with the NRC's determination. Recently, the NRC (NRC 2020b) determined that the likelihood of bats colliding with site buildings or structures on the Surry Power Station, Unit Nos. 1 and 2, site in Virginia would be extremely unlikely. The FWS (2019) again concurred with the NRC staff's determination on the basis that activities associated with the Surry subsequent license renewal would be consistent with the activities analyzed in the FWS's January 5, 2016, programmatic biological opinion (FWS 2016c).

On the Point Beach site, the tallest site structures are the reactor containment buildings, each of which is 63 ft (19 m) high (NextEra 2020b). The turbine buildings and transmission lines are also prominent features on the site. To date, NextEra has reported no incidents of injury or mortality of any species of bat on the Point Beach site associated with site buildings or structures. Accordingly, the NRC staff finds the likelihood of future northern long-eared bat collisions with site buildings or structures to be extremely unlikely and, therefore, discountable.

Vehicle collision risk for bats varies depending on factors including time of year, location of roads and travel pathways in relation to roosting and foraging areas, the characteristics of individuals' flight, traffic volume, and whether young bats are dispersing. Although collision has been documented for several species of bats, the Indiana Bat Draft Recovery Plan (FWS 2007) indicates that bat species do not seem to be particularly susceptible to vehicle collisions. However, the FWS also finds it difficult to determine whether roads pose a greater risk for bats colliding with vehicles or a greater likelihood of decreasing risk of collision by deterring bat activity (FWS 2016c). In most cases, the FWS expects that roads of increasing size decrease the likelihood of bats crossing the roads and, therefore, reduce collision risk (FWS 2016c). During the proposed Point Beach subsequent license renewal term, vehicle traffic from truck deliveries, site maintenance activities, and personnel commuting to and from the site would continue throughout the subsequent license renewal period as it has during the current licensing period. Vehicle use would occur primarily in areas that bats would be less likely to frequent, such as along established county and state roads or within industrial-use areas of the Point Beach site. Additionally, most vehicle activity would occur during daylight hours when bats are less active. To date, NextEra has reported no incidents of injury or mortality of any species of bat on the Point Beach site associated with vehicle collisions. Accordingly, the NRC staff finds the likelihood of future northern long-eared bat collisions with vehicles to be extremely unlikely and, therefore, discountable.

Habitat Loss, Degradation, Disturbance, or Fragmentation, and Associated Effects

As previously established in this SEIS, the Point Beach action area includes forested habitat that northern long-eared bats may rarely to very occasionally inhabit in spring, summer, and fall. In its final rule listing the northern long-eared bat (80 FR 17974), the FWS states that forest conversion and forest modification from management are two of the most common causes of habitat loss, degradation, disturbance, or fragmentation affecting the species. Forest conversion is the loss of forest to another land use type, such as cropland, residential, or industrial. Forest conversion can affect bats in the following ways (80 FR 17974):

- loss of suitable roosting or foraging habitat
- fragmentation of remaining forest patches, leading to longer flights between suitable roosting and foraging habitat
- removal of travel corridors, which can fragment bat colonies and networks
- direct injury or mortality during active forest clearing and construction

Forest management practices maintain forest habitat at the landscape level, but they involve practices that can have direct and indirect effects on bats. Impacts from forest management are typically temporary in nature and can include positive, neutral, and negative impacts, such as (80 FR 17974):

- maintaining or increasing suitable roosting and foraging habitat within the species' home range (positive)
- removing trees or small areas of forest outside of the species' summer home range or away from hibernacula (neutral)
- removing potential roost trees within the species' summer home range (negative)

- performing management activities near hibernacula that could disturb hibernating bats (negative)
- direct injury or mortality during forest clearing (negative)

Concerning forest conversion and its effects, the proposed action would not involve forest conversion or other activities that could result in similar impacts. Accordingly, bats would not experience the effects identified above and associated with forest conversion from the proposed action.

Concerning forest management, the proposed action would not specifically involve forest management. However, NextEra would continue to perform vegetation maintenance on the site over the course of the proposed subsequent license renewal term. Most maintenance would be of grassy, shrubby, mowed areas between buildings and along walkways within the industrial portion of the site or on adjacent hillsides. NextEra would continue to maintain onsite transmission line rights-of-way in accordance with North American Electric Reliability Corporation standards. Less developed areas and forested areas would be largely unaffected, and NextEra does not intend to expand the existing facilities or otherwise perform construction or maintenance activities within these areas (NextEra 2020b).

Site personnel may occasionally remove select trees around the margins of existing forested areas if those trees are deemed hazardous to buildings, infrastructure, or other site facilities or to existing overhead clearances (NextEra 2020b). Negative impacts to bats could result if such trees are potential roost trees. Bats could also be directly injured during tree clearing. However, the FWS's ESA Section 4(d) rule for the northern long-eared bat (81 FR 1900) does not prohibit or restrict hazardous tree removal to protect human life or property. Additionally, tree removal would be infrequent, and NextEra personnel would follow site environmental procedures to minimize potential impacts to the environment.

NextEra would continue routine transmission line maintenance during the proposed subsequent license renewal period. The FWS's northern long-eared bat ESA Section 4(d) rule does not prohibit routine maintenance and expansion of up to 100 ft (30 m) from either edge of an existing right-of-way as long as the project does not occur within 0.25 mi (0.4 km) of a known hibernaculum, does not involve cutting of known maternity roost trees in June or July, and does not involve clear-cutting within 0.25 mi (0.4 km) of known maternity roost trees in June or July. The transmission lines within the scope of the NRC's subsequent license renewal review are only those lines from the Point Beach turbine building to the 345-kV switchyard and 19-kV bus supply bunker. Even if present within the action area, northern long-eared bats are unlikely to be present in this region of the site due to its highly developed nature.

The NRC staff finds that the measures summarized above, in addition to the infrequency with which hazardous trees would likely be removed in forested areas, would not measurably affect any potential spring staging, summer roosting, or fall swarming habitat in the action area. Direct injury or mortality to bats during tree removal is also unlikely because NextEra company guidance would ensure that personnel take the appropriate measures to avoid this potential impact. For instance, NextEra could avoid this impact by removing hazardous trees in the winter when bats are unlikely to be present on the site. Additionally, the continued preservation of the existing forested areas on the site during the subsequent license renewal term would result in positive impacts to northern long-eared bats, if present within or near the action area.

Behavioral Changes Resulting from Refurbishment or Other Site Activities

Construction or refurbishment and other site activities, including site maintenance and infrastructure repairs, could prompt behavioral changes in bats. Noise and vibration and general human disturbance are stressors that may disrupt normal feeding, sheltering, and breeding activities (FWS 2016c). At low noise levels or farther distances, bats initially may be startled but would likely habituate to the low background noise levels. At closer range and louder noise levels, particularly if accompanied by physical vibrations from heavy machinery, many bats would likely be startled to the point of fleeing from their daytime roosts. Fleeing individuals could experience increased susceptibility to predation and would expend increased levels of energy, which could result in decreased reproductive fitness (FWS 2016c: Table 4-1). Increased noise may also affect foraging success. Schaub et al. (2008) found that foraging success of the greater mouse-eared bat (*Myotis myotis*) diminished in areas with noise mimicking the traffic sounds that would be experienced within 49 ft (15 m) of a highway.

Within the Point Beach action area, noise, vibration, and other human disturbances could dissuade bats from using the action area's forested habitat during migration, which could also reduce the fitness of migrating bats. However, bats that use the action area have likely become habituated to such disturbance because Point Beach has been consistently operating for several decades. According to the FWS, bats that are repeatedly exposed to predictable, loud noises may habituate to such stimuli over time (FWS 2010). For instance, Indiana bats have been documented as roosting within approximately 1,000 ft (300 m) of a busy state route adjacent to Fort Drum Military Installation and immediately adjacent to housing areas and construction activities on the installation (U.S. Army 2014). Northern long-eared bats would likely respond similarly.

Continued operation of Point Beach during the subsequent license renewal term would not include major construction or refurbishment and would involve no other maintenance or infrastructure repair activities other than those routine activities already performed on the site. Levels and intensity of noise, lighting, and human activity associated with continued day-to-day activities and site maintenance during the subsequent license renewal term would be similar to ongoing conditions since Point Beach began operating, and such activity would only occur on the developed, industrial-use portions of the site. While these disturbances could cause behavioral changes in migrating or summer roosting bats, such as the expenditure of additional energy to find alternative suitable roosts, the NRC staff assumes that northern long-eared bats, if present in the action area, have already acclimated to regular site disturbances. Thus, continued disturbances during the subsequent license renewal term would not cause behavioral changes in bats to a degree that would be able to be meaningfully measured, detected, or evaluated or that would reach the scale where a take might occur.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on the northern long-eared bat that could be meaningfully measured, detected, or evaluated or such stressors are otherwise unlikely to occur for the following reasons:

- Bat collisions with nuclear power plant structures in the United States are rare, and none have been reported at Point Beach. Vehicle collisions attributable to the proposed action are also unlikely, and none have been reported at Point Beach.
- The proposed action would not involve any construction, land clearing, or other ground-disturbing activities.
- Continued preservation of the existing forested areas on the site would result in positive impacts to northern long-eared bats.
- Bats, if present in the action area, have likely already acclimated to the noise, vibration, and general human disturbances associated with site maintenance, infrastructure repairs, and other site activities. During the subsequent license renewal term, such

disturbances and activities would continue at current rates and would be limited to the industrial-use portions of the site.

Conclusion for Northern Long-eared Bat

All potential effects on the northern long-eared bat resulting from the proposed action would be insignificant or discountable. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the northern long-eared bat.

In a letter dated February 9, 2021, the FWS concurred with this determination on the basis that activities associated with the proposed subsequent license renewal with the potential to affect the northern long-eared bat are consistent with the activities analyzed in the FWS's January 5, 2016, programmatic biological opinion (FWS 2016c, FWS 2021c).

Piping Plover (*Charadrius melodus*)

In Section 3.8.1.2 of this SEIS, the NRC staff concludes that piping plovers may inhabit action area beaches of sufficient width for nesting and foraging in spring and summer. Birds are expected to occur rarely and in low numbers.

The potential stressors that piping plovers could experience from operation of a nuclear power plant (generically) are:

- mortality or injury from collisions with plant structures and vehicles
- habitat loss, degradation, disturbance, or fragmentation, and associated effects
- behavioral changes resulting from refurbishment or other site activities

Mortality or Injury from Collisions with Plant Structures and Vehicles

In the GEIS, the NRC generically determined that the impacts of bird collisions with plant structures and transmission lines would be SMALL at all nuclear power plants (NRC 2013a). However, because the piping plover is federally endangered, this issue requires species-specific evaluation.

On the Point Beach site, the tallest site structures are the reactor containment buildings, each of which is 63 ft (19 m) high (NextEra 2020b). The turbine buildings and transmission lines are also prominent features on the site. However, piping plovers generally fly close to the ground within breeding areas. Therefore, tall structures are unlikely to represent a unique collision hazard. For instance, in a study of flight behaviors of piping plovers, Stantial and Cohen (2015) assessed flight heights of piping plovers in New Jersey and Massachusetts during the 2012 and 2013 breeding seasons. The researchers found that flight heights ranged from 2.3–34.5 ft (0.7–10.5 m) with a mean of 8.5 ft (2.6 m). Visually estimated flight heights ranged from 0.25–131 ft (0.25–40 m). Because piping plovers fly relatively low to the ground, they are acclimated to navigating various natural and manmade flight hazards, and tall structures on the Point Beach site are unlikely to create an additional risk. Even in the case of wind turbines, which have moving components, researchers found that collision hazards at five wind facilities in New England during the piping plover breeding season and assuming constant turbine operation ranged from 0.06–2.27 collisions per year for a single large turbine (41 m radius), 0.03–0.99 for a single medium turbine (22.5 m radius), and 0.01–0.29 for a single small turbine (9.6 m radius) (Stantial 2014).

With respect to vehicle collision hazards, Stantial and Cohen (2015) determined average calculated flight speed of piping plovers to be 30.5 fps (9.3 m/s). The high speed at which piping plovers can fly make them unlikely to collide with site vehicles, especially given that posted speed limits are low throughout the Point Beach site.

Since NextEra began surveying for nesting piping plovers in 2005, it has not observed the species on the site. Therefore, there are no known incidents of injury or mortality of piping plovers associated with site structures or vehicles. Accordingly, the NRC staff finds the likelihood of future piping plover collisions with site structures or vehicles to be extremely unlikely and, therefore, discountable.

Habitat Loss, Degradation, Disturbance, or Fragmentation, and Associated Effects

As previously established in this SEIS, the Point Beach action area includes beach habitat that piping plovers may seasonally inhabit during the breeding season. Beach habitat consists of sand beach, dunes, and gravel shoreline that varies from 0.4–2.4 mi (0.6–3.9 km) in length and 20–82 ft (6–25 m) in width depending on tides, erosion, and deposition. Thus, the Point Beach action area represents marginal habitat because studies indicate that piping plovers select areas with a mean beach width of greater than 100 ft (30 m) for nesting (FWS 2016a). Nonetheless, NextEra presently has no plans for refurbishment, new construction, or other ground-disturbing or maintenance activities as part of the proposed subsequent license renewal that would affect shoreline habitat.

Behavioral Changes Resulting from Refurbishment or Other Site Activities

Construction or refurbishment and other site activities, including site maintenance and infrastructure repairs, could prompt behavioral changes in piping plovers. Noise and vibration and general human disturbance are stressors that may disrupt normal feeding, sheltering, and breeding activities. At low noise levels or farther distances, piping plovers initially may be startled but would likely habituate to the low background noise levels. At closer range and louder noise levels, piping plovers would likely be startled to the point of fleeing from the area. Fleeing individuals would expend increased levels of energy and would forgo the foraging, resting, or breeding opportunity that the action area may have otherwise provided.

Within the Point Beach action area, noise, vibration, and other human disturbances could dissuade piping plovers from using the action area's shoreline habitat. However, piping plovers that use the action area have likely become habituated to such disturbance because Point Beach has been consistently operating for several decades. Additionally, much of the Lake Michigan shoreline is developed, so plovers have likely developed some level of tolerance to human activity based on human activity in other areas of preferred habitat.

Continued operation of Point Beach during the subsequent license renewal term would not include major construction or refurbishment and would involve no other maintenance or infrastructure repair activities other than those routine activities already performed on the site. Levels and intensity of noise, lighting, and human activity associated with continued day-to-day activities and site maintenance during the subsequent license renewal term would be similar to ongoing conditions since Point Beach began operating, and such activity would only occur on the developed, industrial-use portions of the site. While these disturbances could cause behavioral changes in piping plovers, such as the expenditure of additional energy to find alternative suitable habitat, the NRC staff assumes that piping plovers, if present in the action area, have already acclimated to regular site disturbances. Thus, continued disturbances during the subsequent license renewal term would not cause behavioral changes in piping plovers to a degree that would be able to be meaningfully measured, detected, or evaluated or that would reach the scale where a take might occur.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on the piping plover that could be meaningfully measured, detected, or evaluated or such stressors are otherwise unlikely to occur for the following reasons:

- Piping plovers generally fly close to the ground and are, therefore, adept at navigating various flight hazards, such as the Point Beach site's tall buildings and structures. Piping plovers exhibit high flight speeds, which makes individuals unlikely to collide with site vehicles.
- The proposed action would not involve any construction, land clearing, or other ground-disturbing activities. Thus, shoreline habitat would be unaffected.
- Piping plovers, if present in the action area, have likely already acclimated to the noise, vibration, and general human disturbances associated with site maintenance, infrastructure repairs, and other site activities. During the proposed subsequent license renewal term, such disturbances and activities would continue at current rates and would be limited to the industrial-use portions of the site.

Conclusion for Piping Plover

All potential effects on the piping plover resulting from the proposed action would be insignificant or discountable. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the piping plover. Following issuance of this draft SEIS, the NRC staff will request the FWS's concurrence with this determination as part of consultation under ESA Section 7 for the proposed subsequent license renewal.

3.8.2.2 Endangered Species Act: Federally Listed Species and Critical Habitats under National Marine Fisheries Service Jurisdiction

No federally listed species or critical habitats under NMFS's jurisdiction occur within the action area (see Section 3.8.1.3). Therefore, the NRC staff concludes that the proposed action would have no effect on federally listed species or habitats under NMFS's jurisdiction.

3.8.2.3 Endangered Species Act: Cumulative Effects

The ESA regulations at 50 CFR 402.12(f)(4) direct Federal agencies to consider cumulative effects as part of the proposed action effects analysis. Under the ESA, cumulative effects are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Cumulative effects under the ESA do not include past actions or other Federal actions requiring separate ESA Section 7 consultation, which differs from the definition of "cumulative impacts" under NEPA.

When formulating biological opinions under formal ESA Section 7 consultation, the FWS and NMFS (FWS and NMFS 1998) consider cumulative effects when determining the likelihood of jeopardy or adverse modification. Therefore, cumulative effects need only be considered under the ESA if listed species will be adversely affected by the proposed action and formal Section 7 consultation is necessary (FWS 2014b). Because the NRC staff concluded earlier in this section that the proposed subsequent license renewal is not likely to adversely affect any federally listed species and would not destroy or adversely modify designated critical habitats, the NRC staff did not separately consider cumulative effects for the listed species and designated critical habitats. Further, the NRC staff did not identify any actions within the action area that meet the definition of cumulative effects under the ESA.

3.8.2.4 Magnuson–Stevens Act: Essential Fish Habitat

No EFH occurs within the action area (see Section 3.8.1.4). Therefore, the NRC staff concludes that the proposed action would have no effect on EFH.

3.8.2.5 National Marine Sanctuaries Act: Sanctuary Resources

Under Section 304(d) of the NMSA, Federal agencies must consult with NOAA's Office of National Marine Sanctuaries if a Federal action is likely to destroy, cause the loss of, or injure any sanctuary resources. As described in Section 3.8.1.5 of this SEIS, NOAA has recently designated a 962-mi^2 (1550-km^2) area of Lake Michigan as the Wisconsin Shipwreck Coast National Marine Sanctuary. That section describes the marine resources of the sanctuary and includes a figure showing the sanctuary's geographic boundaries.

The sanctuary resources of concern are a nationally significant collection of maritime cultural heritage resources, including 36 known shipwrecks and potentially about 59 shipwrecks yet to be discovered, as well as numerous other historic maritime-related features. Known and potential shipwrecks are located at least 2 mi (3.2 km) from Point Beach and beyond the influence of either Point Beach's cooling water intake structure or the area affected by thermal effluent discharges and, thus, continued operation of Point Beach would not affect these resources. NextEra proposes no shoreline stabilization or other in-water work during the proposed subsequent license renewal term (NextEra 2021a). Therefore, there are no activities associated with the proposed action that would have the potential to affect the environment within the boundaries of the sanctuary.

Based on the above, the NRC staff concludes that the proposed action is not likely to destroy, cause the loss of, or injure any sanctuary resources. Accordingly, the NRC staff also finds that consultation under the NMSA for the proposed action is not required.

3.8.3 No-Action Alternative

Under the no-action alternative, the NRC would not issue subsequent renewed licenses, and Point Beach would permanently shut down on or before the expiration of the current renewed facility operating licenses. Upon shutdown, the plant would require substantially less cooling water and would produce little to no discernable thermal effluent. Thus, the potential for impacts on all aquatic species related to cooling system operation would be significantly reduced. The ESA action area under the no-action alternative would most likely be the same or similar to the area described in Section 3.8.1.1. Northern long-eared bat and piping plover may occur seasonally and in low numbers within the action area (see Section 3.8.1). The NRC would consult with the FWS, as appropriate, to address potential effects to these species resulting from shutdown and decommissioning of the plant. No EFH occur in the region (see Section 3.8.2). Thus, shutdown would not result in impacts on EFH. Actual impacts would depend on the specific shutdown activities and whether any listed species, critical habitats, or designated EFH are present when the no-action alternative is implemented.

3.8.4 Replacement Power Alternatives: Common Impacts

The ESA action area and estuarine waters potentially containing designated EFH for any of the replacement alternatives would depend on factors including site selection, current land uses, planned construction activities, temporary and permanent structure locations and parameters, and the timeline of the alternative. The listed species, critical habitats, and EFH potentially affected by a replacement power alternative would depend on the boundaries of that alternative's effects and the species and habitats federally protected at the time the alternative is implemented. For instance, if Point Beach continues to operate until the end of the current license terms and a replacement power alternative is implemented at that time, FWS and NMFS may have listed new species, delisted currently listed species whose populations have recovered, or revised EFH designations. These listing and designation activities would change the potential for the various alternatives to impact special status species and habitats.

Additionally, requirements for consultation under ESA Section 7 with FWS and NMFS as well as EFH consultation with NMFS would depend on whether Federal permits or authorizations are required to implement each alternative.

Sections 3.6.6 and 3.7.4 of this SEIS describe the types of impacts that terrestrial and aquatic resources would experience under each alternative. Impacts on special status species and habitats would likely be similar in type. However, the magnitude and significance of such impacts could be greater for special status species and habitats because such species and habitats are rare and more sensitive to environmental stressors.

3.8.5 New Nuclear (Small Modular Reactor) Alternative

The impacts of the new nuclear alternative are largely addressed in the impacts common to all replacement power alternatives described in the previous section. Because the NRC would remain the licensing agency under this alternative, the ESA and MSA would require the NRC to consult with FWS and NMFS, as applicable, before issuing a license for construction and operation of the new facility. During these consultations, the agencies would determine whether the new reactors would affect any federally listed species, adversely modify or destroy designated critical habitat, or result in adverse effects on EFH. If the new facility requires a CWA Section 404 permit, USACE may be a cooperating agency for required consultations, or USACE may be required to consult separately. Ultimately, the magnitude and significance of adverse impacts on special status species and habitats would depend on the site location and layout, plant design, plant operations, and the special status species and habitats present in the area when the alternative is implemented.

3.8.6 Natural Gas Combined-Cycle Alternative

The NRC does not license natural gas facilities; therefore, the NRC would not be responsible for ESA Section 7 or MSA consultation for this alternative. The Federal and private responsibilities for addressing impacts on special status species and habitats under this alternative would be similar to those described in Section 3.8.4 of this SEIS. Ultimately, the magnitude and significance of adverse impacts on special status species and habitats resulting from the natural gas alternative would depend on the site location and layout, plant design, plant operations, and the special status species and habitats present in the area when the alternative is implemented.

3.8.7 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

Section 3.8.5 above addresses the impacts of the SMR portion of the combination alternative. The NRC does not license solar or wind facilities; therefore, the NRC would not be responsible for ESA Section 7 or MSA consultation for these portions of the combination alternative. The Federal and private responsibilities for addressing impacts on special status species and habitats under these portions of this alternative would be similar to those described in Section 3.8.4 of this SEIS. Ultimately, the magnitude and significance of adverse impacts on special status species and habitats resulting from the combination alternative would depend on the site location and layout, plant design, plant operations, and the special status species and habitats present in the area when the alternative is implemented.

3.9 <u>Historic and Cultural Resources</u>

This section describes the cultural background and the historic and cultural resources found at Point Beach and in the surrounding area. The description of the resources is followed by the

NRC staff's analysis of the potential impacts on historic and cultural resources from the proposed action (subsequent license renewal) and alternatives to the proposed action.

3.9.1 Cultural Background

Human occupation in Wisconsin extends back about 10,000 years. In the NRC staff's SEIS for the Point Beach initial license renewal (NRC 2005a: 2-48–2-50), Section 2.2.9.1 describes in detail the history of human occupation of the Point Beach site and surrounding region. The NRC staff incorporates this prehistoric occupation description into this SEIS by reference and briefly summarizes it below. Prehistoric occupation of the area is divided into the following:

- Paleoindian Period (10,000–8,500 BC)
- Archaic Period (8,500–1,000 BC)
- Woodland Period (1,000 BC–AD 1,000)
- Mississippian Period (AD 900–1,600)

The Paleoindian Period is characterized by bands of hunters and gathers that followed available game (e.g., mammoth, bison). The Archaic Period was characterized by adjustments to warmer climatic conditions, and population consisting of small groups of hunters and gathers that subsisted on fish, wild plants, and modern game. Ground stone tools appeared during the Archaic period. The Woodland Period is characterized by a transition from earlier hunting and gathering cultures to one based more on horticulture and settled village sites. The Woodland Period is characterized by the appearance of pottery, the bow and arrow, and burial mounds (MPM 2021). In particular, effigy mounds (animal-shaped mounds) appeared during the Late Woodland Period. Approximately 1,000 years ago, people from the present-day St. Louis area migrated to Wisconsin forming the Mississippian Culture. The Mississippian Period is characterized by permanent villages with pyramidal mounds, plaza areas, and agriculture (MPM 2021; WHS 2021a).

In the NRC staff's SEIS for the Point Beach initial license renewal (NRC 2005a: 2-50–2-52), Section 2.2.9.1 describes in detail present-day eastern Wisconsin from European contact and the Historic Period. The NRC staff incorporates this description into this SEIS by reference and briefly summarizes it below.

The first European known to have visited the area was Jean Nicolet, a French explorer, who reached Green Bay in 1634. Green Bay was subsequently established as the first French fur trading settlement, and a number of other trading posts were established during the late 1600s and 1700s. During this time, Native American societal structures and economies were disrupted as a result of fur hunting and trading, and European trade goods replacing traditional tools. In 1831, the Menominee Tribe of Indians signed a treaty that ceded 2.5 million acres (1.1 million ha) in Wisconsin to the United States. The Point Beach site and vicinity were within the ceded land boundaries established in the Treaty of Washington (7 Stat. 342). After becoming a U.S. territory, Wisconsin was surveyed and opened to Euro-American settlers, fur trade declined, and logging became the primary industry in the 1830s. The availability of tanbark from hemlock gave rise to the tanning industry. The tanning industry was short-lived and eastern Wisconsin developed an extensive fishing and shipbuilding industry, with a major center in the city of Manitowoc during the 1800s and 1900s. Drawn by its natural resources and economic opportunities, immigrants from many areas of Europe (Scandinavia, northern and eastern Europe, and the British Isles) and the eastern United States settled in Wisconsin. Logging continued to be a significant industry through the 1920s. The dairy industry began to expand in Wisconsin as a result of New York farmers settling in the area and bringing with them the skills for butter and cheese production (WHS 2021b). By 1915, Wisconsin had become the leading dairy state in the nation, producing more butter and cheese than any other state (WHS 2021b).

3.9.2 Historic and Cultural Resources at Point Beach

Historic and cultural resources within the Point Beach site can include prehistoric era and historic era archaeological sites, historic districts, and buildings, as well as any site, structure, or object that may be considered eligible for listing on the National Register of Historic Places (NRHP). Historic and cultural resources also include traditional cultural properties that are important to a living community of people for maintaining their culture. “Historic property” is the legal term for a historic or cultural resource that is included on, or eligible for inclusion on, the NRHP.

Cultural resource surveys were not conducted within the Point Beach site before construction (NextEra 2020b). However, since construction of Point Beach, five cultural resource surveys were conducted between 1993 and 2018 that surveyed the Point Beach site (NextEra 2020b). These surveys have identified the archaeological sites listed in Table 3-22. A 2004 Phase I archaeological survey recommended no further investigation pertaining to the isolated finds listed in Table 3-22 (NRC 2005a). However, for the artifact scatters, the Phase I archaeological survey recommended that they should be avoided or that further evaluations should be conducted to determine if the sites are eligible for listing on the NRHP (NRC 2005a; NextEra 2020b). NextEra has implemented this recommendation by avoiding the sites to protect them from potential activities (NextEra 2020b, NextEra 2021b; NRC 2005a). A 2018 Phase I archaeological survey conducted by Commonwealth Heritage Group, Inc. revisited site 47-MN-0267 and found no cultural materials in the mapped location of this site (NextEra 2021b). Commonwealth recommended that site 47-MN-0257 does not meet the criteria for listing in the NRHP given the lack of evidence of a prehistoric site (NextEra 2021b).

In addition to the archaeological sites identified in Table 3-22, in 2004, a fishing shed located within the Point Beach site was evaluated for eligibility for listing in the NRHP. The evaluation concluded that the fishing shed was not eligible for inclusion in the NRHP and on October 21, 2004, the Wisconsin Historical Society issued a determination to that effect (NextEra 2020b, NRC 2005a). Point Beach is also listed on Wisconsin’s Architecture and History Inventory (NextEra 2020b). NextEra has commissioned an architectural survey to evaluate the eligibility of Point Beach for listing on the NRHP (see Section 3.9.4.1 below).

Table 3-22 Archaeological Sites within the Point Beach site

Site Number[a]	Site Type/Description	Cultural Affiliation
47-MN-0267	Campsite/Village	Unknown Prehistoric
47-MN-0437	Isolated find	Unknown Prehistoric
47-MN-0438	Isolated find	Unknown Prehistoric
47-MN-0439	Isolated find	Unknown Prehistoric
47-MN-0440	Isolated find	Unknown Prehistoric
47-MN-0441	Isolated find	Unknown Prehistoric
47-MN-0442	Lithic scatter	Unknown Prehistoric
47-MN-0443	Isolated find	Unknown Prehistoric
47-MN-0444	Isolated find	Unknown Prehistoric
47-MN-0445	Isolated find	Unknown Prehistoric
47-MN-0451	Isolated find	Early Archaic

Table 3-22 Archaeological Sites within the Point Beach site (cont.)

Site Number[a]	Site Type/Description	Cultural Affiliation
47-MN-0452	Historic cultural material	Historic Euro-American
47-MN-0454	Historic cultural material	Historic Euro-American
47-MN-0455	Isolated find	Unknown Prehistoric

(a) Wisconsin's Archaeological Sites Inventory entry number

Source: NextEra 2020b and NextEra 2021b

There are historic properties located near the Point Beach site. The following historic properties are within a 6-mi radius of the Point Beach site and are listed on the National Register of Historic Places: the Pathfinder shipwreck (approximately 2.5 mi (4 km) from Point Beach), Rouse Simmons shipwreck (approximately 6 mi (9.6 km) from Point Beach), Continental shipwreck (approximately 3.5 mi (4.8 km) from Point Beach), and Rawley Point Light Station (approximately 5 mi (8.0 km) from Point Beach) (NextEra 2020b; WHS 2021c).

In June 2021, under the NMSA, NOAA designated a 962-mi^2 (1,550-km^2) area of Lake Michigan as the Wisconsin Shipwreck Coast National Marine Sanctuary (86 FR 32737). The area includes waters off Ozaukee, Sheboygan, Manitowoc, and Kewaunee counties of Wisconsin. Within this boundary are 36 known shipwrecks (including 21 listed on the NRHP), about 59 suspected shipwrecks, and other underwater cultural resources (submerged aircraft, docks, piers, and isolated artifacts). The shipwrecks in the sanctuary consist of vessels that sailed Lake Michigan, carrying grain and raw materials, and they retain historical and archaeological value (NOAA 2020a). The primary objective of the NMSA is to protect the sanctuary's biological and cultural resources (see additional discussion in Sections 3.8.1.5 and 3.8.3.5 of this SEIS). The designation will provide long-term resource protection and management for the shipwrecks and other underwater cultural resources (NOAA 2020a).

3.9.3 Procedures and Integrated Cultural Resources Management Plan

Cultural Resources on the Point Beach site are managed and protected by NextEra procedures. NextEra maintains an "Archaeological, Cultural, and Historic Resources" procedure manual that is specific to Point Beach. The procedure manual ensures that known and unknown cultural resources are protected from unauthorized disturbance and removal. The procedure manual establishes a process for all activities that require a Federal permit, use Federal funding, or have the potential to impact cultural resources (NextEra 2020b).

3.9.4 Proposed Action

Table 3-2 identifies one site-specific (Category 2) issue related to historic and cultural resources applicable to Point Beach during the subsequent license renewal term. This issue is analyzed below.

3.9.4.1 Category 2 Issue Related to Historic and Cultural Resources: Historic and Cultural Resources

The National Historic Preservation Act of 1966, as amended (54 U.S.C. 300101 et seq.) (NHPA), requires Federal agencies to consider the effects of their undertakings on historic properties. Issuing a subsequent renewed operating license to a nuclear power plant is a Federal agency undertaking that could potentially affect historic properties. Historic properties are defined as resources included on, or eligible for inclusion on, the NRHP. The criteria for eligibility are listed in Title 36, "Parks, Forests, and Public Property" of the *Code of Federal Regulations* (36 CFR) Section 60.4 "Criteria for Evaluation," and include (a) association with significant events in history, (b) association with the lives of persons significant in the past, (c) embodiment of distinctive characteristics of a type, period, or method of construction, or (d) sites or places that have yielded, or may be likely to yield, information important in prehistory or history.

The historic preservation review process (NHPA Section 106) is outlined in regulations issued by the Advisory Council on Historic Preservation (ACHP) in 36 CFR Part 800, "Protection of Historic Properties." In accordance with NHPA provisions, the NRC is required to make a reasonable effort to identify historic properties included on, or eligible for inclusion on, the NRHP in the area of potential effect (APE). The APE for a subsequent license renewal action includes the power plant site, the transmission lines up to the first substation, and immediate environs that may be affected by the subsequent license renewal decision and land-disturbing activities associated with continued reactor operations during the subsequent license renewal term. In addition, the NRC is required to notify the State historic preservation officer (SHPO) if historic properties would not be affected by subsequent license renewal or if no historic properties are present. In Wisconsin, the Wisconsin State Historic Preservation Office, within the Wisconsin Historical Society, administers the State's historic preservation program. The NRC also notifies all consulting parties, including Indian Tribes, and makes this finding public (through the NEPA process) before issuing subsequent renewed operating licenses. Similarly, if historic properties are present and could be affected by the undertaking, the NRC is required to assess and resolve any adverse effects in consultation with SHPO and any Indian Tribe that attaches religious and cultural significance to identified historic properties.

3.9.4.2 Consultation

In accordance with 36 CFR 800.8, "Coordination with the National Environmental Policy Act," on February 1, 2021, the NRC initiated written consultations with the ACHP and the Wisconsin State Historic Preservation Office. Also, on February 1, 2021, the NRC initiated consultation with the following federally recognized Tribes:

- Bad River Band of Lake Superior Chippewa
- Citizen Potawatomi Nation
- Forest County Potawatomi Community
- Fort Belknap Indian Community
- Hannahville Indian Community
- Ho-Chunk Nation
- Lac Courte Oreilles Band of Lake Superior Chippewa Indians
- Lac Du Flambeau Band of Lake Superior Indians
- Little Traverse Bay Bands of Odawa Indians
- Match-e-be-nash-she-wish Band of Pottawatomi
- Menominee Indian Tribe of Wisconsin
- Miami Tribe of Oklahoma
- Nottawaseppi Huron Band of the Potawatomi
- Oneida Nation of Wisconsin

- Ottawa Tribe of Oklahoma
- Pokagon Band of Potawatomi Indians
- Prairie Band Potawatomi Nation
- Red Cliff Band of Lake Superior Chippewa Indians
- Sokaogon Chippewa Community
- St. Croix Chippewa Indians of Wisconsin
- Stockbridge-Munsee Community Band of Mohican Indians
- Winnebago Tribe of Nebraska

In these letters, the NRC provided information about the proposed action, defined the APE, and indicated that the NHPA review would be integrated with the NEPA process, in accordance with 36 CFR 800.8(c). The NRC invited participation in the identification of, and possible decisions concerning, historic properties, and also invited participation in the scoping process. On March 18, 2021, the Nottawaseppi Huron Band of Potawatomi stated in correspondence to the NRC that based on the description of the proposed action, it did not object to the project (Nottawaseppi Huron Band of Potawatomi 2021). On March 8, 2021, the Miami Tribe of Oklahoma stated in correspondence to the NRC that they are not aware of existing documentation directly linking a specific Miami cultural or historic site to the Point Beach site and requested that if any archaeological evidence is discovered during any phase of the proposed project that the NRC notify the Tribe (Miami Tribe of Oklahoma 2021). On March 19, 2021, the NRC notified Miami Tribe of Oklahoma that in 2004, a Phase I cultural resource survey was conducted within the 1,260-acre (509-ha) Point Beach site that identified the archaeological resources listed in Table 3-22 of this SEIS (NRC 2021f).

On March 5, 2021, the Wisconsin State Historic Preservation Office stated in correspondence to the NRC that as part of the subsequent license renewal undertaking “an architectural/structural survey of Units 1 and 2, including all ancillary buildings and structures, that may now fall within the 50-year threshold for inclusion on the National Register of Historic Places” should be conducted and that NextEra should also update its equivalent Historic Properties Management Plan (Archaeological, Cultural, and Historic Resources procedure manual) to include architectural resources (WISHPO 2021a). An architectural survey has been commissioned by NextEra and provided to the Wisconsin State Historic Preservation Office for review regarding the eligibility of Point Beach (NextEra 2021b, WISHPO 2021b). On October 5, 2021, the Wisconsin State Historic Preservation Office stated in correspondence to NextEra that the office concurs that no properties eligible for inclusion in the NRHP were encountered during the recent Historic Architectural survey (WISHPO 2021b). Additionally, NextEra is coordinating with the Wisconsin State Historic Preservation Office revisions to its Archaeological, Cultural, and Historic Resources procedure manual (NextEra 2021b; WISHPO 2021b).

3.9.4.3 Findings

Section 3.9.2 of this SEIS discusses cultural resources on the Point Beach property. NextEra does not anticipate physical changes or ground-disturbing activities at Point Beach or any location outside the property boundary to support subsequent license renewal (NextEra 2020b). Additionally, no periodic maintenance dredging or shoreline stabilization is anticipated during the subsequent license renewal term (NextEra 2020b, 2021b). NextEra has procedures in place to manage and protect cultural resources at Point Beach. If cultural or historic resources are inadvertently encountered, work should be stopped and the SHPO should be contacted to determine the appropriate next steps (NextEra 2020b).

Given that (1) no new ground disturbance or modifications are anticipated during the subsequent license renewal period, (2) no periodic maintenance dredging or shoreline stabilization is anticipated during the subsequent license renewal term, and (3) NextEra has procedures in place to manage and protect cultural resources, the NRC staff concludes that the proposed Point Beach subsequent license renewal would not adversely affect any known historic properties or historic and cultural resources.

3.9.5 No-Action Alternative

Under the no-action alternative, the NRC would not issue subsequent renewed operating licenses and NextEra would permanently terminate reactor operation on or before the expiration of the current renewed licenses. As a result of facility shutdown, land-disturbing activities or dismantlement are not anticipated because these would be conducted during decommissioning. However, effects on historic properties or historic and cultural resources would depend on the specific shutdown activities when the no-action alternative is implemented.

3.9.6 Replacement Power Alternatives: Common Impacts

If construction and operation of replacement power alternatives require a Federal undertaking (e.g., license, permit), the Federal agency would need to make a reasonable effort to identify historic properties within the APE and consider the effects of the undertaking on historic properties, in accordance with NHPA Section 106. Identified historic and cultural resources would need to be recorded and evaluated for eligibility for listing on the NRHP. If historic properties are present and could be affected by the undertaking, adverse effects would be assessed, determined, and resolved in consultation with the SHPO and any Indian Tribe that attaches religious and cultural significance to identified historic properties through the NHPA Section 106 process.

Construction

Impacts to historic and cultural resources from the construction of replacement power alternatives are primarily related to ground disturbance (e.g., land clearing, excavations). For the new nuclear alternative, natural gas alternative, and portions of the combination alternative, this SEIS assumes that the new facilities would be built on the Point Beach site. For the solar PV and onshore wind portions of the combination alternative, this SEIS assumes that they would primarily be constructed at other sites (offsite from the Point Beach site). Undisturbed land areas (onsite and offsite) would need to be surveyed to identify and record historic and cultural material. Any historic or cultural resources and archaeological sites found during these surveys would need to be evaluated for eligibility for listing on the NRHP. Areas of greatest cultural sensitivity should be avoided while maximizing the use of previously disturbed areas.

Operations

The potential for impacts on historic and cultural resources from the operation of replacement power alternatives would be related to maintenance activities at the site, as well as visual impacts that would vary with plant heights and associated exhaust stacks or cooling towers. As in the case of construction (discussed above), undisturbed land areas would need to be surveyed to identify and record historic and cultural material. Any historic and cultural resources and archaeological sites found during these surveys would need to be evaluated for eligibility for listing on the NRHP. Areas of greatest cultural sensitivity should be avoided while maximizing the use of previously disturbed areas.

3.9.7 New Nuclear (Small Modular Reactor) Alternative

Potential impacts to historic and cultural resources from the construction and operation of the new nuclear alternative would include those common to all replacement power alternatives discussed in Section 3.9.6. The new nuclear alternative would require an estimated 110 acres (45 ha) of land on the Point Beach site. As discussed in Section 3.9.2, archaeological sites have been recorded on the Point Beach site and the following historic properties are within a 6-mi radius of the Point Beach site and are listed on the NRHP: the Pathfinder shipwreck (approximately 2.5 mi (4 km) from Point Beach), Rouse Simmons shipwreck (approximately 6 mi (9.6 km) from Point Beach), Continental shipwreck (approximately 3.5 mi (4.8 km) from Point Beach), Rawley Point Light Station (approximately 5 mi (8.0 km) from Point Beach). If any portion of the new nuclear plant would be cited on undisturbed land, a cultural resource survey should be conducted before construction to identify historic and cultural resources. Given that the new nuclear alternative would be sited within the previously surveyed site and the existing transportation and transmission line infrastructure at Point Beach would be adequate to support this alternative, avoidance of significant historic and cultural resources would be possible. If avoidance is not possible, impacts on historic and cultural resources could occur from the construction of the new nuclear alternative, and impacts would need to be minimized or mitigated. The Wisconsin SHPO would need to be consulted before any ground-disturbing activities at Point Beach.

Construction and operation of the new nuclear alternative would introduce additional buildings and structures to the Point Beach site that could affect the viewshed of historic properties or historic and cultural resources. Construction of the buildings and structures, while not out of character with the current site, would be taller than the current Point Beach buildings (approximately 63 ft (19 m) tall). The tallest structure of the new nuclear alternative would be 160 ft (50 m). A plume could be visible, particularly during winter months, as a result of operation of the mechanical draft cooling towers (NRC 2018a). The impact determination during construction and operations of this alternative would depend on the specific location chosen within the Point Beach site.

3.9.8 Natural Gas Combined-Cycle Alternative

Potential impacts on historic and cultural resources from the construction and operation of the natural gas alternative would include those common to all replacement power alternatives discussed in Section 3.9.6. The natural gas alternative would require an estimated 60 acres (45 ha) of land on the Point Beach site and up to an additional 120 acres (49 ha) for the natural gas pipeline. The new corridors for construction of the natural gas pipeline would need to be surveyed to identify and record historic and cultural material. As discussed in Section 3.9.2, archaeological sites have been recorded on the Point Beach site and the following historic properties are within a 6-mi radius of the Point Beach site and are listed on the NRHP: the Pathfinder shipwreck (approximately 2.5 mi (4 km) from Point Beach), Rouse Simmons shipwreck (approximately 6 mi (9.6 km) from Point Beach), Continental shipwreck (approximately 3.5 mi (4.8 km) from Point Beach), Rawley Point Light Station (approximately 5 mi (8.0 km) from Point Beach). Onsite and offsite historic and cultural resources could be avoided during construction of the natural gas alternative. Given that the natural gas plant would be sited within the previously surveyed site and the existing transportation and transmission line infrastructure at Point Beach would be adequate to support this alternative, avoidance of significant historic and cultural resources would be possible. However, if avoidance is not possible, especially during construction of the natural gas pipeline, impacts would need to be minimized or mitigated. The Wisconsin SHPO would need to be consulted prior to any ground-disturbing activities.

Construction and operation of the natural gas alternative would introduce additional buildings and structures to the Point Beach site that could affect the viewshed of historic properties or historic and cultural resources. Construction of the buildings and structures, while not out of character with the current site, would be taller than the current Point Beach buildings (approximately 63 ft (19 m) tall). The tallest structures would be the plant stacks, approximately 150 ft (46 m) tall. A plume could be visible, particularly during winter months, as a result of operation of the mechanical draft cooling towers. The impact determination during construction and operations of this alternative would depend on the specific location chosen within the Point Beach site, the location of the new pipeline corridor, and the presence of historic and cultural resources along the corridor.

3.9.9 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

Potential impacts on historic and cultural resources from construction and operation of the new nuclear portion of the combination alternative would be similar to those discussed under the new nuclear alternative in Section 3.9.7, given that it would be sited within the Point Beach site and have similar plant structures. Therefore, impacts on historic and cultural resources from construction and operation of the new nuclear portion of the combination alternative would depend on the specific location chosen within the Point Beach site.

Potential impacts on historic and cultural resources from construction of the solar PV portion of the combination alternative would include those common to all replacement power alternatives discussed in Section 3.9.6. The solar PV portion would require 3,200 acres (1,300 ha) of land. A small portion of the solar PV portion would be located on the Point Beach site, but the solar PV portion would primarily be located at different sites (offsite from the Point Beach site). The sites would need to be surveyed to identify and record historic and cultural material. Using previously disturbed sites could minimize impacts to historic and cultural resources, particularly given the land requirement for the solar PV portion of the combination alternative. Historic and cultural resources could be avoided during construction of the solar PV portion. If avoidance is not possible, impacts on historic and cultural resources could occur from construction and impacts would need to be minimized or mitigated. Solar panels would have a low visual profile; therefore, operation would not substantially change historic property, if present, viewsheds. The impact determination during construction and operations of the solar PV portion of the combination alternative would depend on the specific site locations and presence of historic and cultural resources.

Potential impacts on historic and cultural resources from construction and operation of the onshore wind portion of the combination alternative would include those common to all replacement power alternatives discussed in Section 3.9.6. The locations of the onshore wind portion are unknown but would be offsite from the Point Beach site. The onshore wind portion would require an estimated 31,000 acres (12,000 ha) of land. Much of this land would be unaffected and approximately 610 acres (248 ha) of temporary land disturbance and 310 acres (125 ha) of permanent land disturbance would occur. The sites would need to be surveyed to identify and record historic and cultural material. Historic and cultural resources could be avoided during construction of the onshore wind portion of the combination alternative. If avoidance is not possible, impacts on historic and cultural resources could occur from construction, and impacts would need to be minimized or mitigated. Using previously disturbed sites could minimize impacts to historic and cultural resources. Wind turbines would have a maximum height of 475 ft (145 m). Construction and operation of the onshore wind portion could create aesthetic changes to historic properties or historic and cultural resources, if present, viewsheds. The impact determination during construction and operations of the onshore wind portion of the combination alternative would depend on the specific site locations and presence of historic and cultural resources.

3.10 Socioeconomics

This section describes current socioeconomic factors that have the potential to be affected by changes in power plant operations at Point Beach, Units 1 and 2. Point Beach and the communities that support it can be described as a dynamic socioeconomic system. The communities supply the people, goods, and services required to operate the nuclear power plant. An operating power plant, in turn, provides wages and benefits to the people and pays money for goods and services. The measure of a community's ability to support Point Beach power plant operations depends on its ability to respond to changing environmental, social, economic, and demographic conditions.

3.10.1 Power Plant Employment

The socioeconomic region of influence is defined by the areas where Point Beach workers and their families reside, spend their income, and use their benefits, thus affecting the economic conditions of the region. The workforce at Point Beach consists of approximately 700 workers, comprised of 506 NextEra employees and 175 supplemental workers (NextEra 2020b). Over 95 percent of workers reside in five counties in Wisconsin (see Table 3-23). The remaining workers are spread among nine counties in Wisconsin and other states, with numbers ranging from one to four workers per county. Because over 80 percent of Point Beach workers live in Brown and Manitowoc counties, the greatest socioeconomic effects are likely to be experienced there. The socioeconomic impact analysis is therefore focused on these two counties.

Table 3-23 Residence of NextEra Employees by Wisconsin County

County	Number of Employees	Percentage of Total
Total	506	100
Brown	160	32
Kewaunee	63	12
Manitowoc	250	49
Outagamie	9	2
Sheboygan	8	2
Other counties	16	3

Source: NextEra 2020b

Refueling outages occur on an 18-month staggered cycle for Point Beach Units 1 and 2 and historically have lasted approximately 25 days per unit. During refueling outages, site employment typically increases by an additional 800 temporary workers (NextEra 2020b). Outage workers come from all regions of the country; however, most are from Wisconsin.

3.10.2 Regional Economic Characteristics

Goods and services are needed to operate Point Beach. Although procured from a wider region, some portion of these goods and services are purchased directly from within the socioeconomic region of influence. These transactions sustain existing jobs and maintain income levels in the local economy. This section presents information on employment and income in the Point Beach socioeconomic region of influence.

3.10.2.1 Regional Employment and Income

From 2010 to 2020, the labor force in the Point Beach socioeconomic region of influence decreased 0.5 percent to nearly 181,000 persons. However, the number of employed persons increased by 1.8 percent, to approximately 170,000 persons. Consequently, from 2010–2020, the number of unemployed people in the region of influence decreased by nearly 27 percent to nearly 11,000 persons, or about 6 percent of the total 2020 workforce—down from 8.2 percent in 2010 (BLS 2021).

According to the U.S. Census Bureau's (USCB's) 2019 American Community Survey 1-Year Estimates, manufacturing and educational, health, and social services represented the largest employment sectors in the socioeconomic region of influence followed by retail (USCB 2021).

Estimated income information for the socioeconomic region of influence (USCB 2019 American Community Survey 1-Year Estimates) is presented in Table 3-24.

Table 3-24 Estimated Income Information for the Point Beach Power Station Socioeconomic Region of Influence (2019, 1-Year Estimates)

	Brown County	Manitowoc County	Wisconsin
Median household income (dollars)[(a)]	64,458	60,785	64,168
Per capita income (dollars)[(a)]	33,546	32,054	34,568
Families living below the poverty level (percent)	5.9	5.0	6.2
People living below the poverty level (percent)	10.3	8.7	10.4

[(a)] In 2019 inflation-adjusted dollars

Source: USCB 2021a

3.10.2.2 Unemployment

According to the USCB's 2019 American Community Survey 1-Year Estimates, the unemployment rates in Brown County and Manitowoc County were 3 and 1.6 percent, respectively. Comparatively, the unemployment rate in Wisconsin during this same time period was 3.2 percent (USCB 2021).

3.10.3 Demographic Characteristics

According to the 2010 Census, an estimated 81,843 people lived within 20 mi (32 km) of Point Beach, which equates to a population density of 65 persons per square mile (NextEra 2020b). This translates to a Category 3, "Most sparse" population density using the license renewal GEIS (NRC 1996) measure of sparseness, which is defined as "60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 mi [32 km]." An estimated 777,625 people live within 50 mi (80 km) of Point Beach with a population density of 99 persons per square mile (NextEra 2020b). With one city within a 50-mi (80-km) radius having populations greater than 100,000 persons, this translates to a Category 3, "Not close proximity" population density, using the license renewal GEIS (NRC 1996) measure of proximity (one or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 mi (80 km)). Therefore, Point Beach is in a "medium" population area based on the license renewal GEIS sparseness and proximity matrix.

Table 3-25 shows population projections and percent growth from 1980 to 2060 in the two-county Point Beach region of influence. Over the last several decades, the population of

Brown County has increased steadily, while the population of Manitowoc County has remained relatively unchanged and slightly decreased. The population of Brown County is projected to continue to increase at a more moderate rate, while the population of Manitowoc County is expected to continue to decrease at a slow rate.

Table 3-25 Population and Percent Growth in Point Beach Socioeconomic Region of Influence Counties 1980–2010, 2019 (Estimated), and 2020–2060 (Projected)

		Brown County		Manitowoc County	
	Year	Population	Percent Change	Population	Percent Change
Recorded	1980	175,280	–	82,918	–
	1990	194,594	11.0	80,421	-3.0
	2000	226,778	16.5	82,887	3.1
	2010	248,007	9.4	81,442	-1.7
Estimated Projected	2019	264,542	6.7	78,981	-3.0
	2020	270,720	9.2	81,400	-0.1
	2030	299,540	10.6	82,230	1.0
	2040	312,320	4.3	78,920	-4.0
	2050	335,793	7.5	78,370	-0.7
	2060	356,593	6.2	77,130	-1.6

Sources: Decennial population data for 1970–2010 and estimated 2019 (USCB 2021); projections for 2020–2040 by Wisconsin Department of Health Services (WDHS 2015); 2050–2060 calculated.

The 2010 Census demographic profile of the two-county region of influence population is presented in Table 3-26. According to the 2010 Census, minorities (race and ethnicity combined) comprised approximately 14 percent of the total two-county population (USCB 2021a). The largest minority populations in the region of influence were people of Hispanic, Latino, or Spanish origin of any race (approximately 6 percent) followed by Asian (approximately 3 percent).

Table 3-26 Demographic Profile of the Population in the Point Beach Region of Influence in 2010

	Brown County	Manitowoc County	Region of Influence
Total Population	248,007	81,442	329,449
Race (Percent of Total Population, Not Hispanic or Latino)			
White	83.7	92.3	85.9
Black or African American	2.1	0.5	1.7
American Indian and Alaska Native	2.4	0.5	1.9
Asian	2.7	2.5	2.6
Native Hawaiian and Other Pacific Islander	0.0	0.0	0.0
Some other race	0.1	0.1	0.1
Two or more races	1.7	0.9	1.5

Table 3-26 Demographic Profile of the Population in the Point Beach Region of Influence in 2010 (cont.)

	Brown County	Manitowoc County	Region of Influence
Hispanic, Latino, or Spanish Ethnicity of Any Race			
Hispanic or Latino	17,985	2,565	20,550
Percent of total population	7.3	3.1	6.2
Total minority	**40,305**	**6,232**	**46,537**
Percent of total population	16.3	7.7	14.1
Source: USCB 2021a.			

According to the USCB's 2019 American Community Survey 1-Year Estimates (USCB 2021), minority populations in the region of influence increased by nearly 14,000 persons since 2010, and now comprise nearly 18 percent of the population (see Table 3-27). The largest changes occurred in the population of people who identify themselves as Hispanic, Latino, or Spanish origin of any race, which grew by over 6,800 persons since 2010, an increase of over 33 percent. The next largest change was an increase in the Asian population, which grew more than 3,100 persons, or approximately 35 percent since 2010.

Table 3-27 Demographic Profile of the Population in the Point Beach Region of Influence, 2019, 1-Year Estimates

	Brown County	Manitowoc County	Region of Influence
Total Population	264,542	78,981	343,523
Race (percent of total population, Not Hispanic or Latino)			
White	80.2	89.8	82.4
Black or African American	2.6	1.1	2.2
American Indian and Alaska Native	2.2	0.8	1.9
Asian	3.5	3.2	3.4
Native Hawaiian and Other Pacific Islander	0.0	0.0	0.0
Some other race	0.1	0.0	0.1
Two or more races	2.3	0.8	2.0
Hispanic, Latino, or Spanish Ethnicity of Any Race			
Hispanic or Latino	23,906	3,498	27,404
Percent of total population	9.0	4.4	8.0
Total minority	**52,277**	**8,084**	**60,361**
Percent of total population	19.8	10.2	17.6
Source: USCB 2021a			

3.10.3.2 Transient Population

Within 50 mi (80 km) of Point Beach, colleges and recreational opportunities attract daily and seasonal visitors who create a demand for temporary housing and services. In 2020, approximately 33,000 students attended colleges and universities within 50 mi (80 km) of Point Beach (NCES 2021a).

Based on the USCB's 2015–2019 American Community Survey 5-Year Estimates (USCB 2021), approximately 35,000 seasonal housing units are located within 50 mi (80 km) of Point Beach. Of those, 1,688 housing units are in the two-county socioeconomic region of influence.

3.10.3.3 Migrant Farm Workers

Migrant farm workers are individuals whose employment requires travel to harvest agricultural crops. These workers may or may not have a permanent residence. Some migrant workers follow the harvesting of crops, particularly fruit, throughout rural areas of the United States. Others may be permanent residents living near Point Beach who travel from farm to farm harvesting crops.

Migrant workers may be members of minority or low-income populations. Because they travel and can spend a significant amount of time in an area without being actual residents, migrant workers may be unavailable for counting by census takers. If uncounted, these minority and low-income workers would be underrepresented in the decennial Census population counts.

The U.S. Department of Agriculture's National Agricultural Statistics Survey conducts the Census of Agriculture every 5 years. This results in a comprehensive compilation of agricultural production data for every county in the United States. Beginning with the 2002 Census of Agriculture, farm operators were asked whether they hired migrant workers—defined as a farm worker whose employment required travel—to do work that prevented the workers from returning to their permanent place of residence the same day.

Information about both migrant and temporary farm labor (working less than 150 days) can be found in the 2017 Census of Agriculture. Table 3-28 presents information on migrant and temporary farm labor within 50 mi (80 km) of Point Beach.

Table 3-28 Migrant Farm Workers and Temporary Farm Labor in Counties Located Within 50 mi (80 km) of Point Beach (2017)

County[(a)]	Number of Farms with Hired Farm Labor[(b)]	Number of Farms Hiring Workers for Less Than 150 days[(b)]	Number of Farm Workers Working for Less Than 150 days[(b)]	Number of Farms Reporting Migrant Farm Labor[(b)]
Total	3,209	2,128	7,493	81
Wisconsin				
Brown	300	193	716	12
Calumet	233	150	463	3
Door	174	134	405	8
Fond du Lac	413	267	954	15
Kewaunee	231	164	895	5
Manitowoc	304	228	864	7
Marinette	128	86	376	3
Oconto	212	136	471	8
Outagamie	338	205	594	6
Shawano	348	212	713	4

Table 3-28 Migrant Farm Workers and Temporary Farm Labor in Counties Located Within 50 mi (80 km) of Point Beach (2017) (cont.)

County[a]	Number of Farms with Hired Farm Labor[b]	Number of Farms Hiring Workers for Less Than 150 days[b]	Number of Farm Workers Working for Less Than 150 days[b]	Number of Farms Reporting Migrant Farm Labor[b]
Sheboygan	305	206	672	8
Winnebago	223	147	370	2

Note: ROI counties are in bold italics.

[a] Counties within 50 mi (80 km) of Point Beach with at least one block group located within the 50-mi (80-km) radius.

[b] Table 7. Hired farm Labor—Workers and Payroll: 2017.

Source: 2017 Census of Agriculture—County Data (NASS 2021)

According to the 2017 Census of Agriculture, approximately 7,500 farm workers were hired to work for less than 150 days and were employed on 2,128 farms within 50 mi (80 km) of Point Beach. The county with the highest number of temporary farm workers (954 workers on 267 farms) was Fond du Lac County, WI (NASS 2021). Approximately 81 farms in the 50-mi (80-km) radius of Point Beach reported hiring approximately 460 migrant workers in the 2017 Census of Agriculture. Fond du Lac County, WI, also had the highest number of farms (15) reporting migrant farm labor (NASS 2021).

3.10.4 Housing and Community Services

This section presents information on housing and local public services, including education and water supply.

3.10.4.1 Housing

Table 3-29 lists the total number of occupied and vacant housing units, vacancy rates, and median values of housing units in the socioeconomic region of influence. Based on the USCB's 2019 American Community Survey 1-year estimates (USCB 2021), there were approximately 149,000 housing units in the region of influence, of which over 141,000 were occupied. The median values of owner-occupied housing units in the region of influence range from $196,100 in Brown County to $140,300 in Manitowoc County. The homeowner vacancy rate was approximately 1 percent in both Brown and Manitowoc counties (USCB 2021).

Table 3-29 Housing in the Point Beach Region of Influence (2019, 1-Year Estimate)

	Brown County	Manitowoc County	Region of Influence
Total housing units	**111,218**	**37,652**	**148,870**
Occupied housing units	107,385	33,831	141,216
Total vacant housing units	3,833	3,821	7,654
Percent total vacant	3.4	10.1	5.1
Owner-occupied units	66,275	25,057	91,332
Median value (dollars)	196,100	140,300	180,791
Owner vacancy rate (percent)	0.8	0.8	0.8
Renter-occupied units	41,110	8,774	49,884

Table 3-29 Housing in the Point Beach Region of Influence (2019, 1-Year Estimate) (cont.)

	Brown County	Manitowoc County	Region of Influence
Median rent (dollars/month)	795	751	787
Rental vacancy rate (percent)	3.0	4.2	3.2

Source: USCB 2021

3.10.4.2 Education

The Manitowoc County has six public school districts, and 29 schools with a total of 10,317 students in the 2019–2020 school year. The Manitowoc Public School District is the largest school district in Manitowoc County with 4,987 students and 11 schools. The school district has six elementary schools (grades pre-kindergarten through 5), two middle schools (grades 6 through 8), and one high school (grades 9 through 12). All of these schools are located in Manitowoc, WI (NCES 2021b).

3.10.4.3 Public Water Supply

There are 17 public municipal community water systems in Brown County including Green Bay, which obtains its water from Lake Michigan. Due to groundwater depletion, Lake Michigan water has been identified for the area's long-term potable water needs. Wastewater collection, treatment, and disposal are provided to all or portions of county cities, all nine villages, and 9 of 13 towns in Brown County (NextEra 2020b).

Municipal water systems serve 11 communities within Manitowoc County. Nine public water systems are supplied by groundwater through community wells. The cities of Manitowoc and Two Rivers use Lake Michigan for public water. Each community's water system meets everyday demand in addition to providing higher volumes for fire protection (NextEra 2020b).

Point Beach is not connected to a municipal system and accesses potable water through a series of groundwater wells. Sanitary wastes are treated onsite before disposal at the Point Beach cooling water discharge location. A local licensed septage hauler periodically removes sludge for offsite disposal. (NextEra 2020b)

Because population and water demand are projected to increase slightly during the subsequent license renewal term, existing water sources are expected to meet the needs of the population. Brown and Manitowoc counties have enough water service capabilities to meet the need.

3.10.5 Tax Revenues

In Wisconsin, public utilities are taxed by the State and are exempt from paying local property taxes. Instead, NextEra pays an annual gross-receipts license fee for Point Beach based on prior year's electricity sales. The annual fee is equivalent to 1.59 percent of the nuclear power plant's gross revenues for the previous calendar year. The annual fees are paid to the Wisconsin Department of Revenue and deposited in the State general fund. NextEra annual license fee payments to the Wisconsin Department of Revenue on behalf of Point Beach ranged from $7,279,882 in 2015, to $8,027,490 in 2019.

Wisconsin apportions the utility fees to municipal and county taxing authorities through shared revenue funding. Apportionment includes unrestricted payments; payments to qualifying municipalities that limit growth in spending; and public utility aid, which helps pay for services in counties and municipalities with property tax exempt utilities. Utility aid payments are also viewed as partial compensation for air pollution, noise, traffic congestion, and land use constraints caused by the presence of a utility. Shared revenue utility aid payments are calculated using the following: ad valorem (net book value), spent nuclear storage, minimum payment, megawatt, incentive payment, decommissioning costs, and per capita limit.

As previously noted, Peach Bottom is in the town of Two Creeks in Manitowoc County. Between 2015 and 2019, utility aid payments represented approximately 2 to 3 percent of the total revenue of Manitowoc County. These payments support county programs including health and human services, public safety, law enforcement, highway construction and maintenance, solid waste collection, parks and recreation, culture and education, and other municipal programs.

The town of Two Creeks receives the largest share of public utility aid in Manitowoc County. As presented in Table 3-30, the utility aid payment represented approximately 30 to 64 percent of the total revenue of Two Creeks from 2015 to 2019. These aid payments provide funding for highway construction; solid waste collection and disposal; fire, health and human services; and parks and recreation.

NextEra's payments remained relatively consistent between 2015 and 2019, with no adjustments caused by reassessments or other actions that could have resulted in significant increases or decreases in fee payments. NextEra does not anticipate any future changes in tax laws, assessments, or any other adjustments that could result in notable future increases or decreases in license fees or other payments to Manitowoc County and the town of Two Creeks (NextEra 2020b).

Table 3-30 NextEra Property Tax Payments (in millions of dollars), 2015–2019

	2015	2016	2017	2018	2019
Wisconsin Department of Revenue Annual License Fee	7.3	7.8	7.9	7.8	8.0
Manitowoc County					
Total Shared Revenues	4.4	4.4	4.4	4.5	4.6
Utility Aid Payment (on behalf of Point Beach)	1.9	1.9	1.9	1.9	2.0
Total Revenue and Other Financing Sources	57.8	62.3	76.7	63.1	79.4
Percent of Total Tax Revenues	3	3	3	3	3
Town of Two Creeks					
Total Shared Revenues	0.234	0.234	0.232	0.236	0.237
Utility Aid Payment (on behalf of Point Beach)	0.231	0.231	0.229	0.234	0.234
Total Revenue and Other Financing Sources	0.770	0.403	0.357	0.363	0.685
Percent of Total Tax Revenues	30	57	64	64	34

Sources: NextEra 2020b; WDR 2021a, WDR 2021b

3.10.6 Local Transportation

The primary road network surrounding Point Beach is shown in Figure 2-1. A major east coast highway, Interstate 43 (I-43), runs north and south across Wisconsin, providing access to the cities of Green Bay, Manitowoc, and Sheboygan. The primary access to Point Beach is from Nuclear Road to Lake Shore Road by traveling east from State Highway42, approximately 1 mi (1.6 km) west of Point Beach.

State Highway 42 is the main road feeding commuter traffic to Point Beach and connects the communities of Manitowoc, Two Rivers, Two Creeks, and Kewaunee, with County Highway V, which provides access from the town of Mishicot. It is a two-lane, undivided highway classified as a major collector. Over the years, traffic counts have been decreasing on State Highway 42. County Highway V is classified as a major collector west of State Highway 42, providing access from the village of Mishicot, and a minor collector east of State Highway 42 supporting local traffic (NextEra 2020b).

The closest port to point Beach is the Port of Manitowoc. The port handles bulk commodities, newly constructed yachts, and passengers on the Lake Michigan car ferry. The port is also home to a marine contracting firm that services Lake Michigan ports in Wisconsin and Michigan. The car ferry dock located at the port provides seasonal ferry service across Lake Michigan from Manitowoc to Ludington, MI (NextEra 2020b).

There are two airfields within approximately 10 mi (16 km) of Point Beach: Goins Airport (private use) and Woodland Airstrip Ultralight Flightpark (private use). The Manitowoc County Airport, located approximately 13 mi (21 km) south-southwest, is the closest public use airport. The nearest full-service airport is Green Bay-Austin Straubel International Airport, southwest of Green Bay, WI (NextEra 2020b).

The Wisconsin Department of Transportation average annual daily traffic (AADT) volumes for the state roads with plant access are listed in Table 3-31. The AADT values represent traffic volumes for a 24-hour period factored by both day of week and month of year.

Table 3-31 Wisconsin State Routes in the Vicinity of Point Beach: 2017 Annual Average Daily Traffic Volume Estimates

Roadway and Location	Annual Average Daily Traffic Volume Estimates
State Highway 42	
Between County Highway BB and Zanders Road (north of Nuclear Road)	1,300
North of County Highway VV (south of Nuclear Road)	2,100
County Highway V	
East of State Highway 42	400[a]
East of Mishicot (west of State Highway 42)	1,100[b]

[a] Count as of July 11, 2011.
[b] Count as of March 30, 2021.

Source: WisDOT 2021

3.10.7 Proposed Action

Socioeconomic effects of ongoing reactor operations at Point Beach have become well established as regional socioeconomic conditions have adjusted to the presence of the nuclear power plant. Changes in employment and tax revenue could impact the availability of community services and housing, as well as traffic on roads near Point Beach.

NextEra indicated in its ER that it has no plans to add non-outage workers during the subsequent license renewal term and that increased maintenance and inspection activities could be managed using the current workforce (NextEra 2020b). Consequently, people living near Point Beach would not experience any changes in socioeconomic conditions during the subsequent license renewal term beyond what is currently being experienced. Therefore, the impact of continued reactor operations during the subsequent license renewal term would not exceed the Category 1 (generic) socioeconomic impacts predicted in the GEIS. For these issues, the GEIS predicted socioeconomic impacts would be SMALL for all nuclear plants.

3.10.8 No-Action Alternative

3.10.8.1 Socioeconomics

Under the no-action alternative, the NRC would not issue subsequent renewed operating licenses, and Point Beach Units 1 and 2 would permanently shut down on or before the expiration of the current renewed operating licenses. This would have a noticeable impact on socioeconomic conditions in the counties and communities near Point Beach. The loss of jobs, income, and tax revenue would have an immediate socioeconomic impact. As jobs are eliminated, some, but not all, of the approximately 700 workers could leave. Income from the buying and selling of goods and services needed to maintain the power plant would also be reduced. In addition, loss of tax revenue could affect the availability of public services.

If workers and their families move away, increased vacancies and reduced demand for housing would likely cause property values to fall. The greatest socioeconomic impact would be experienced in the communities located nearest to Point Beach, in Brown and Manitowoc counties. However, the loss of jobs, income, and tax revenue, may not be as noticeable in large communities due to the time and steps required to prepare the nuclear plant for decommissioning. Therefore, depending on the jurisdiction, socioeconomic impacts from not issuing subsequent renewed licenses and terminating reactor operations at Point Beach could range from SMALL to MODERATE.

3.10.8.2 Transportation

Traffic volume on roads near Point Beach may be noticeably reduced after the termination of reactor operations. Any reduction in traffic volume would coincide with workforce reductions at Point Beach. The number of truck deliveries and shipments would also be reduced until active decommissioning. Therefore, due to the time and steps required to prepare the nuclear plant for decommissioning, traffic-related transportation impacts would be SMALL.

3.10.9 Replacement Power Alternatives

Workforce requirements for replacement power alternatives were evaluated to measure their possible effects on current socioeconomic and transportation conditions. Table 3-32 summarizes the socioeconomic and transportation impacts of replacement power alternatives. The following provides a discussion of the common socioeconomic and transportation impacts during construction and operations of replacement power alternatives.

3.10.9.1 Socioeconomics

Socioeconomic impacts are defined in terms of changes in the social and economic conditions of a region. For example, the creation of jobs and the purchase of goods and services during the construction and operation of a replacement power plant could affect regional employment, income, and tax revenue. For each alternative, two types of jobs would be created: (1) construction jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact; and (2) operations jobs, which have the greater potential for permanent, long-term socioeconomic impact.

While the selection of a replacement power alternative could create opportunities for employment and income and generate tax revenue in the local economy, employment, income, and tax revenue would be greatly reduced or eliminated in communities near Point Beach. These impacts are described in the "No-Action Alternative" (Section 3.10.8).

Construction

The relative economic effect of an influx of workers on the local economy and tax base would vary, with the greatest impacts occurring in the communities where most construction workers would reside and spend their income. As a result, some local communities could experience an economic boom during construction from increased tax revenue and income generated by expenditures for goods and services and increased demand for temporary (rental) housing. After construction, local communities would likely experience a return to preconstruction economic conditions.

Operations

Prior to the commencement of startup and operations, local communities would see an influx of operations workers and their families and increased demand for permanent housing and public services. These communities would also experience the economic benefits from increased income and tax revenue generated by the purchase of goods and services needed to operate a new replacement power plant. Consequently, power plant operations would have a greater potential than power plant construction for effecting permanent, long-term socioeconomic impacts on the region.

3.10.9.2 Transportation

Transportation impacts are defined in terms of changes in level of service conditions on local roads. Additional vehicles during construction and operations could lead to traffic congestion and level of service impacts on local roadways and delays at intersections.

Construction

Transportation impacts would consist of commuting workers and truck deliveries of equipment and material to the construction site. Traffic volumes would increase substantially during shift changes. Trucks would deliver equipment and material to the construction site and remove waste material, thereby increasing the amount of traffic on local roads. The increase in traffic volumes could result in level of service impacts and delays at intersections during certain hours of the day. In some instances, construction material could also be delivered and removed by rail or barge.

Operations

Traffic volumes would be greatly reduced after construction because of the smaller size of the operations workforce. Transportation impacts would consist of commuting operations workers and truck deliveries of equipment and material and removal of waste material.

Table 3-32 Socioeconomic and Transportation Impacts of Replacement Power Alternatives

Alternative	Resource Requirements	Impacts	Discussion
New Nuclear (small modular reactor)	Construction: peak 1,650 workers for several months	MODERATE to LARGE	

Table 3-32 Socioeconomic and Transportation Impacts of Replacement Power Alternatives (cont.)

Alternative	Resource Requirements	Impacts	Discussion
	Operations: 750 workers	MODERATE to LARGE	If all three small modular reactors are constructed/installed at the same time. Some operations workers could transfer from Point Beach.
Natural Gas Combined-Cycle	Construction: peak 950 workers for several months	MODERATE	
	Operations: 120 workers	SMALL to MODERATE	If all three combined-cycle combustion turbines are constructed/installed at the same time. Some operations workers could transfer from Point Beach.
Combination New Nuclear (small modular reactor), Solar, and Onshore Wind	Construction: peak 1,100 (Nuclear), 375 (Solar), and 220 (Wind) workers for several months	MODERATE to LARGE	
	Operations: 500 (Nuclear), 20 (Solar), and 20 (Wind) workers	MODERATE	Jobs would likely be scattered throughout the region and would not have a noticeable effect on local economy.

Sources: NRC 2016a, NRC 2018; DOE 2011; BLM 2019; Tegen 2016

3.11 Human Health

Point Beach is both an industrial facility and a nuclear power plant. Similar to any industrial facility or nuclear power plant, the operation of Point Beach over the subsequent license renewal period will produce various human health risks for workers and members of the public. This section describes the human health risks resulting from the operation of Point Beach, including from radiological exposure, chemical hazards, microbiological hazards, electromagnetic fields, and other hazards. The description of these risks is followed by the NRC staff's analysis of the potential impacts on human health from the proposed action (subsequent license renewal) and alternatives to the proposed action.

3.11.1 Radiological Exposure and Risk

Operation of a nuclear power plant involves the use of nuclear fuel to generate electricity. Through the fission process, the nuclear reactor splits uranium atoms, resulting generally in (1) the production of heat which is then used to produce steam to drive the plant's turbines and generate electricity and (2) the creation of radioactive byproducts. As required by NRC regulations at 10 CFR 20.1101, "Radiation protection programs," NextEra designed a radiation protection program to protect onsite personnel (including employees and contractor employees), visitors, and offsite members of the public from radiation and radioactive material at Point

Beach. The Point Beach radiation protection program is extensive and includes, but is not limited to, the following:

- Organization and Administration (e.g., a radiation protection manager who is responsible for the program and who ensures that there are trained and qualified workers for the program)
- Implementing Procedures
- ALARA Program to minimize dose to workers and members of the public
- Dosimetry Program (i.e., measure radiation dose to plant workers)
- Radiological Controls (e.g., protective clothing, shielding, filters, respiratory equipment, and individual work permits with specific radiological requirements)
- Radiation Area Entry and Exit Controls (e.g., locked or barricaded doors, interlocks, local and remote alarms, personnel contamination monitoring stations)
- Posting of Radiation Hazards (i.e., signs and notices alerting plant personnel of potential hazards)
- Recordkeeping and Reporting (e.g., documentation of worker dose and radiation survey data)
- Radiation Safety Training (e.g., classroom training and use of mockups to simulate complex work assignments)
- Radioactive Effluent Monitoring Management (i.e., controlling and monitoring radioactive liquid and gaseous effluents released into the environment)
- Radioactive Environmental Monitoring (e.g., sampling and analysis of environmental media, such as direct radiation, air, water, groundwater, milk, food products (corn, soybeans, and peanuts), fish, oysters, clams, crabs, silt, and shoreline sediment to measure the levels of radioactive material in the environment that may impact human health)
- Radiological Waste Management (i.e., controlling, monitoring, processing, and disposing of radioactive solid waste)

For radiation exposure to Point Beach personnel, the NRC staff reviewed the data contained in NUREG-0713, Volume 40, *Occupational Radiation Exposure at Commercial Nuclear Power Reactors and other Facilities 2018: Fifty-First Annual Report* (NRC 2020c). The 51st annual report was the most recent annual report available at the time of this environmental review. It summarizes the occupational exposure data in the NRC's Radiation Exposure Information and Reporting System database through 2018. Nuclear power plants are required by 10 CFR 20.2206, "Reports of individual monitoring," to report their occupational exposure data to the NRC annually.

NUREG-0713 calculates a 3-year average collective dose per reactor for workers at all nuclear power reactors licensed by the NRC. The 3-year average collective dose is one of the metrics that the NRC uses in the Reactor Oversight Process to evaluate the applicant's ALARA program. Collective dose is the sum of the individual doses received by workers at a facility licensed to use radioactive material over a 1-year time period. There are no NRC or EPA standards for collective dose. Based on the data for operating pressurized-water reactors like the ones at Point Beach, the average annual collective dose per reactor year was

34 person-rem (NRC 2020c). In comparison, Point Beach had a reported annual collective dose per reactor year of 31 person-rem.

In addition, as reported in NUREG-0713, for 2018, one worker at Point Beach received an annual dose greater than 1.0 rem (0.01 Sv), which is less than the NRC occupational dose limit of 5.0 rem (0.05 Sv) in 10 CFR 20.1201, “Occupational dose limits for adults.”

Section 2.1.4, “Radioactive Waste Management Systems,” of this SEIS discusses offsite dose to members of the public.

3.11.2 Chemical Hazards

State and Federal environmental agencies regulate the use, storage, and discharge of chemicals, biocides, and sanitary wastes. Such environmental agencies also regulate how facilities like Point Beach manage minor chemical spills. Chemical and hazardous wastes can potentially impact workers, members of the public, and the environment.

NextEra currently controls the use, storage, and discharge of chemicals and sanitary wastes at Point Beach in accordance with its chemical control procedures, waste management procedures, and Point Beach site-specific chemical spill prevention plans (NextEra 2020b). NextEra monitors and controls discharges of chemical and sanitary wastes through Point Beach’s WPDES permit process, discussed in Section 3.5.1.3 of this SEIS. These plant procedures, plans, and processes are designed to prevent and minimize the potential for a chemical or hazardous waste release and, in the event of such a release, minimize impact on workers, members of the public, and the environment.

3.11.3 Microbiological Hazards

Thermal effluents associated with nuclear power plants that discharge to a cooling pond or lake, such as Point Beach, have the potential to promote the growth of certain thermophilic microorganisms linked to adverse human health effects. Microorganisms of particular concern include several types of bacteria (*Legionella* species, *Salmonella* species, *Shigella* species, and *Pseudomonas aeruginosa*) and the free-living amoeba *Naegleria fowleri*.

The public can be exposed to the thermophilic microorganisms *Salmonella*, *Shigella*, *P. aeruginosa*, and *N. fowleri* during swimming, boating, or other recreational uses of freshwater. If these organisms are naturally occurring and a nuclear plant’s thermal effluent enhances their growth, the public could experience an elevated risk of infection when recreating in the affected waters.

Nuclear plant workers can be exposed to *Legionella* when performing cooling system maintenance through inhalation of cooling tower vapors because these vapors are often within the optimum temperature range for *Legionella* growth. Plant personnel most likely to come in contact with aerosolized *Legionella* are workers who clean and maintain cooling towers and condenser tubes. Public exposure to *Legionella* from nuclear plant operation is generally not a concern because exposure risk is confined to cooling towers and related components and equipment, which are typically within the protected area of the site and, therefore, not accessible to the public.

<u>Thermophilic Microorganisms of Concern</u>

Salmonella typhimurium and *S. enteritidis* are two species of enteric bacteria that cause salmonellosis, a disease more common in summer than winter. Salmonellosis is transmitted through contact with contaminated human or animal feces and may be spread through water transmission, contact with infected animals or food, or contamination in laboratory settings

(CDC 2015). These bacteria grow at temperatures ranging from 77 °F to 113 °F (25 °C to 45 °C), have an optimal growth temperature around human body temperature (98.6 °F (37°C)), and can survive extreme temperatures as low as 41 °F (5 °C) and as high as 122 °F (50 °C) (Oscar 2009). Research studies examining the persistence of *Salmonella* species outside of a host found that the bacteria can survive for several months in water and in aquatic sediments (Moore et al. 2003). The Centers for Disease Control and Prevention (CDC) reports no outbreaks or cases of waterborne *Salmonella* infection from recreational waters in the United States within the past 10 years (2010–2019) (CDC 2019a). All reported *Salmonella* outbreaks during this period were associated with contaminated foods, contact with contaminated domestic animals, or laboratory exposure (CDC 2019a).

Shigella species causes the infection shigellosis, which can be contracted through contact with contaminated food, water, or feces. When ingested, the bacteria release toxins that irritate the intestines. Like salmonellosis, shigellosis infections are more common in summer than in winter because the bacteria optimally grow at temperatures between 77 and 99 °F (25 and 37 °C) (PHAC 2011). Shigellosis outbreaks related to recreational uses of water are rare; almost all cases are related to food contamination.

Pseudomonas aeruginosa can be found in soil, hospital respirators, water, and sewage, and on the skin of healthy individuals. It is most commonly linked to infections transmitted in healthcare settings. Infections from exposure to *P. aeruginosa* in water can lead to the development of mild respiratory illnesses in healthy people. These bacteria optimally grow at 98.6 °F (37 °C) and can survive in high-temperature environments up to 107.6 °F (42 °C) (Todar 2004).

The free-living amoeba *N. fowleri* prefers warm freshwater habitats and is the causative agent of human primary amebic meningoencephalitis (PAM). Infections occur when *N. fowleri* penetrate the nasal tissue through direct contact with water in warm lakes, rivers, or hot springs and migrate to the brain tissues. This free-swimming amoeba species grows best at higher temperatures of up to 115 °F (46 °C) (CDC 2021). It is typically not present in waters below 95 °F (35 °C) (Tyndall et al. 1989). The *N. fowleri*-caused disease PAM is rare in the United States. From 1962–2019, the CDC reports an average of 2.5 cases of PAM annually nationwide.

Legionella is a genus of common warm water bacteria that occurs in lakes, ponds, and other surface waters, as well as some groundwater sources and soils. The bacteria thrive in aquatic environments as intracellular parasites of protozoa and are only pathogenic to humans when aerosolized and inhaled into the lungs. Approximately 2 to 5 percent of those exposed in this way develop an acute bacterial infection of the lungs known as Legionnaires' disease (Pearson 2003). Legionella optimally grow in stagnant surface waters containing biofilms or slimes that range in temperature from 95 to 113 °F (35 to 45 °C), although the bacteria can persist in waters from 68 to 122 °F (20 to 50 °C) (Pearson 2003). As such, human infection is often associated with complex water systems within buildings or structures, such as cooling towers (CDC 2016). Potential adverse health effects related to *Legionella* would generally not be of concern at Point Beach because the plant does not use cooling towers. The CDC issues biannual surveillance summary reports concerning Legionnaires' disease.[4]

[4] According to the most recently available data from the CDC, no cases within Wisconsin were attributable to cooling systems or other categories that could be attributable to nuclear plant operation. There were three *Escherichia coli* infection cases from waterborne pathogens in untreated recreational water (a reservoir setting) in Wisconsin over the period 2013–2014 (CDC 2014). No other cases have been documented since 2014.

Baseline Conditions in Lake Michigan

As described in Section 2.1.3 of this SEIS, Point Beach utilizes a once-through cooling system for both units drawing water from Lake Michigan with discharges by individual flumes for each unit. The surface water temperature of Lake Michigan can range from an average of 35 to 70 °F (1.7 to 21.1 °C) depending on year and season (see Figure 3.6-4 and Section 3.7.1.1 of NextEra 2020b; incorporated into this SEIS by reference). The average condenser discharge temperature generally does not exceed 85 °F (29.4 °C) in August according to data from the last 5 years of operation (Figure 3.6-5 of NextEra 2020b), with the highest reading of 87.7 °F (30.9 °C) for Unit 1 in August 2017 (NextEra 2018), and the highest average daily discharge temperature occurring in August 2019 at 88.8 °F (31.6 °C) (Section 3.10.1 of NextEra 2020b). Thermal effluent becomes well mixed with the receiving water body of Lake Michigan within a short distance from the shore. Thermal effluent temperatures quickly lower to a few degrees above the local water temperature by the time it reaches the edge of the security zone.

3.11.4 Electromagnetic Fields

Based on its evaluation in the license renewal GEIS (NUREG-1437, NRC 2013a), the NRC staff has not found electric shock resulting from direct access to energized conductors or from induced charges in metallic structures to be a problem at most operating plants. Generally, the staff also does not expect electric shock from such sources to be a human health hazard during the subsequent license renewal period. However, a site-specific review is required to determine the significance of the electric shock potential along the portions of the transmission lines that are within the scope of this SEIS. Transmission lines that are within the scope of the NRC's subsequent license renewal environmental review are limited to: (1) those transmission lines that connect the nuclear plant to the substation where electricity is fed into the regional distribution system and (2) those transmission lines that supply power to the nuclear plant from the grid (NRC 2013a).

As discussed in Section 2.1.6.5, "Power Transmission Systems," of this SEIS, the only transmission lines that are in scope for Point Beach subsequent license renewal are onsite. Specifically, there are two in-scope transmission lines. Both units are connected to the switchyard by two overhead 345 kilovolt (kV) transmission lines and are in compliance with National Electrical Safety Code (NESC) clearances (NextEra 2020b). Therefore, there is no potential shock hazard to offsite members of the public from these onsite transmission lines. As discussed in Section 3.11.5, "Other Hazards," of this SEIS, Point Beach maintains an occupational safety program, which includes protection from acute electrical shock and is in accordance with Occupational Safety and Health Administration (OSHA) regulations.

3.11.5 Other Hazards

This section addresses two additional human health hazards: (1) physical occupational hazards and (2) occupational electric shock hazards.

Nuclear power plants are industrial facilities that have many of the typical occupational hazards found at any other electric power generation utility. Nuclear power plant workers may perform electrical work, electric powerline maintenance, repair work, and maintenance activities and may be exposed to potentially hazardous physical conditions (e.g., falls, excessive heat, cold, noise, electric shock, and pressure).

OSHA is responsible for developing and enforcing workplace safety regulations. Congress created OSHA by enacting the Occupational Safety and Health Act of 1970, as amended (29 U.S.C. 651 et seq.) to safeguard the health of workers. With specific regard to nuclear power plants, plant conditions that result in an occupational risk, but do not affect the safety of licensed radioactive materials, are under the statutory authority of OSHA rather than the NRC as set forth in a memorandum of understanding (NRC 2013c) between the NRC and OSHA. Occupational hazards are reduced when workers adhere to safety standards and use appropriate protective equipment; however, fatalities and injuries from accidents may still occur. NextEra maintains an occupational safety program for its workers in accordance with OSHA regulations (NextEra 2020b). Based on an OSHA inspection in 2019 of all Point Beach occupational safety programs, OSHA recognized NextEra for continued participation in the OSHA's Voluntary Protection Program as a Star participant for achieving a level of worker protection that goes beyond compliance with government regulations (NextEra 2021a).

3.11.6 Proposed Action

According to the GEIS (NRC 1996 and NRC 2013a), the generic (Category 1) issues related to human health as identified in Table 3-1 would have SMALL impacts resulting from license renewal. As discussed in Section 3.11 above, the NRC staff identified no new and significant information for these issues. Thus, as concluded in the GEIS, the impacts of those generic issues related to human health would be SMALL.

Table 3-2 identifies one uncategorized issue (chronic effects of electromagnetic fields (EMFs)) and two site-specific (Category 2) issues (microbiological hazards to the public and electric shock hazards) related to human health applicable to Point Beach subsequent license renewal. These issues are analyzed below.

3.11.6.1 Category 2 Issue Related to Human Health: Microbiological Hazards to the Public

In the GEIS (NRC 2013a), the NRC staff determined that effects of thermophilic microorganisms on the public for plants using cooling ponds, lakes, or canals or cooling towers that discharge to a river is a Category 2 issue that requires site-specific evaluation during each license renewal review.

Based on the information presented in Section 3.11.3 of this SEIS, the thermophilic organisms most likely to be of potential concern in Lake Michigan are *N. fowleri*, a free-living amoeba that causes the infection PAM, and cyanobacteria, which can cause harmful algal blooms that can result in skin rash and gastrointestinal illnesses in exposed individuals. The public could be exposed to these microorganisms during swimming, boating, fishing, and other recreational uses of Lake Michigan. During its environmental review, the NRC staff identified no reported cases to the WDNR of cyanobacteria and related algal blooms along the shores of Lake Michigan.

As explained in Section 3.11.3, all other thermophilic microorganisms identified in the GEIS that may be associated with thermal effluents of nuclear plants are not specifically of concern at Point Beach or within Lake Michigan. These could include *Salmonella typhimurium, Shigella* species, *Pseudomonas aeruginosa*, and *Legionella* species.

<u>*Naegleria fowleri*</u>

As previously discussed, Point Beach's thermal effluent discharge is below *N. fowleri's* optimal growth temperature of 115 °F (46 °C). Thus, the Point Beach thermal discharges are not high enough in temperature to facilitate proliferation of this microorganism or to cause a public health concern. There have been no known occurrences of PAM from Lake Michigan, and the proposed action would not result in any operational changes that would affect thermal effluent temperature or otherwise create favorable conditions for *N. fowleri* growth. During the proposed subsequent license renewal term, the public health risk from *N. fowleri* exposure in Lake Michigan remains extremely low.

Conclusion

The thermophilic microorganisms *N. fowleri* can pose public health concerns in recreational-use waters when these organisms are present in high enough concentrations to cause infection. Based on the NRC staff's preceding analysis, continued thermal effluent discharges from Point Beach during the proposed subsequent license renewal term would not contribute to the proliferation in Lake Michigan of *N. fowleri*. No infections are known from Lake Michigan, and none are expected during the proposed subsequent license renewal term.

The NRC staff concludes that the impacts of thermophilic microorganisms on the public are SMALL for the proposed Point Beach subsequent license renewal.

3.11.6.2 Uncategorized Issue Related to Human Health: Chronic Effects of Electromagnetic Fields

The GEIS and the NRC's regulations (NRC 2013a; 10 CFR Part 51, Subpart A, Appendix B) do not designate the chronic effects of 60-hertz EMFs from powerlines as either a Category 1 or 2 issue. Until a scientific consensus is reached on the health implications of EMFs, the NRC will not include them as Category 1 or 2 issues.

The potential for chronic effects from EMFs continues to be studied and is not known at this time. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the U.S. Department of Energy (DOE). The NIEHS report (NIEHS 1999) contains the following conclusion:

> The NIEHS concludes that ELF-EMF (extremely low frequency-electromagnetic field) exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or noncancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

This statement was not sufficient to cause the NRC to change its position with respect to the chronic effects of EMFs. The NRC staff considers the GEIS finding of "UNCERTAIN" still appropriate and will continue to follow developments on this issue.

3.11.6.3 Category 2 Issue Related to Human Health: Electric Shock Hazards

Based on the GEIS (NRC 2013a), the NRC staff found that electric shock resulting from direct access to energized conductors or from induced charges in metallic structures has not been identified as a problem at most operating nuclear power plants and generally is not expected to be a problem during the license renewal term. However, a site-specific review is required to determine the significance of the electric shock potential along the portions of the transmission lines that are within the scope of the Point Beach subsequent license renewal review.

As discussed in Section 3.11.4 of this SEIS, there are no offsite transmission lines that are in scope for this SEIS. Therefore, there are no potential impacts on members of the public. There are two onsite overhead transmission lines with the potential for electric shock to workers through induced currents. To address this occupational hazard, NextEra adheres to NESC code for clearances and OSHA compliance requirements for shock hazard avoidance (NextEra 2020b). As discussed in Section 3.11.5, Point Beach maintains an occupational safety program in accordance with OSHA regulations for its workers, which includes protection from acute electric shock. Therefore, the NRC staff concludes that the potential impacts from electric shock hazards during the subsequent license renewal term would be SMALL.

3.11.6.4 Environmental Consequences of Postulated Accidents

The GEIS (NRC 2013a) evaluates the following two classes of postulated accidents as they relate to license renewal:

> Design-Basis Accidents: Postulated accidents that a nuclear facility must be designed and built to withstand without loss to the systems, structures, and components necessary to ensure public health and safety.

> Severe Accidents: Postulated accidents that are more severe than design-basis accidents because they could result in substantial damage to the reactor core.

As shown in Appendix B to Subpart A of 10 CFR Part 51 Table B-1, the GEIS (NRC 2013a) addresses design-basis accidents as a Category 1 (generic) issue and concludes that the environmental impacts of design-basis accidents are of SMALL significance for all nuclear power plants.

In Table B-1, the GEIS (NRC 2013a) designates severe accidents as a Category 2 issue that requires site-specific analysis. Based on information in the GEIS, the NRC determined in 10 CFR Part 51, Subpart A, Appendix B that for all nuclear power plants, the environmental impacts of severe accidents associated with license renewal are SMALL, with a caveat:

> The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are SMALL for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives. (NRC 2013a)

NextEra's 2004 environmental report submitted as part of its initial license renewal application for Point Beach included an assessment of severe accident mitigation alternatives (SAMAs) for Point Beach (NextEra 2004). The NRC staff at that time reviewed NextEra's 2004 analysis of SAMAs and documented this review in its SEIS for the initial license renewal, which the NRC published in 2005, as Supplement 23 to NUREG-1437 (NRC 2005a). Since the NRC staff has previously considered SAMAs for Point Beach, NextEra was not required to perform another SAMA analysis for its subsequent license renewal application (see 10 CFR 51.53(c)(3)(ii)(L)).

However, the NRC's regulations at 10 CFR Part 51, which implement Section 102(2) of NEPA, require that all applicants for license renewal submit an environmental report to the NRC and in that report identify "any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware" (10 CFR 51.53(c)(3)(iv)). This includes new and significant information that could affect the environmental impacts related to postulated severe accidents or that could affect the results of a previous SAMA assessment. Accordingly, in its subsequent license renewal application environmental report (NextEra 2020b), NextEra evaluated areas of new and potentially significant information that could affect the environmental impact of postulated severe accidents during the subsequent license renewal period. The NRC staff provides a discussion of new information pertaining to SAMAs in Appendix F, "Environmental Impacts of Postulated Accidents," of this SEIS.

Based on the NRC staff's review and evaluation of NextEra's analysis of new and potentially significant information regarding SAMAs and the staff's independent analyses as documented in Appendix F of this SEIS, the staff concludes that there is no new and significant information for Point Beach related to SAMAs.

3.11.7 No-Action Alternative

Under the no-action alternative, the NRC would not issue subsequent renewed licenses, and Point Beach would permanently shut down on or before the expiration of the current renewed licenses. Human health risks would be smaller following plant shutdown. The reactor units, which currently operate within regulatory limits, would emit less radioactive gaseous, liquid, and solid material to the environment. In addition, following shutdown, the variety of potential accidents at the plant (radiological or industrial) would be reduced to a limited set associated with shutdown events and fuel handling and storage. In Section 3.11.6, “Proposed Action,” of this SEIS, the NRC staff concluded that the impacts of continued plant operation on human health would be SMALL, except for “chronic effects of electromagnetic fields,” for which the impacts are UNCERTAIN. In Section 3.11.6.4, “Environmental Consequences of Postulated Accidents,” the NRC staff concluded that the impacts of accidents during operation are SMALL. Therefore, as radioactive emissions to the environment decrease, and as the likelihood and types of accidents decrease following shutdown, the NRC staff concludes that the risk to human health following plant shutdown (i.e., the no-action alternative) would be SMALL.

3.11.8 Replacement Power Alternatives: Common Impacts

Impacts on human health from construction of a replacement power station would be similar to impacts associated with the construction of any major industrial facility. Compliance with worker protection rules, the use of personal protective equipment, training, and placement of engineered barriers would limit those impacts on workers to acceptable levels.

The human health impacts from the operation of a power station include public risk from inhalation of gaseous emissions. Regulatory agencies, including the EPA and State of Wisconsin agencies, base air emission standards and requirements on human health impacts. These agencies also impose site-specific emission limits to protect human health.

3.11.9 New Nuclear (Small Modular Reactor) Alternative

The construction impacts of the new nuclear alternative would include those identified in Section 3.11.8 of this SEIS. Because the NRC staff expects that the licensee would limit access to active construction areas to only authorized individuals, the impacts on human health from the construction of three new SMR modules would be SMALL.

The human health effects from the operation of the new nuclear alternative would be similar to those of operating the existing Point Beach Units 1 and 2. Small modular reactor designs would use the same type of fuel (i.e., form of the fuel, enrichment, burnup, and fuel cladding) as those plants considered in the NRC staff’s evaluation in the GEIS (NRC 2013a). As such, their impacts would be similar to Point Beach. As presented in Section 3.11.6, impacts on human health from the operation of Point Beach would be SMALL, except for “chronic effects of electromagnetic fields,” for which the impacts are UNCERTAIN. Therefore, the NRC staff concludes that the impacts on human health from the operation of the new nuclear alternative would be SMALL.

3.11.10 Natural Gas Combined-Cycle Alternative

The construction impacts of the NGCC alternative would include those identified in Section 3.11.8 of this SEIS. Because the NRC staff expects that the licensee would limit access to active construction areas to only authorized individuals, the impacts on human health from the construction of an NGCC facility would be SMALL.

The human health effects from the operation of the NGCC alternative would include those identified in Section 3.11.8 as common to the operation of all replacement power alternatives. Health risk may be attributable to nitrogen oxide emissions that contribute to ozone formation (NRC 2013a). Given the regulatory oversight exercised by the EPA and state agencies, the NRC staff concludes that the human health impacts from the NGCC alternative would be SMALL, except for "chronic effects of electromagnetic fields," for which the impacts are UNCERTAIN. Therefore, the NRC staff concludes that the impacts on human health from the operation of the NGCC alternative would be SMALL.

3.11.11 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

Impacts on human health from construction of the combination alternative would include those identified in Section 3.11.8 of this SEIS as common to the construction of all replacement power alternatives. Since the NRC staff expects that the builder will limit access to the active construction area to only authorized individuals, the impacts on human health from the construction of the combination alternative would be SMALL.

The human health effects from the operation of the SMR portion of the combination alternative would be similar to those of operating the existing Point Beach Units 1 and 2. Small modular reactor designs would use the same type of fuel (i.e., form of the fuel, enrichment, burnup, and fuel cladding) as those plants considered in the NRC staff's evaluation in the GEIS (NRC 2013a). As such, their impacts would be similar to Point Beach. As presented in Section 3.11.9, the "chronic effects of electromagnetic fields," impacts for the SMR are UNCERTAIN. Therefore, the NRC staff concludes that the impacts on human health from the operation of the SMR portion of the combination alternative would be SMALL.

Solar PV panels are encased in heavy-duty glass or plastic. Therefore, there is little risk that the small amounts of hazardous semiconductor material that they contain would be released into the environment. In the event of a fire, hazardous particulate matter could be released to the atmosphere. Given the short duration of fires and the high melting points of the materials found in the solar PV panels, the impacts from inhalation are minimal. Also, the risk of fire at ground-mounted solar installations is minimal due to precautions taken during site preparation, such as the removal of fuels and the lack of burnable materials contained in the solar PV panels. Another potential risk associated with PV systems and fire is the potential for shock or electrocution from contact with a high-voltage conductor. Proper procedures and clear marking of system components should be used to provide emergency responders with appropriate warnings to diminish the risk of shock or electrocution (OIPP 2010). Solar PV panels do not produce EMFs at levels considered harmful to human health, as established by the International Commission on Non-Ionizing Radiation Protection. These small EMFs diminish significantly with distance and are indistinguishable from normal background levels within several yards (OIPP 2010). Based on this information, the NRC staff concludes that the human health impacts from the operation of the solar PV portion of the combination alternative would be SMALL.

Operational hazards at a wind facility for the workforce include working at heights, working near rotating mechanical or electrically energized equipment, and working in extreme weather. Adherence to safety standards and the use of appropriate protective equipment through implementation of an OSHA-approved worker safety program would minimize occupational hazards. Potential impacts on workers and the public include ice thrown from rotor blades and broken blades thrown as a result of mechanical failure. Adherence to proper worker safety procedures and limiting public access to wind turbine sites would minimize the impacts from thrown ice and broken rotor blades. Potential impacts also include EMF exposure, aviation safety hazards, and exposure to noise and vibration from the rotating blades. Impacts from

EMF exposure would be minimized by adherence to proper worker safety procedures and limiting public access to any components that could create an EMF. Aviation safety hazards would be minimized by proper siting of the wind turbine facilities and maintaining all proper safety warning devices, such as indicator lights, for pilot visibility. The NRC staff has identified no epidemiologic studies on noise and vibration from wind turbines that would suggest any direct human health impact. Based on this information, the NRC staff concludes that the human health impacts from the operation of the wind portion of the combination alternative would be SMALL.

Therefore, given the expected compliance with worker and environmental protection rules and the use of personal protective equipment, training, and engineered barriers, the NRC staff concludes that the potential human health impacts for the combination alternative would be SMALL.

3.12 Environmental Justice

Under EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (59 FR 7629), Federal agencies are responsible for identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of agency actions on minority and low-income populations. Independent agencies, such as the NRC, are not bound by the terms of EO 12898 but are "requested to comply with the provisions of [the] order." In 2004, the Commission issued the agency's "Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions" (69 FR 52040), which states that "The Commission is committed to the general goals set forth in E.O. 12898, and strives to meet those goals as part of its NEPA review process."

The following information is adapted from the Council on Environmental Quality (CEQ) "Environmental Justice: Guidance Under the National Environmental Policy Act" (CEQ 1997).

Disproportionately High and Adverse Human Health Effects

Adverse health effects are measured in risks and rates that could result in latent cancer fatalities, as well as other fatal or nonfatal adverse impacts on human health. Adverse health effects may include bodily impairment, infirmity, illness, or death. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant (as employed by NEPA) and appreciably exceeds the risk or exposure rate for the general population or for other appropriate comparison group (CEQ 1997).

Disproportionately High and Adverse Environmental Effects

A disproportionately high environmental impact that is significant (as employed by NEPA) refers to an impact or risk of an impact on the natural or physical environment in a low-income or minority community that appreciably exceeds the environmental impact on the larger community. Such effects may include ecological, cultural, human health, economic, or social impacts. An adverse environmental impact is an impact that is determined to be both harmful and significant (as employed by NEPA). In assessing cultural and aesthetic environmental impacts, impacts that uniquely affect geographically dislocated or dispersed minority or low-income populations or American Indian Tribes are considered (CEQ 1997).

This environmental justice analysis assesses the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations that could result from the continued operation of Point Beach associated with the proposed action (subsequent license renewal) and alternatives to the proposed action. In assessing the impacts, the following definitions of minority individuals, minority populations, and low-income population were used (CEQ 1997):

Minority Individuals

Individuals who identify themselves as members of the following population groups: Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, or two or more races, meaning individuals who identified themselves on a Census form as being a member of two or more races, for example, White and Asian.

Minority Populations

Minority populations are identified when (1) the minority population of an affected area exceeds 50 percent or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

Low-income Population

Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the U.S. Census Bureau's (USCB's) Current Population Reports, Series P60, on Income and Poverty.

Minority Population

According to the USCB's 2010 Census data, approximately 12 percent of the population residing within a 50-mi (80-km) radius of Point Beach identified themselves as minority individuals. The largest minority populations were Hispanic, Latino, or Spanish origin of any race (approximately 5 percent), and Asian (approximately 3 percent) (MCDC 2021).

According to the CEQ definition, a minority population exists if the percentage of the minority population of an area (e.g., census block group) exceeds 50 percent or is meaningfully greater than the minority population percentage in the general population. The NRC staff's environmental justice analysis applied the meaningfully greater threshold in identifying higher concentrations of minority populations; the meaningfully greater threshold is any percentage greater than the minority population within the 50-mi (80-km) radius. Therefore, for the purposes of identifying higher concentrations of minority populations, census block groups within the 50-mi (80-km) radius of Point Beach were identified as minority population block groups if the percentage of the minority population in the block group exceeded 12 percent, the percent of the minority population within the 50-mi (80-km) radius of Point Beach.

As shown in Figure 3-10, high population minority block groups (race and ethnicity) are predominantly clustered northwest and west in the cities of Green Bay and Appleton, respectively. The nearest minority block groups are clustered south-southwest of Point Beach in the city of Manitowoc, WI. Based on this analysis, Point Beach Units 1 and 2 are not located in a minority population block group. The Oneida Nation has Tribal lands located southwest of the city of Green Bay in Outagamie and Brown counties.

According to 2010 Census data, minority populations in the socioeconomic region of influence (Brown and Manitowoc counties) comprised 14 percent of the total two-county population (Table 3-26). Figure 3-10 shows predominantly minority population block groups, using 2010 Census data for race and ethnicity, within a 50-mi (80-km) radius of Point Beach.

According to the USCB's 2019 American Community Survey 1-Year Estimates (USCB 2021), since 2010, minority populations in the region of influence increased by nearly 14,000 persons and now comprise approximately 18 percent of the population (Table 3-27).

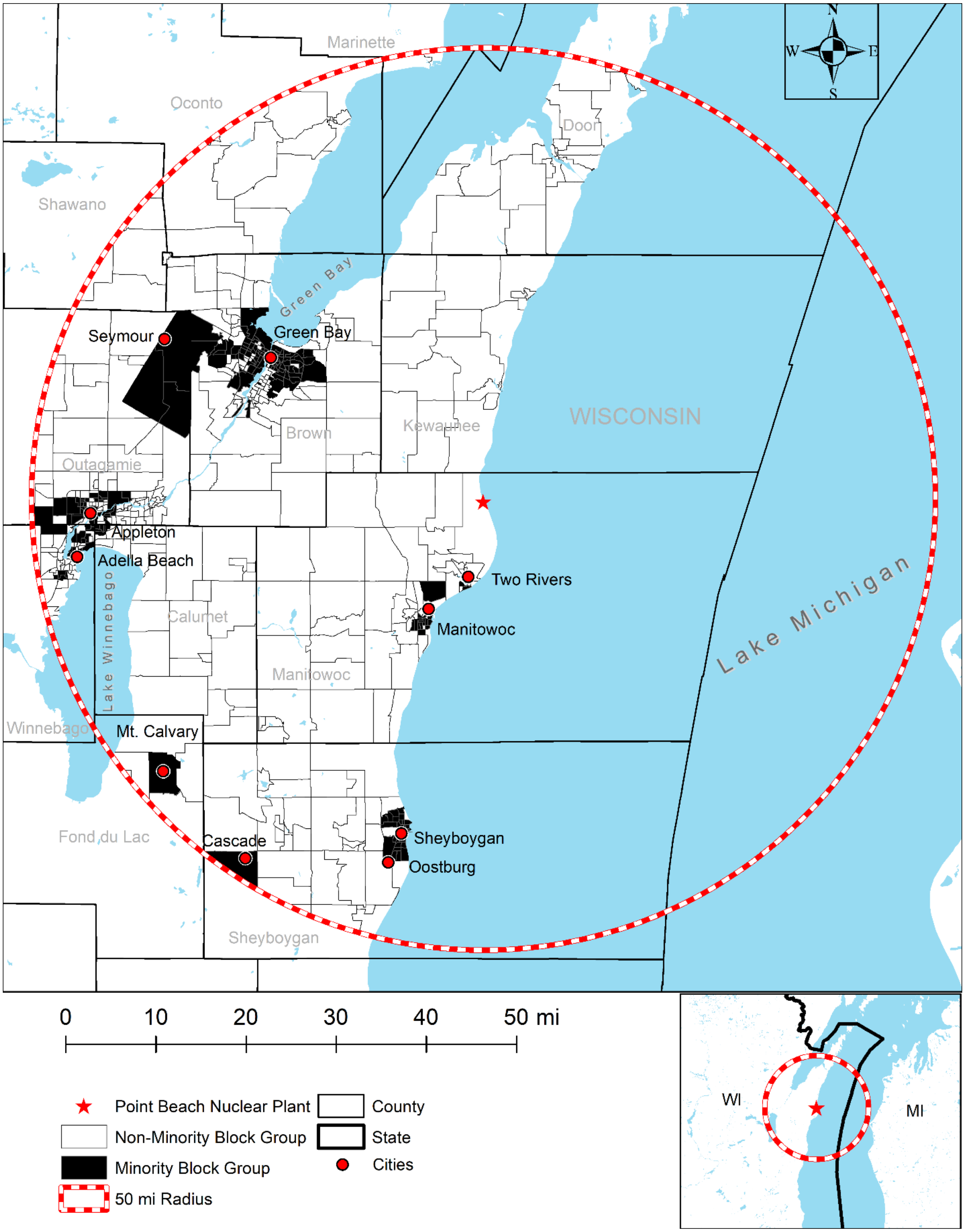
Low-Income Population

The USCB's 2015–2019 American Community Survey (ACS) data identify approximately 9 percent of individuals and 6 percent of families residing within a 50-mi (80-km) radius of Point Beach as living below the Federal poverty threshold in 2019 (MCDC 2021). The 2019 Federal poverty threshold was $26,172 for a family of four (USCB 2021).

Figure 3-11 shows the location of low-income block groups within a 50-mi (80-km) radius of Point Beach. Census block groups were considered low-income population block groups if the percentage of individuals living below the Federal poverty threshold within the block group exceeded 9 percent, the percent of the individuals living below the Federal poverty threshold within the 50-mi (80-km) radius of Point Beach.

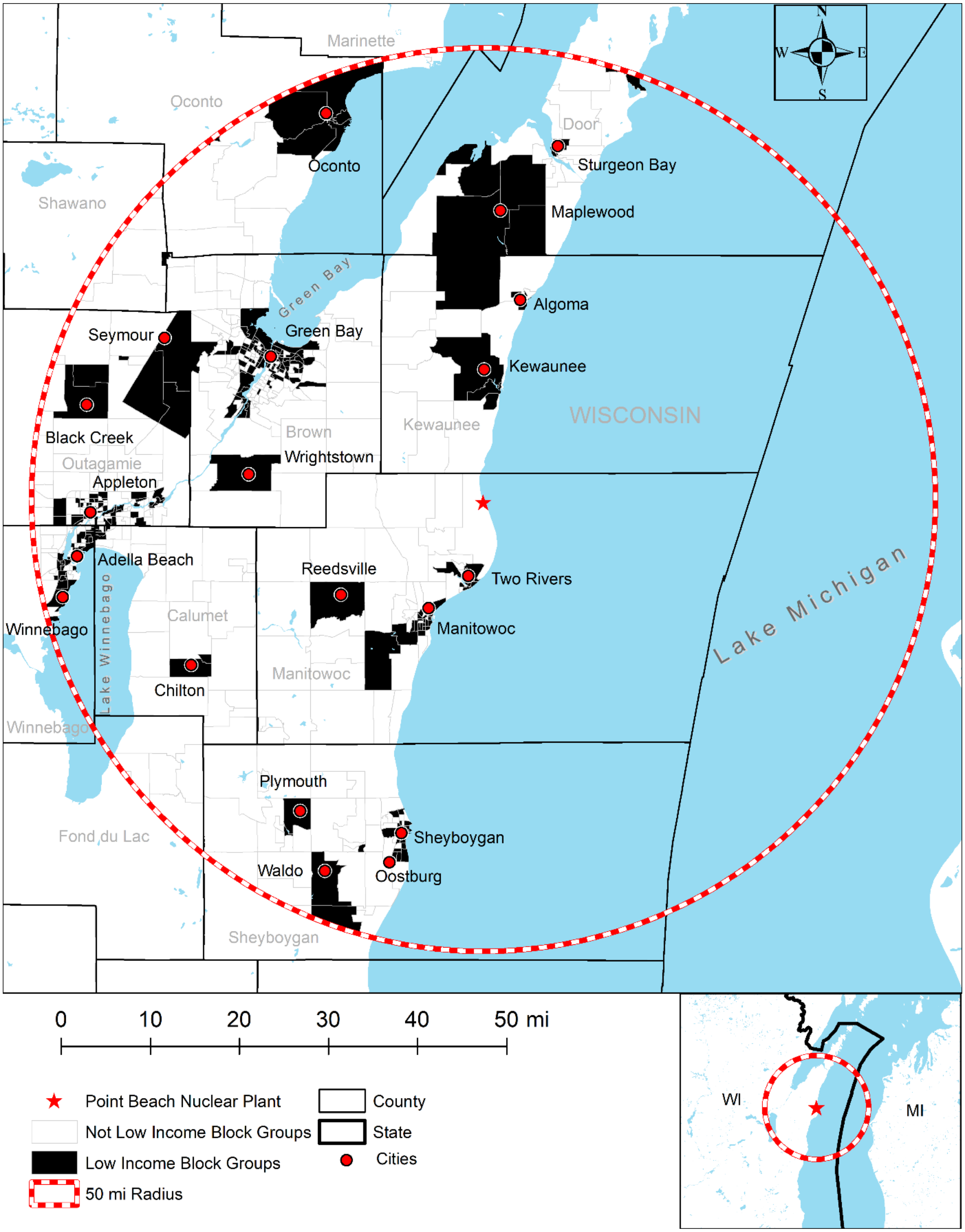
As shown in Figure 3-11, low-income block groups are predominantly clustered northwest and west in the cities of Green Bay and Appleton, respectively. The nearest low-income block groups is located south of Point Beach in the city of Two Rivers, WI. Based on this analysis, Point Beach is not located in a low-income population block group.

According to the USCB's 2019 American Community Survey 1-Year Estimates, 6.2 percent of families and 10.4 percent of people in Wisconsin were living below the Federal poverty threshold and the median household and per capita incomes for Wisconsin were $64,168 and $34,568, respectively (USCB 2021). In the socioeconomic region of influence, people living in Manitowoc County have a lower median household and per capita incomes ($60,785 and $32,054, respectively), with lower percentages of families and people (5.0 percent and 8.7 percent, respectively) living below the poverty level. People living in Brown County have a slightly higher median household ($64,458) and lower per capita incomes ($33,546), with lower percentages of families and people (5.9 percent and 10.3 percent, respectively) living below the poverty level (USCB 2021).



Source: USCB 2021.

Figure 3-10 2010 Census—Minority Block Groups Within a 50-mi (80-km) Radius of Point Beach



Source: USCB 2021

Figure 3-11 2014–2018, American Community Survey 5-Year Estimates—Low-Income Block Groups Within a 50-mi (80-km) Radius of Point Beach

3.12.1 Proposed Action

The NRC addresses environmental justice matters for license renewal by (1) identifying the location of minority and low-income populations that may be affected by the continued operation of the nuclear power plant during the license renewal term, (2) determining whether there would be any potential human health or environmental effects to these populations and special pathway receptors (groups or individuals with unique consumption practices and interactions with the environment), and (3) determining whether any of the effects may be disproportionately high and adverse. Adverse health effects are measured in terms of the risk and rate of fatal or nonfatal adverse impacts on human health. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risks of impacts on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts.

Figures 3-10 and 3-11 show the locations of the minority and low-income population block groups within a 50-mi (80-km) radius of Point Beach. This area of impact is consistent with the 50-mi (80-km) impact analysis for public and occupational health and safety. This chapter of the SEIS presents the assessment of environmental and human health impacts for each resource area. The analyses of impacts for all environmental resource areas indicated that the impact from subsequent license renewal would be SMALL.

Potential impacts on minority and low-income populations (including migrant workers or Native Americans) would mostly consist of socioeconomic and radiological effects; however, radiation doses from continued operations during the subsequent license renewal term are expected to continue at current levels, and they would remain within regulatory limits. Section 3.11.6.4 of this SEIS discusses the environmental impacts from postulated accidents that might occur during the subsequent license renewal term, which include both design-basis and severe accidents. In both cases, the NRC has generically determined that impacts associated with design-basis accidents are small because nuclear plants are designed and operated to withstand such accidents, and the probability-weighted consequences of severe accidents are small.

Therefore, based on this information and the analysis of human health and environmental impacts presented in this chapter, there would be no disproportionately high and adverse human health and environmental effects on minority and low-income populations from the proposed Point Beach subsequent license renewal.

Subsistence Consumption of Fish and Wildlife

As part of addressing environmental justice concerns associated with license renewal, the NRC also assesses the potential radiological risk to special population groups (such as migrant workers or Native Americans) from exposure to radioactive material received through their unique consumption practices and interactions with the environment, including the subsistence consumption of fish and wildlife; native vegetation; contact with surface waters, sediments, and local produce; absorption of contaminants in sediments through the skin; and inhalation of airborne radioactive material released from the plant during routine operation. The special pathway receptors analysis is an important part of the environmental justice analysis because consumption patterns may reflect the traditional or cultural practices of minority and low-income populations in the area, such as migrant workers or Native Americans. The results of this analysis related to the proposed Point Beach subsequent license renewal are presented here.

Section 4-4 of EO 12898 directs Federal agencies, whenever practical and appropriate, to collect and analyze information about the consumption patterns of populations that rely principally on fish and wildlife for subsistence and to communicate the risks of these consumption patterns to the public. In this SEIS, the NRC staff considered whether there were any means for minority or low-income populations to be disproportionately affected by examining impacts on Native Americans, Hispanics, migrant workers, and other traditional lifestyle special pathway receptors. The assessment of special pathways considered the levels of radiological and nonradiological contaminants in fish, sediments, water, milk, and food products on or near Point Beach.

Radionuclides released to the atmosphere may deposit on soil and vegetation and may therefore eventually be incorporated into the human food chain. To assess the impact of reactor operations on humans from the ingestion pathway, NextEra collects and analyzes samples of air, water, milk, soil, shoreline sediment, aquatic biota, leafy vegetation (grasses, weeds, and crops), fish samples, and direct exposure for radioactivity as part of its ongoing comprehensive radiological environmental monitoring program.

To assess the impact of nuclear power plant operations, samples are collected annually from the environment and analyzed for radioactivity. A plant effect would be indicated if the radioactive material detected in a sample was higher than background levels. Two types of samples are collected. The first type, a control sample, is collected from areas beyond the influence of the nuclear power plant or any other nuclear facility. These control samples are used as reference data to determine normal background levels of radiation in the environment. The second type of samples, indicator samples, are collected near the nuclear power plant from areas where any radioactivity contribution from the nuclear power plant will be at its highest concentration. These indicator samples are then compared to the control samples, to evaluate the contribution of nuclear power plant operations to radiation or radioactivity levels in the environment. An effect would be indicated if the radioactivity levels detected in an indicator sample were larger or higher than the control sample or background levels.

NextEra collects samples from the aquatic and terrestrial environment near Point Beach. The aquatic environment includes precipitation, surface, lake, and well water, shoreline sediments, algae, and fish from Lake Michigan. Aquatic monitoring results for 2019 showed only naturally occurring radioactivity and radioactivity associated with fallout from past atmospheric nuclear weapons testing and were consistent with levels measured before Point Beach began operating. NextEra detected no radioactivity greater than the minimum detectable activity in any aquatic sample during 2019, and identified no adverse long-term trends in aquatic monitoring data (NextEra 2020e).

The terrestrial environment includes airborne particulates, food products (milk, corn, hay, alfalfa, and soybeans), and other vegetation. Terrestrial monitoring results for 2019 showed only naturally occurring radioactivity. The radioactivity levels detected were consistent with levels measured prior to the operation of Point Beach. NextEra detected no radioactivity greater than the minimum detectable activity in any terrestrial samples during 2019. The terrestrial monitoring data also showed no adverse trends in the terrestrial environment (NextEra 2020e).

Analyses performed on all samples collected from the environment at Point Beach, in 2019, showed no significant measurable radiological constituent above background levels. Overall, radioactivity levels, detected in 2019, were consistent with previous levels as well as radioactivity levels measured prior to the operation of Point Beach. Radiological environmental monitoring program sampling in 2019 did not identify any radioactivity above background or the minimum detectable activity (NextEra 2020e).

The Radiation Protection Unit of the Wisconsin Department of Health and Family Services maintains a radiological environmental monitoring program to confirm the results from the Point Beach program. As a courtesy to the state of Wisconsin, NextEra collects samples for the State from sites near or co-located with Point Beach sampling locations (NextEra 2020e).

Based on the radiological environmental monitoring data, the NRC staff concludes that disproportionately high and adverse human health impacts are not expected in special pathway receptor populations in the region because of subsistence consumption of water, local food, fish, or wildlife. In addition, the continued operation of Point Beach would not have disproportionately high and adverse human health and environmental effects on these populations.

3.12.2 No-Action Alternative

Under the no-action alternative, the NRC would not renew the operating licenses, and Point Beach Units 1 and 2 would permanently shut down on or before the expiration of the current renewed facility operating licenses. Impacts on minority and low-income populations would depend on the number of jobs and the amount of tax revenues lost in communities located near the power plant after reactor operations cease. Not renewing the operating licenses and terminating reactor operations could have a noticeable impact on socioeconomic conditions in the communities located near Point Beach. The loss of jobs and income could have an immediate socioeconomic impact.

Some, but not all, of the approximately 700 workers could leave the area. In addition, less tax revenue could reduce the availability of public services. This could disproportionately affect minority and low-income populations that may have become dependent on these services. See also Appendix J, "Socioeconomics and Environmental Justice Impacts Related to the Decision to Permanently Cease Operations," of the decommissioning GEIS (NUREG-0586) (NRC 2002a) for additional discussion of these impacts.

3.12.3 Replacement Power Alternatives: Common Impacts

<u>Construction</u>

Potential impacts to minority and low-income populations from the construction of a replacement power plant would mostly consist of environmental and socioeconomic effects (e.g., noise, dust, traffic, employment, and housing impacts). The extent of the effects experienced by these populations is difficult to determine because it would depend on the location of the power plant and affected transportation routes. Noise and dust impacts from construction would be short term and primarily limited to onsite activities. Minority and low-income populations residing on site access roads would be affected by increased truck and commuter vehicle traffic during construction, especially during shift changes. However, these effects would be temporary, limited to certain hours of the day, and would not likely be high and adverse. Increased demand for temporary housing during construction could disproportionately affect low-income populations reliant on low-cost rental housing. However, given the proximity of Point Beach to the Green Bay metropolitan area, construction workers could commute to the site, thereby reducing the potential demand for rental housing.

Operations

Low-income populations living near the new power plant that rely on subsistence consumption of fish and wildlife could be disproportionately affected. In addition, emissions during power plant operations could disproportionately affect nearby minority and low-income populations, depending on the type of replacement power. However, air emissions are expected to remain within regulatory permitted standards and limits during power plant operations.

Conclusion

Based on this information and the analysis of human health and environmental impacts presented in this SEIS, it is unlikely that a replacement power plant would be constructed and allowed to operate in a manner that would result in disproportionately high and adverse human health and environmental effects on minority and low-income populations. However, this determination would depend on the location, plant design, and operational characteristics of the replacement power plant. Therefore, the NRC cannot determine whether a replacement power alternative would result in disproportionately high and adverse human health and environmental effects on minority and low-income populations.

3.12.4 New Nuclear (Small Modular Reactor) Alternative

Potential impacts to minority and low-income populations during the construction of the new nuclear alternative would be similar to the construction impacts described above in Section 3.12.3. Similarly, potential impacts during power plant operations would mostly consist of radiological emissions; however, to operate, radiation doses must remain within regulatory limits.

3.12.5 Natural Gas Combined-Cycle Alternative

Potential impacts to minority and low-income populations from the construction and operation of the natural gas combined-cycle alternative would be the similar to the construction and operation impacts described above in Section 3.12.3.

3.12.6 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

Potential impacts to minority and low-income populations from the construction and operation of the combination alternative would be similar to the construction and operation impacts described above in Section 3.12.3. Potential impacts during nuclear power plant operations would mostly consist of radiological emissions; however, to operate, radiation doses must remain within regulatory limits.

3.13 Waste Management and Pollution Prevention

Like any operating nuclear power plant, Point Beach will produce both radioactive and nonradioactive waste during the subsequent license renewal period. This section describes waste management and pollution prevention at Point Beach. The description of these waste management activities is followed by the NRC staff’s analysis of the potential impacts of waste management activities from the proposed action (subsequent license renewal) and alternatives to the proposed action.

3.13.1 Radioactive Waste

As discussed in Section 2.1.4, “Radioactive Waste Management Systems,” of this SEIS, Point Beach uses liquid, gaseous, and solid waste processing systems to collect and treat, as needed, radioactive materials produced as a byproduct of plant operations. Each of the liquid, gaseous, and solid waste disposal systems is designed to serve both reactor units. Radioactive materials in liquid, gaseous, and solid effluents are reduced before being released into the environment so that the resultant dose to members of the public from these effluents is well within the NRC and EPA dose standards. Radionuclides that can be efficiently removed from the liquid and gaseous effluents before release are converted to a solid waste form for disposal in a licensed disposal facility.

3.13.2 Nonradioactive Waste

Waste minimization and pollution prevention are important elements of operations at all nuclear power plants. Licensees are required to consider pollution prevention measures as dictated by the Pollution Prevention Act (Public Law 101-5084) and the Resource Conservation and Recovery Act of 1976, as amended (Public Law 94-580) (NRC 2013a).

The Resource Conservation and Recovery Act (RCRA) governs the disposal of solid waste. The WDNR regulates solid and hazardous waste in Wisconsin. As described in Section 2.1.5, “Nonradioactive Waste Management System,” of this SEIS, Point Beach has a nonradioactive waste management program to handle nonradioactive waste in accordance with Federal, State, and corporate regulations and procedures. Point Beach maintains a waste minimization program that uses material control, process control, waste management, recycling, and feedback to reduce waste.

The Point Beach SWPPP identifies potential sources of pollution that may affect the quality of stormwater discharges from permitted outfalls. The SWPPP also describes BMPs for reducing pollutants in stormwater discharges and assuring compliance with the site’s NPDES permit.

Point Beach also has an environmental management system (NextEra 2020b). Procedures are in place to monitor areas within the site that have the potential to discharge oil into or upon navigable waters, in accordance with the regulations in 40 CFR Part 112, “Oil Pollution Prevention.” The Pollution Incident/Hazardous Substance Spill Procedure identifies and describes the procedures, materials, equipment, and facilities that NextEra uses to minimize the frequency and severity of oil spills at Point Beach.

Point Beach is subject to the EPA reporting requirements in 40 CFR Part 110, “Discharge of Oil,” under CWA Section 311(b)(4). Under these regulations, Point Beach must report to the National Response Center any discharges of oil if the quantity may be harmful to the public health or welfare or to the environment. Based on the NRC staff’s review of Section E9.5.3.6 of the ER (NextEra 2020b) and a review of records from 2015–2019, no spills reportable under 40 CFR Part 110 occurred. In addition, the applicant confirmed that no reportable spills have triggered this notification requirement since the ER was written (NextEra 2021a).

Point Beach is also subject to the reporting provisions of the Wisconsin Statute 292.11 and Wisconsin Administrative Code Ch. NR 706. This reporting provision requires that any release of oil in a quantity of 1 gallon of gasoline or more than 5 gallons of petroleum product other than gasoline that spills onto a pervious surface or runs off an impervious surface must be reported to the WDNR, the coordinator of emergency services of the locality that could reasonably be expected to be impacted, and appropriate Federal authorities. Based on the NRC staff’s review of Section E9.5.3.7 of the ER (NextEra 2020b) and a review of records from 2015–2019, no reportable spills under the Wisconsin Statute 292.11 and Wisconsin Administrative Code

Ch. NR 706 occurred. In addition, the applicant confirmed that there have been no reportable spills that would trigger this notification requirement since the ER was written (NextEra 2021a).

3.13.3 Proposed Action

According to the GEIS (NRC 1996, NRC 2013a), the generic issues related to waste management as identified in Table 3-1 would not be affected by continued operations associated with license renewal. As discussed in Chapter 3 of this SEIS, the NRC staff identified no new and significant information for these issues. Thus, as concluded in the GEIS, the impacts of those generic issues related to waste management would be SMALL.

As shown in Table 3-2, the NRC staff did not identify any Point Beach site-specific (Category 2) waste management issues resulting from issuing a subsequent renewed license for an additional 20 years of operations.

3.13.4 No-Action Alternative

Under the no-action alternative, Point Beach would permanently cease operation on or before the end of the term of the current renewed operating licenses and enter decommissioning. After shutdown, the plant would generate less spent nuclear fuel, emit less gaseous and liquid radioactive effluents into the environment, and generate less low-level radioactive and nonradioactive wastes. In addition, following shutdown, the variety of potential accidents at the plant (radiological and industrial) would be reduced to a limited set associated with shutdown events and fuel handling and storage. Therefore, as radioactive emissions to the environment decrease and the likelihood and variety of accidents decrease following shutdown, the NRC staff concludes that impacts resulting from waste management from implementation of the no-action alternative would be SMALL.

3.13.5 Replacement Power Alternatives: Common Impacts

Impacts from waste management common to all analyzed replacement power alternatives would be from construction-related nonradiological debris generated during construction activities. This waste would be recycled or disposed of in approved landfills.

3.13.6 New Nuclear (Small Modular Reactor) Alternative

Impacts from the waste generated during the construction of the new nuclear alternative would include those identified in Section 3.13.5 of this SEIS as common to all replacement power alternatives.

During normal plant operations, routine plant maintenance and cleaning activities would generate radioactive low-level waste, spent nuclear fuel, high-level waste, and nonradioactive waste. Sections 2.1.4 and 2.1.5 of this SEIS discuss radioactive and nonradioactive waste management, respectively, at Point Beach. Small modular reactor designs would use the same type of fuel (i.e., form of the fuel, enrichment, burnup, and fuel cladding) as those plants considered in the NRC staff’s evaluation in the GEIS (NRC 2013a), and as such, all wastes generated would be similar to those generated at Point Beach. According to the GEIS, the NRC does not expect the generation and management of solid radioactive and nonradioactive waste during the subsequent license renewal term to result in significant environmental impacts. Based on this information, the NRC staff concludes that the waste impacts for the new nuclear alternative would be SMALL.

3.13.7 Natural Gas Combined-Cycle Alternative

Impacts from the waste generated during the construction of the natural gas combined-cycle alternative would include those identified in Section 3.13.5 of this SEIS as common to all replacement power alternatives.

Waste generation from natural gas technology would be minimal. The only significant waste generated at a natural gas combined-cycle power plant would be spent selective catalytic reduction catalyst (plants use selective catalytic reduction catalyst to control nitrogen oxide emissions).

The spent catalyst would be regenerated or disposed of offsite. Other than the spent selective catalytic reduction catalyst, waste generation at an operating natural gas-fired plant would be limited largely to typical operations and maintenance of nonhazardous waste. Based on this information, the NRC staff concludes that the waste impacts for the natural gas combined-cycle alternative would be SMALL.

3.13.8 Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

Impacts from the waste generated during the construction of the combination alternative would include those identified in Section 3.13.5 of this SEIS as common to all replacement power alternatives.

Waste generation associated with construction and operation of the new nuclear portion of the combination alternative would be similar to, but less than, those associated with the new nuclear alternative discussed in Section 3.13.6. This is because the SMR portion of the combination alternative would entail construction and operation of two (as opposed to three) 400 megawatt electrical plants.

The construction of the solar PV portion of the combination alternative would create sanitary and industrial waste. This waste could be recycled or shipped to an offsite waste disposal facility. All of the waste would be handled in accordance with appropriate WDNR regulations. Impacts on waste management resulting from the construction and operation of the solar PV portion would be minimal, and of a smaller quantity as compared to the new nuclear alternative. In summary, the waste management impacts resulting from the construction and operation of the solar PV portion would be SMALL.

During construction of onshore wind facilities as part of the combination alternative, waste materials or the accidental release of fuels are expected to be negligible because of the very limited amount of traffic and construction activity that might occur with construction, installation, operation, and decommissioning of onshore turbine generators. Therefore, the waste management impacts resulting from the construction and operation of the onshore wind portion would be SMALL.

Based on the above, the NRC staff concludes that the waste impacts for the combination alternative would be SMALL.

3.14 <u>Evaluation of New and Significant Information</u>

As stated in Section 3.1 of this SEIS, for Category 1 (generic) issues, the NRC staff can rely on the analysis in the GEIS (NRC 2013a) unless otherwise noted. Table 3-1 lists the Category 1 issues that apply to Point Beach during the proposed subsequent license renewal period. For these issues, the NRC staff did not identify any new and significant information based on its review of the applicant's ER, the environmental site audits, the review of available information as cited in this SEIS, or arising through the environmental scoping process, that would change the conclusions presented in the GEIS.

New and significant information must be new, based on a review of the GEIS (NRC 2013a), as codified in Table B-1 of Appendix B to Subpart A of 10 CFR Part 51. Such information must also bear on the proposed action or its impacts, presenting a seriously different picture of the impacts from those envisioned in the GEIS (i.e., impacts of greater severity than impacts considered in the GEIS, considering their intensity and context).

The NRC defines new and significant information in Regulatory Guide 4.2, Supplement 1, "Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications" (NRC 2013d), as (1) information that identifies a significant environmental impact issue that was not considered or addressed in the GEIS and, consequently, not codified in Table B-1 in Appendix B to Subpart A of 10 CFR Part 51 or (2) information not considered in the assessment of impacts evaluated in the GEIS leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1. Further, a significant environmental issue includes, but is not limited to, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or with an intensity or scope (context) not previously recognized.

In accordance with 10 CFR 51.53(c), "Operating license renewal stage," the applicant's ER (NextEra 2020b) must analyze the Category 2 (site-specific) issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. Additionally, the applicant's ER must discuss actions to mitigate any adverse impacts associated with the proposed action and environmental impacts of alternatives to the proposed action. In accordance with 10 CFR 51.53(c)(3), the applicant's ER does not need to analyze any Category 1 issue unless there is new and significant information on a specific issue.

NUREG-1555, Supplement 1, Revision 1, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants for Operating License Renewal*, describes the NRC process for identifying new and significant information (NRC 2013e). The search for new information includes:

- review of an applicant's ER (NextEra 2020b) and the process for identifying and evaluating the significance of new information
- review of public comments
- review of environmental quality standards and regulations
- coordination with Federal, State, and local environmental protection and resource agencies
- review of technical literature as documented through this SEIS

New information that the NRC staff discovers is evaluated for significance using the criteria set forth in the GEIS. For Category 1 issues for which new and significant information is identified, reconsideration of the conclusions for those issues is limited in scope to assessment of the relevant new and significant information; the scope of the assessment does not include other facets of an issue that the new information does not affect.

The NRC staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the GEIS and has conducted its own independent review, including a public involvement process (e.g., public meetings and comments) to identify new and significant issues for the Point Beach subsequent license renewal application environmental review. The assessment of new and significant information for each resource is addressed within each resource area discussion.

3.15 Impacts Common to All Alternatives

This section describes the impacts that the NRC staff considers common to all alternatives discussed in this SEIS, including the proposed action and replacement power alternatives. In addition, the following sections discuss termination of operations, the decommissioning of a nuclear power plant and potential replacement power facilities, and greenhouse gas emissions.

3.15.1 Fuel Cycle

This section describes the environmental impacts associated with the fuel cycles of both the proposed action and all replacement power alternatives that are analyzed in detail in this SEIS.

3.15.1.1 Uranium Fuel Cycle

The uranium fuel cycle includes uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials, and management of low-level wastes and high-level wastes related to uranium fuel cycle activities. Section 4.12.1.1 of the 2013 license renewal GEIS describes in detail the generic potential radiological and nonradiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes (NRC 2013a). The staff incorporates the information in NUREG-1437, Revision 1, Section 4.12.1.1 (NRC 2013a: 4-183–4-197) here by reference. The GEIS does not identify any site-specific (Category 2) uranium fuel cycle issues.

As stated in the GEIS (NRC 1996, 2013a), the generic issues related to the uranium fuel cycle as identified in Table 3-1 would not be affected by continued operations associated with license renewal. The NRC staff identified no new and significant information for these issues. Thus, as concluded in the GEIS, the impacts of generic issues related to the uranium fuel cycle would be SMALL.

3.15.1.2 Replacement Power Plant Fuel Cycles

New Nuclear Energy Alternatives

Uranium fuel cycle impacts for a nuclear power plant result from the initial extraction of fuel, transport of fuel to the facility, and management and ultimate disposal of spent fuel. The environmental impacts of the uranium fuel cycle are referenced above in Section 3.15.1.1.

Fossil Fuel Energy Alternatives

Fuel cycle impacts for a fossil fuel-fired power plant result from the initial extraction of fuel, cleaning and processing of fuel, transport of fuel to the facility, and management and ultimate disposal of any solid wastes from fuel combustion. These impacts are discussed in more detail in Section 4.12.1.2 of the GEIS (NRC 2013a) and can generally include the following:

- significant changes to land use and visual resources
- impacts to air quality, including release of criteria pollutants, fugitive dust, volatile organic compounds, and methane into the atmosphere
- noise impacts
- geology and soil impacts due to land disturbances and mining
- water resource impacts, including degradation of surface water and groundwater quality

- ecological impacts, including loss of habitat and wildlife disturbances
- historic and cultural resources impacts within the mine or pipeline footprint
- socioeconomic impacts from employment of both the mining workforce and service and support industries
- environmental justice impacts
- health impacts to workers from exposure to airborne dust and methane gases
- generation of industrial wastes

Renewable Energy Alternatives

For renewable energy technologies that rely on the extraction of a fuel source (e.g., biomass), such alternatives may have fuel cycle impacts with some similarities to those associated with the uranium fuel cycle. However, as stated in Section 4.12.1.2 of the GEIS (NRC 2013a) (subsection, "Renewable Energy Alternatives"), the fuel cycle for renewable technologies such as wind, solar, geothermal, and ocean wave and current is difficult to define. This is because the associated natural resources continue to exist (i.e., the resources are not consumed or irreversibly committed) regardless of any effort to harvest them for electricity production. Impacts from the presence or absence of these renewable energy technologies are often difficult to determine (NRC 2013a).

3.15.2 Terminating Power Plant Operations and Decommissioning

This section describes the environmental impacts associated with the termination of operations and the decommissioning of a nuclear power plant and replacement power alternatives. All operating power plants will terminate operations and be decommissioned at some point after the end of their operating life or after a decision is made to permanently cease operations. For the proposed action at Point Beach, subsequent license renewal would delay this eventuality for an additional 20 years beyond the current license periods, to end in 2050 (Unit 1) and 2053 (Unit 2).

3.15.2.1 Existing Nuclear Power Plant

Decommissioning would occur whether Point Beach is shut down at the end of its current renewed licenses or at the end of the subsequent license renewal term. The decommissioning GEIS (NUREG-0586) (NRC 2002a) evaluates the environmental impacts from the activities associated with the decommissioning of any reactor before or at the end of an initial or renewed license. Additionally, Section 4.12.2.1 of the GEIS (NRC 2013a) summarizes the incremental environmental impacts associated with nuclear power plant decommissioning activities. As noted in Table 3-1, there is one Category 1 issue, "Termination of plant operations and decommissioning," applicable to Point Beach decommissioning following the subsequent license renewal term. This issue states that license renewal is expected to have a negligible effect on the impacts of terminating operations and decommissioning on all resources. The license renewal GEIS did not identify any site-specific (Category 2) decommissioning issues.

3.15.2.2 Replacement Power Plants

New Nuclear and Fossil Fuel Energy Alternatives

The environmental impacts from the termination of power plant operations and decommissioning of a power generating facility are dependent on the facility's decommissioning plan. The decommissioning plan outlines the actions necessary to restore the site to a condition equivalent in character and value to the site on which the facility was first constructed

(NRC 2013a). General elements and requirements for a thermoelectric power plant decommissioning plan are discussed in Section 4.12.2.2 of the license renewal GEIS (NRC 2013a) and can include the removal of structures to at least 3 ft (1 m) below grade, the removal of all accumulated waste materials, the removal of intake and discharge structures, and the cleanup and remediation of incidental spills and leaks at the facility. The environmental consequences of decommissioning can generally include the following:

- short-term impacts on air quality and noise from the deconstruction of facility structures
- short-term impacts on land use and visual resources
- long-term reestablishment of vegetation and wildlife communities
- socioeconomic impacts due to decommissioning the workforce and the long-term loss of jobs
- elimination of health and safety impacts on operating personnel and the general public

The NRC staff incorporates the information in the GEIS, Section 4.12.2.2 (NRC 2013a: 4-224–4-225), here by reference.

Activities that are unique to the termination of operations and decommissioning of a nuclear power generating facility include the safe removal of the facility from service and the reduction of residual radioactivity to a level that permits release of the property under restricted conditions or unrestricted use and termination of the license.

Renewable Energy Alternatives

Termination of power plant operations and decommissioning for renewable energy facilities would generally be similar to the activities and impacts discussed for new nuclear and fossil fuel energy alternatives above. Decommissioning would involve the removal of facility components and any operational wastes and residues to restore sites to a condition equivalent in character and value to the site on which the facility was first constructed. In other circumstances, supporting infrastructure (e.g., buried utilities and pipelines) could be abandoned in place (NRC 2013a). The range of possible decommissioning considerations and impacts, depending on the renewal energy alternative considered, are discussed in Section 4.12.2.2 of the GEIS (see subsection, “Renewable Alternatives”) (NRC 2013a). The NRC staff incorporates the information in the GEIS, Section 4.12.2.2 (NRC 2013a: 4-227–4-228), here by reference.

3.15.3 Greenhouse Gas Emissions and Climate Change

The following sections discuss greenhouse gas (GHG) emissions and climate change impacts. Section 3.15.3.1 evaluates GHG emissions associated with the operation of Point Beach and replacement power alternatives. Section 3.15.3.2 discusses the observed changes in climate and potential future climate change during the subsequent license renewal term, based on climate model simulations under future global GHG emissions scenarios. In Section 3.16, “Cumulative Impacts,” of this SEIS, the NRC staff considers the potential cumulative, or overlapping, impacts from climate change on environmental resources where there are incremental impacts of the proposed action (subsequent license renewal).

3.15.3.1 Greenhouse Gas Emissions from the Proposed Action and Alternatives

Gases found in the Earth’s atmosphere that trap heat and play a role in the Earth’s climate are collectively termed greenhouse gases (GHGs). GHGs include carbon dioxide (CO_2), methane (CH4), nitrous oxide (N_2O), water vapor (H_2O), and fluorinated gases, such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). The

Earth's climate responds to changes in concentrations of GHGs in the atmosphere because these gases affect the amount of energy absorbed and heat trapped by the atmosphere. Increasing concentrations of these gases in the atmosphere generally increase the Earth's surface temperature. Atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have significantly increased since 1750 (IPCC 2007, IPCC 2013). Carbon dioxide, methane, nitrous oxide, and fluorinated gases (termed long-lived greenhouse gases) are well mixed throughout the Earth's atmosphere, and their impact on climate is long lasting and cumulative in nature as a result of their long atmospheric lifetime (EPA 2016). Therefore, the extent and nature of climate change is not specific to where GHGs are emitted. Carbon dioxide is of primary concern for global climate change because it is the primary gas emitted as a result of human activities. Climate change research indicates that the cause of the Earth's warming over the last 50 years is due to the buildup of GHGs in the atmosphere resulting from human activities (IPCC 2013, USGCRP 2014, USGCRP 2017, USGCRP 2018). The EPA has determined that greenhouse gases "may reasonably be anticipated both to endanger public health and to endanger public welfare" (74 FR 66496).

Proposed Action

The operation of Point Beach results in both direct and indirect GHG emissions. NextEra has calculated direct (i.e., stationary combustion sources) and indirect (i.e, workforce commuting) GHG emissions, which are provided in Table 3-33. NextEra does not maintain an inventory of GHG emissions resulting from visitor and delivery vehicles (NextEra 2020b). Fluorinated gas emissions from refrigerant sources and from electrical transmission and distribution systems can result from leakage, servicing, repair, or disposal of sources. In addition to being GHGs, chlorofluorocarbons and hydrochlorofluorocarbons are ozone-depleting substances that are regulated by the Clean Air Act under Title VI, "Stratospheric Ozone Protection." NextEra maintains a program to manage stationary refrigeration appliances at Point Beach to recycle, recapture, and reduce emissions of ozone-depleting substances. Therefore, Table 3-33 below does not account for any potential emissions from stationary refrigeration sources at Point Beach (NextEra 2020b).

Table 3-33 Annual Greenhouse Gas Emissions[(a)] from Operation at Point Beach, Units 1 and 2

Year	Onsite Combustion Sources[(a)] (tons)	Workforce Commuting[(b)] (tons)	Total CO_{2eq} (tons)
2014	1,110	3,460	4,570
2015	820	3,460	4,280
2016	830	3,460	4,290
2017	930	3,460	4,390
2018	660	3,460	4,120

Note: GHG emissions are reported in metric tons and converted to short tons. All reported values are rounded. To convert tons per year, multiply by 0.90718. Expressed in carbon dioxide equivalents (CO_2eq), a metric used to compare the emissions of greenhouse gases (GHG) based on their global warming potential (GWP). The GWP is a measure used to compare how much heat a GHG traps in the atmosphere. The GWP is the total energy that a gas absorbs over a period of time compared to carbon dioxide. CO2eq is obtained by multiplying the amount of the GHG by the associated GWP. For example, the GWP of methane is 21; therefore, 1 ton of methane emission is equivalent to 21 tons of carbon dioxide emissions.

Table 3-33 Annual Greenhouse Gas Emissions[(a)] from Operation at Point Beach, Units 1 and 2 (cont.)

Year	Onsite Combustion Sources[(a)] (tons)	Workforce Commuting[(b)] (tons)	Total CO_{2eq} (tons)

(a) Onsite combustion sources include Point Beach turbines, diesel generators, boilers, and diesel engines.

(b) Emissions consider Point Beach permanent full-time employees and supplemental staff (667 passenger vehicles per day based on a 3.1 percent carpool rate for 681 employees) and does not include additional contractor workers during refueling outages. Refueling outages occur on an 18-month schedule and last approximately 25 days per unit.

Source: NextEra 2020b, 2021b

<u>No-Action Alternative</u>

Under the no-action alternative, the NRC would not issue subsequent renewed licenses, and Point Beach would permanently shut down on or before the expiration of the current renewed licenses. At some point, all nuclear plants will terminate operations and undergo decommissioning. The decommissioning GEIS (NUREG-0586) (NRC 2002a) considers the environmental impacts from decommissioning. Therefore, the scope of impacts considered under the no-action alternative includes the immediate impacts resulting from activities at Point Beach that would occur between plant shutdown and the beginning of decommissioning (i.e., activities and actions necessary to cease operation of Point Beach). Facility operations would terminate at or before the expiration of the current renewed licenses. When the facility stops operating, a reduction in GHG emissions from activities related to plant operation, such as the use of diesel generators and employee vehicles, would occur. The NRC staff anticipates that GHG emissions for the no-action alternative would be less than those presented in Table 3-33, which shows the estimated direct GHG emissions from operation of Point Beach and associated mobile emissions.

Since the no-action alternative would result in a loss of power generating capacity due to shutdown, the sections below discuss GHG emissions associated with replacement baseload power generation for each replacement power alternative analyzed.

<u>New Nuclear (Small Modular Reactor) Alternative</u>

The license renewal GEIS (NRC 201a) presents life-cycle GHG emissions associated with nuclear power generation. As presented in Tables 4.12-4 through 4.12-6 of the GEIS, life-cycle GHG emissions from nuclear power generation can range from 1 to 288 grams carbon equivalent per kilowatt-hour (g Ceq/kWh). Nuclear power plants do not burn fossil fuels to generate electricity. Sources of GHG emissions from the new nuclear alternative would include diesel generators, auxiliary boilers, and gas turbines, similar to existing sources at Point Beach. Therefore, the NRC staff estimate that GHG emissions from a new nuclear alternative would be similar to Point Beach.

<u>Natural Gas Combined-Cycle Alternative</u>

The license renewal GEIS (NRC 201a) presents life-cycle GHG emissions associated with natural gas power generation. As presented in Table 4.12.5 of the GEIS, life-cycle GHG emissions from natural gas can range from 120 to 930 g Ceq/kWh. The NRC staff estimates that direct emissions from the operation of three 460 MWe natural gas combined-cycle units would total 3.9 million tons (3.5 million MT) of carbon dioxide equivalents (CO_2eq) per year.

Combination (Small Modular Reactor, Solar, and Onshore Wind) Alternative

For the combination alternative, GHGs would primarily be emitted from the new nuclear portion of this alternative. Therefore, the NRC staff estimates that GHG emissions from the combination alternative would be similar to, but less than the new nuclear alternative since the combination alternative would consist of two (as opposed to three) small modular reactor units.

Summary of Greenhouse Gas Emissions from the Proposed Action and Alternatives

Table 3-34 below presents the direct GHG emissions from facility operations under the proposed action of subsequent license renewal and alternatives to the proposed action. GHG emissions from the natural gas combined-cycle alternative are several orders of magnitude greater than those from continued operation of Point Beach. If Point Beach's generating capacity were to be replaced by the NGCC alternative, there would be an increase in GHG emissions. Therefore, the NRC staff concludes that the continued operation of Point Beach (the proposed action) results in GHG emissions avoidance as compared to the natural gas combined-cycle alternative. However, the proposed action, the no-action alternative, the new nuclear alternative, and the combination alternative would have similar and comparable GHG emissions. If Point Beach's generating capacity were to be replaced by either the new nuclear alternative or the combination alternative, there would be no significant increase in GHG emissions.

Table 3-34 Direct Greenhouse Gas Emissions from Facility Operations Under the Proposed Action and Alternatives

Technology/Alternative	CO_2eq[a] (tons/year)
Proposed Action (Point Beach subsequent license renewal)[b]	1,110
No-Action Alternative[c]	<1,110
New Nuclear Alternative [d]	1,110
Natural Gas Combined-Cycle Alternative [e]	4.5 million
Combination Alternative[f]	<1,110

Note: All reported values are rounded. To convert tons per year to metric tons per year, multiply by 0.90718

[a] Carbon dioxide equivalent (CO_2eq) is a metric used to compare the emissions of greenhouse gases (GHG) based on their global warming potential (GWP). The GWP is a measure used to compare how much heat a GHG traps in the atmosphere. The GWP is the total energy that a gas absorbs over a period of time compared to carbon dioxide. CO_2eq is obtained by multiplying the amount of the GHG by the associated GWP. For example, the GWP of methane is 21; therefore, 1 ton of methane emission is equivalent to 21 tons of carbon dioxide emissions.

[b] Greenhouse gas emissions include direct emissions from onsite combustion sources. Highest value presented in Table 3-33 was used.

[c] Emissions resulting from activities at Point Beach that would occur between plant shutdown and the beginning of decommissioning and assumed not to be greater than greenhouse gas emissions from operation at Point Beach.

[d] Emissions assumed to be similar to Point Beach operation.

[e] Emissions from direct combustion of natural gas. Greenhouse gas emissions estimated using emission factors developed by the U.S. Department of Energy's (DOE's) National Energy Technology Laboratory (NETL 2012)

[f] Emissions primarily from the new nuclear portion, assumed to be similar to but less than the new nuclear alternative.

3.15.3.2 Climate Change

Climate change is the decades or longer change in climate measurements (e.g., temperature and precipitation) that has been observed on a global, national, and regional level (IPCC 2007;

EPA 2016a; USGCRP 2014). Climate change can vary regionally, spatially, and seasonally, depending on local, regional, and global factors. Just as regional climate differs throughout the world, the impacts of climate change can vary among locations.

Observed Trends in Climate Change Indicators

On a global level, from 1901 to 2016 average temperature has increased by 1.8 °F (1.0 °C) (USGCRP 2018). The year 2020 was the second warmest year in a 140-year climate record; the top five warmest years (in order) are 2016, 2020, 2019, 2015, and 2017 (NOAA 2020b, 2020c). Since 1901, precipitation has increased at an average rate of 0.1 in. (0.25 cm) per decade on a global level (EPA 2021e). The observed global change in average surface temperature and precipitation has been accompanied by an increase in sea surface temperatures, a decrease in global glacier ice, an increase in sea level, and changes in extreme weather events. Such extreme events include an increase in the frequency of heat waves, very heavy precipitation (defined as the heaviest 1 percent of all daily events), and recorded maximum daily high temperatures (IPCC 2007; EPA 2016; USGCRP 2009, 2014).

The U.S. Global Change Research Program (USGCRP) compiles the best available information and maintains the current state of knowledge regarding climate change trends and effects at the regional and national level. The USCGRP reports that from 1901 to 2016, average surface temperatures have increased by 1.8 °F (1.0 °C) across the contiguous United States (USGCRP 2018, Chapter 2, Key Message 5). Since 1901, average annual precipitation has increased by 4 percent across the United States, comprised of increases in the northern and eastern United States and decreases across the Southern and Western United States (USGCRP 2018, Chapter 2 Key Message 6). Since the 1980s, data show an increase in the length of the frost-free season, the period between the last occurrence of 32 °F (0 °C) in the spring and first occurrence of 32 °F (0 °C) in the fall, across the contiguous United States. Over the period 1991 through 2011, the average frost-free season was 10 days longer than between 1901 and 1960 (USGCRP 2014). Over just the past two decades, the number of high temperature records observed in the United States has far exceeded the number of low temperature records (USGCRP 2018).

Across the Midwest region, annual average temperature from 1905–2012 has warmed by 1.5 °F (0.5 °C). The rate of warming over recent decades has accelerated, with average temperatures increasing twice as quickly between 1950 and 2010 (USGCRP 2014; NOAA 2013). For the Midwest, the length of the frost-free season has increased by 9 days from 1991–2012 relative to 1901–1960 (USGCRP 2018). Precipitation in the Midwest from 1895–2011 has increased 0.31 in. (0.78 cm) per decade (NOAA 2013). The Great Lakes have exhibited increases in surface temperatures, declining lake ice cover, increasing summer evaporation rates, and earlier seasonal stratification of temperatures (USGCRP 2018). For example, average annual maximum ice coverage for the Great Lakes from 2003–2013 was 43 percent and for 1962–2013 the average annual maximum ice coverage was 52 percent (NOAA 2017b). For the 1995–2019 period, Lake Michigan average surface water rate of warming has been 0.56–0.72 °F per decade (0.31–0.40 °C per decade), with the greatest warming occurring in October (Anderson et al. 2021). Lake Michigan-Huron water level hydrographs show a significant downward trend for the period of 1860–2010 and historic lows in 2013 (NOAA 2013). Since 2013, however, Lake Michigan-Huron water levels have experienced a rise of more than 3 ft (NOAA 2017b; USACE 2021c).

The NRC staff used the National Oceanic and Atmospheric Administration's (NOAA) Climate at a Glance tool to analyze temperature and precipitation trends for the 1895–2020 period in the Wisconsin East Central Climate Division. A trend analysis shows that the average annual temperature has increased at a rate of 0.2 °F (0.1 °C) per decade, while average annual precipitation has increased at a rate of 0.34 in. (0.86 cm) per decade (NOAA 2020c).

Climate Change Projections

Future global GHG emission concentrations (emission scenarios) and climate models are commonly used to project possible climate change. Climate models indicate that over the next few decades, temperature increases will continue due to current GHG emission concentrations in the atmosphere (USGCRP 2014). This is because it takes time for Earth's climate system to respond to changes in GHG concentrations; if GHG concentrations were to stabilize at current levels, this would still result in at least an additional 1.1 °F (0.6 °C) of warming over this century (USGCRP 2018). Over the longer term, the magnitude of temperature increases and climate change effects will depend on future global greenhouse gas emissions (IPCC 2007, 2013; USGCRP 2009, 2014, 2018). Climate model simulations often use GHG emission scenarios to represent possible future social, economic, technological, and demographic development that, in turn, drive future emissions. Consequently, the GHG emission scenarios, their supporting assumptions, and the projections of possible climate change effects entail substantial uncertainty.

The Intergovernmental Panel on Climate Change (IPCC) has generated various representative concentration pathway (RCP) scenarios commonly used by climate modeling groups to project future climate conditions (IPCC 2000, 2013; USGCRP 2017, 2018). For instance, the A2 scenario is representative of a high-emission scenario under which GHG emissions continue to rise during the 21st century from 40 gigatons (GT) of carbon dioxide equivalents (CO_2eq) per year in 2000 to 140 GT of CO_2eq per year by 2100. The B1 scenario, on the other hand, is representative of a low-emission scenario in which emissions rise from 40 GT of CO_2eq per year in 2000, to 50 GT of CO_2eq per year mid-century before falling to 30 GT of CO2eq per year by 2100 (IPCC 2000; USGCRP 2014). In the IPCC Fifth Assessment Report, four RCPs were developed and are based on predicted changes in radiative forcing (a measure of the influence that a factor, such as GHG emissions, has in changing the global balance of incoming and outgoing energy) in the year 2100, relative to preindustrial conditions. The four RCPs are numbered in accordance with the change in radiative forcing measured in watts per square meter (i.e., +2.6 (very low), +4.5 (lower), +6.0 (mid-high), and +8.5 (higher)) (USGCRP 2018). For example, RCP2.6 is representative of a mitigation scenario aimed at limiting the increase of global mean temperature to 1.1 °F (2 °C) (IPCC 2014). RCP8.5 reflects a continued increase in global emissions resulting in increased warming by 2100. Most recently, the USGCRP and IPCC have used the RCPs and associated modeling results as the basis for their climate change assessments (IPCC 2013; USGCRP 2017, 2018).

The NRC staff considered the best available climate change studies performed by the USGCRP and partner agencies as part of the staff's assessment of potential changes in climate indicators during the Point Beach subsequent license renewal terms (2030–2050 for Unit 1, and 2033–2053 for Unit 2). The results of these studies are summarized as follows.

As input to the Third National Climate Assessment report (USGCRP 2014), NOAA analyzed future regional climate change scenarios based on climate model simulations using a high (A2) and low (B1) emission scenarios (NOAA 2013). NOAA climate model simulations (for the period between 2021 and 2050, 2035 midpoint, relative to the 1971–1999 reference period) indicate the following. Annual mean temperature is projected to increase by 2.5–3.5 °F (1.3–1.9 °C) across the Midwest under both a low and high-emission scenario. Increases in temperature during this timeframe are projected to occur for all seasons. The Fourth National Climate Assessment (USGCRP 2017) provides regional projections for annual temperature based on the RCP4.5 and RCP8.5 scenarios for the mid-century (2036–2065) as compared to the average for 1976–2005. The modeling predicts increases of 4–6 °F (2.2–3.3 °C) in Wisconsin under both scenarios (USGCRP 2017). As for precipitation, the climate model simulations suggest spatial difference in annual mean precipitation across the Midwest. For the 2021–2050 period, annual mean precipitation is projected to increase 3 to 6 percent under a high emissions scenario (A2) across Wisconsin, and under a low emissions scenario annual mean precipitation is projected to increase 0 to 3 percent (NOAA 2013).

Future long-term water level projections for the Great Lakes are highly uncertain (USGCRP 2014). Model simulations have resulted in a wide distribution in magnitude and sign (declines/increases) for water level projections. For instance, Angel and Kunkel (2010) estimated possible future average water levels of Lake Michigan-Huron under three emission scenarios (low emission scenario (B1), intermediate emission scenario (A1B), and high-emission scenario (A2)) for three future periods (2005–2034, 2035–2064, and 2065–2094) relative to the 1970–1999 reference period. The model simulations primarily resulted in a reduction of lake levels and wide range in lake level changes. For example, 75 percent of the model simulations estimate declining lake levels for Lake Michigan-Huron. The 2050–2064 model-simulated average lake-level changes ranged from -5.8 ft to +2.9 ft (-1.77 m to +0.89 m). However, recent studies indicate that earlier approaches overestimated evaporation losses and therefore declines in water levels (USGCRP 2014; MacKay and Seglenieks 2012). Recent water level projections primarily indicate small declines in average water levels for Lake Michigan-Huron by mid-century across various GHG scenarios, but simulations continue to generate a range in sign and magnitude lake level response (USGCRP 2018; Lofgren and Rouhana 2016).

The effects of climate change on Point Beach structures, systems, and components are outside the scope of the NRC staff's license renewal environmental review. The environmental review documents the potential effects from continued nuclear power plant operation on the environment. Site-specific environmental conditions are considered when siting nuclear power plants. This includes the consideration of meteorological and hydrologic siting criteria as set forth in 10 CFR Part 100, "Reactor site criteria." NRC regulations require that plant structures, systems, and components important to safety be designed to withstand the effects of natural phenomena, such as flooding, without loss of capability to perform safety functions. Further, nuclear power plants are required to operate within technical safety specifications in accordance with the NRC operating license, including coping with natural phenomena hazards. The NRC conducts safety reviews prior to allowing licensees to make operational changes due to changing environmental conditions. Additionally, the NRC evaluates nuclear power plant operating conditions and physical infrastructure to ensure ongoing safe operations under the plant's initial and renewed operating licenses through the NRC's Reactor Oversight Process. If new information about changing environmental conditions (such as rising sea levels that threaten safe operating conditions or challenge compliance with the plant's technical specifications) becomes available, the NRC will evaluate the new information to determine if any safety-related changes are needed at licensed nuclear power plants. This is a separate and distinct process from the NRC staff's subsequent license renewal environmental review that it conducts in accordance with NEPA. Nonetheless, as discussed below in Section 3.16, the NRC staff considers the impacts of climate change in combination with the effects of subsequent license renewal in assessing cumulative impacts to the environment.

3.16 Cumulative Impacts

Cumulative impacts may result when the environmental effects associated with the proposed action (subsequent license renewal) are added to the environmental effects from other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. As explained in the license renewal GEIS (NRC 2013a), the effects of the license renewal action, combined with the effects of other actions, could generate cumulative impacts on a given resource.

For the purposes of this analysis, past actions are those that occurred since the commencement of Point Beach reactor operations and before the submittal of the subsequent license renewal application. Older actions are considered as part of the affected environment analyses presented in Sections 3.2 through 3.13 of this SEIS. Present actions are those that are occurring during current power plant operations. Reasonably foreseeable future actions are those that would occur through the end of power plant operation, including the period of extended operation. Therefore, the cumulative impacts analysis considers potential effects through the end of the current license term, as well as through the end of the 20-year subsequent license renewal term.

The cumulative impacts analysis accounts for both geographic (spatial) and time (temporal) considerations of past, present, and reasonably foreseeable future actions to determine whether other potential actions are likely to contribute to the total environmental impact. In addition, because cumulative impacts accrue to resources and focus on overlapping impacts with the proposed action, no cumulative impacts analysis was performed for resource areas where the proposed action is unlikely to have any incremental impacts on that resource. Consequently, no cumulative impacts analysis was performed for the following resource areas: land use, noise, geology and soils, terrestrial resources, aquatic resources, and historic and cultural resources.

As noted in Section 3.15.3.2, “Climate Change,” of this SEIS, changes in climate could have broad implications for certain resource areas. Accordingly, a climate change impact discussion is provided for those resource areas that could be incrementally affected by the proposed action (subsequent license renewal). It is also important to note that the potential effects of climate change could occur irrespective of the proposed action.

Information from NextEra’s ER (NextEra 2020b); responses to requests for additional information; information from other Federal, State, and local agencies; scoping comments; and information gathered during the environmental site audit at Point Beach were used to identify past, present, and reasonably foreseeable future actions in the cumulative impacts analysis. To evaluate cumulative impacts resulting from the continued operation of Point Beach, the incremental impacts of the proposed action, as described in Sections 3.2 to 3.13 of this SEIS, are combined with the impacts of other past, present, and reasonably foreseeable future actions, regardless of which agency (Federal or non-Federal) or person undertakes such actions. In general, the effects of past actions have already been described and accounted for in each resource-specific description of the existing (i.e., affected) environment, which serves as the environmental baseline for the cumulative impacts analysis.

Appendix E describes other actions, including new and continuing activities and specific projects that the NRC staff identified during this environmental review and that were considered in the analysis of potential cumulative impacts.

3.16.1 Air Quality

The region of influence that the NRC staff considered in the cumulative air quality analysis consists of Manitowoc County, where Point Beach is located, because air quality designations in Wisconsin are made at the county level. NextEra has not proposed any refurbishment related activities during the subsequent license renewal term. As a result, the NRC staff expects that air emissions from the plant during the subsequent license renewal term would be similar to those presented in Section 3.3 of this SEIS. Appendix E identifies present and reasonably foreseeable future projects that could contribute to the cumulative impacts to air quality in Manitowoc County. Development and construction activities identified in Appendix E could increase air emissions during their respective construction periods, but those air emissions would be temporary and localized. Future and continued operation of facilities can result in increases in vehicular traffic and in overall long-term air emissions that contribute to cumulative air impacts. Fossil fuel energy facilities (e.g., Manitowoc Plant) and concentrated animal feeding operations can be significant sources of air emissions.

Climate change can impact air quality as a result of changes in meteorological conditions. The formation, transport, dispersion, and deposition of air pollutants depend, in part, on weather conditions (IPCC 2007). Ozone is particularly sensitive to climate change (IPCC 2007; EPA 2009a). Ozone is formed by the chemical reaction of nitrogen oxides and volatile organic compounds in the presence of heat and sunlight. Sunshine, high temperatures, and air stagnation are favorable meteorological conditions for higher levels of ozone (IPCC 2007; EPA 2009a). The emission of ozone precursors also depends on temperature, wind, and solar radiation (IPCC 2007). According to the EPA, both nitrogen oxide and biogenic volatile organic compound emissions are expected to be higher in a warmer climate (EPA 2009a). Modeled studies of climate-related ozone changes for the Midwest project increases in summer averages of the maximum daily 8-hour ozone concentrations (USGCRP2018; EPA 2017; Nolte et al. 2018).

3.16.2 Water Resources

3.16.2.1 Surface Water Resources

The description of the affected environment in Section 3.5.1, “Surface Water Resources,” of this SEIS serves as the baseline for the NRC staff’s cumulative impacts assessment for surface water resources. Point Beach withdraws cooling water from Lake Michigan and discharges return flows and comingled effluents back to the lake. As such, this cumulative impact review focuses on those projects and activities where water uses or effluent discharges to Lake Michigan could contribute to cumulative impacts with the region of influence of Point Beach.

<u>Water Use Considerations</u>

Point Beach returns all but a small fraction of the water withdrawn for condenser and auxiliary cooling back to Lake Michigan. NextEra has not proposed to increase Point Beach Units 1 and 2 surface water withdrawals or consumptive water use during the subsequent license renewal term. In addition, Point Beach’s surface water withdrawals from Lake Michigan and associated consumptive water use (for surface water and groundwater) are subject to the provisions of a Water Use Individual Permit, issued by the WDNR, as described in Section 3.5.1.2 of this SEIS. NextEra would need to seek a permit modification from the State to increase Point Beach’s surface water withdrawals or consumptive water use during the subsequent license renewal term.

The NRC staff continues to recognize that resolution of any future conflicts over water availability would fall within the regulatory authority of the States with jurisdiction over desired and beneficial uses of the waters of Lake Michigan. Specifically, Wisconsin is a party to the 2008 Great Lakes–St. Lawrence River Basin Water Resources Compact, which also includes the States of Illinois, Indiana, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin. The Compact is a legally binding interstate agreement that details how its member States will manage the use of the water supply of the Great Lakes Basin. The Compact explicitly provides a framework for each state to enact programs and laws protecting the Basin, and it is the formal mechanism for implementing the previous good-faith commitments made between the governors of the U.S. member States and the premiers of Ontario and Quebec under the 2005

Great Lakes–St. Lawrence River Basin Sustainable Water Resources Agreement (Great Lakes Council 2021). Central to the water use management provisions of the Compact is that withdrawals and consumptive uses will be managed to ensure that there will be no significant individual or cumulative adverse impacts to the quantity or quality of the waters of the Great Lakes. The compact's consumptive use and water diversion requirements are met by the State of Wisconsin under the WDNR's water use permitting program (WAC NR 860) (see Section 3.5.1.2 of this SEIS).

The NRC staff has identified no new or proposed projects (see Appendix E, Table E-1) with the potential to substantially impact surface water withdrawals or consumptive water along the western shore of Lake Michigan where Point Beach is located.

Water Quality Considerations

Ambient water quality along the western shore of Lake Michigan is the product of past and present activities (e.g., water withdrawals, effluent discharges, and accidental spills and releases) associated with urban development, industrial and commercial development, agricultural practices, and shoreline development. Future development can result in water quality degradation if those projects increase sediment loading and the discharge of other pollutants to nearby surface water bodies, including Lake Michigan. In Appendix E, Table E-1 of this SEIS, the NRC staff has identified a number of ongoing and reasonably foreseeable future actions that could impact surface water quality in affected watersheds that drain to Lake Michigan.

On an individual facility basis, state-issued NPDES permits (WPDES permits in Wisconsin) under CWA Section 402 set limits on wastewater, stormwater associated with construction and industrial activity, and other point source discharges. As previously discussed, CWA Section 303(d) requires states to identify all "impaired" waters for which effluent limitations and pollution control activities are not sufficient to attain water quality standards and to establish total maximum daily loads to ensure future compliance with water quality standards. As discussed in Section 3.5.1.3 of this SEIS, Wisconsin's CWA Section 303(d) list shows that the waters of Lake Michigan lying within Manitowoc County continue to be impaired for fish consumption due to polychlorinated biphenyls (PCBs) and mercury in fish tissue. Ongoing cooling and associated wastewater discharges from Point Beach, which are subject to a WPDES individual permit, are a very small contributor to the pollutant and thermal loading to Lake Michigan. Further, as indicated in Appendix E, Table E-1, there are a number of WPDES permitted discharges in the Point Beach region. The NRC staff assumes that the contributions to cumulative impacts on surface water quality are managed where facilities are in compliance with their respective permits. Consequently, a substantial regulatory framework exists to address current and potential future sources of water quality degradation within the waters along the western shore of Lake Michigan.

Climate Change and Related Considerations

Climate change can impact surface water resources as a result of changes in temperature, precipitation, and other parameters, as discussed in Section 3.15.3.2 of this SEIS.

The U.S. Global Change Research Program (USGCRP) projects that water demand across the states bordering Lake Michigan, including Wisconsin, Illinois, Indiana, and Michigan, will increase by 0 to 10 percent by 2060, relative to 2005, based on combined changes in population, socioeconomic conditions, and climate (USGCRP 2014: Figure 3.11).

Elevated surface water temperatures can decrease the cooling efficiency of thermoelectric power generating facilities and plant capacity. Therefore, as intake water temperatures warm, the volume of surface water needed for power plant cooling can increase (USGCRP 2014).

Regulatory agencies would need to account for changes in water availability in their water resources allocation and environmental permitting programs. Regardless of water use permitting constraints, power plant operators would have to account for any changes in water temperature in operational practices and procedures.

Since 1958, heavy precipitation (i.e., the amount of annual precipitation falling in the heaviest 1 percent of events) has increased by an average of 42 percent across the Midwest region (USGCRP 2018: Figure 2.6). Observed increases in heavy precipitation events are projected to continue across the Midwest, including eastern Wisconsin. Increases in annual precipitation and heavy precipitation events can result in greater runoff from the land while increasing the potential for riverine flooding. In turn, these changes can result in the transport of a higher sediment load and other contaminants to surface waters with potential degradation of ambient water quality.

3.16.2.2 Groundwater Resources

Section 3.5.2, "Groundwater Resources," of this SEIS describes regional groundwater water systems and water use. As discussed in that section, water is withdrawn from the Silurian aquifer through five onsite wells for drinking water, sanitary use, and fire suppression. Between 2015 and 2019, water was withdrawn from these onsite supply wells at an average rate of 12,542 gpd (around 8.7 gpm). Onsite groundwater use is not expected to increase significantly during the subsequent license renewal period.

As discussed in Section 3.5.3, the impact of current plant operations and groundwater withdrawals on the aquifer is considered to be SMALL and the NRC staff did not identify any new and significant information to indicate the possibility of groundwater use conflicts during the subsequent license renewal term beyond those discussed in the GEIS. There are no known current or planned projects requiring groundwater withdrawals in the vicinity of Point Beach that, if implemented in addition to subsequent license renewal, would potentially cause an adverse impact on groundwater use and quality.

In Section 3.5.3, the NRC staff also addressed the impact of past and future operation of the plant on groundwater quality. Point Beach has implemented a groundwater protection program to identify and monitor leaks and the monitoring well network. The staff determined that the groundwater protection program sampling strategy is robust enough that potential future releases into groundwater, while not expected, would likely be readily detected. In addition, because the low permeability surficial deposits (over 100 ft) at Point Beach act as a barrier to prevent radionuclides in the surficial groundwater from impacting the underlying Silurian aquifer and shallow onsite groundwater flows east toward Lake Michigan, offsite groundwater users are not expected to be impacted. Therefore, over the period of subsequent license renewal period, there is little chance of significant impacts on the groundwater quality of onsite and offsite aquifers.

Therefore, the NRC staff concludes that the cumulative impacts of continued operation of Point Beach on groundwater use and quality during the subsequent license renewal period would be SMALL and that no mitigation measures are warranted.

3.16.3 Socioeconomics

This section addresses socioeconomic factors that have the potential to be affected by changes in operations at Point Beach, in addition to the aggregate effects of other past, present, and reasonably foreseeable future actions. As discussed in Section 3.10.7 of this SEIS, the continued operation of Point Beach during the subsequent license renewal term would have no impact on socioeconomic conditions in the region beyond what is already being experienced.

Because NextEra has no plans to hire additional workers during the subsequent license renewal term, overall expenditures and employment levels at Point Beach would remain relatively unchanged with no new or increased demand for housing and public services. Based on this and other information presented in this SEIS, there would be no contributory effect on socioeconomic conditions in the region during the subsequent license renewal term from the continued operation of Point Beach beyond what is currently being experienced. Therefore, the only contributory effects would come from reasonably foreseeable future planned activities at Point Beach unrelated to the proposed action (subsequent license renewal) and other planned offsite activities in the vicinity of Point Beach.

NextEra has no planned activities at Point Beach beyond continued reactor operations and maintenance. When combined with other past, present, and reasonably foreseeable future activities, the contributory effects of reactor operations and maintenance at Point Beach would have no new or increased socioeconomic impact in the region beyond what is currently being experienced.

3.16.4 Human Health

The NRC and the EPA have established radiological dose limits to protect the public and workers from both acute and long-term exposure to radiation and radioactive materials. These dose limits are specified in 10 CFR Part 20 and 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations." As discussed in Section 3.11.6 et seq., "Human Health," of this SEIS, the impacts on human health from continued plant operations during the subsequent license renewal term are SMALL.

For the purposes of this cumulative impacts analysis, the geographical area considered is the area within a 50-mi (80-km) radius of Point Beach. There are no other operational nuclear power plants within this 50-mi (80-km) radius. However, approximately 5 mi (8 km) north of Point Beach is the Kewaunee Power Station, a nuclear power plant that has permanently ceased operations and is currently undergoing decommissioning. Kewaunee Power Station completed the transfer of the spent fuel from its spent fuel pool to its onsite independent spent fuel storage installation (ISFSI) in June 2017 with major decommissioning and dismantlement activities scheduled to begin in 2069 (NRC 2021g). As discussed in Section 2.1.4.4, "Radioactive Waste Storage," of this SEIS, NextEra stores spent nuclear fuel from Point Beach in a storage pool and in an onsite ISFSI. NextEra stated in its ER that it has no current plans to add additional storage capacity (NextEra 2020b).

The EPA regulations at 40 CFR Part 190 limit the dose to members of the public from all sources in the nuclear fuel cycle, including nuclear power plants, fuel fabrication facilities, waste disposal facilities, and transportation of fuel and waste. As discussed in Section 2.1.4.5 of this SEIS, NextEra has a radiological environmental monitoring program that measures radiation and radioactive materials in the environment from Point Beach, its ISFSI, and all other sources. The NRC staff reviewed the radiological environmental monitoring results for the 5-year period from 2015 through 2019 as part of this cumulative impacts assessment. The review of NextEra's data showed no indication of an adverse trend in radioactivity levels in the environment from either Point Beach or the ISFSI. The data showed that there was no measurable impact on the environment from operations at Point Beach.

In summary, the NRC staff concludes that there is no significant cumulative effect on human health resulting from the proposed action of subsequent license renewal, in combination with cumulative impacts from other sources. The NRC staff bases this conclusion on its review of radiological environmental monitoring program data, radioactive effluent release data, and worker dose data; the expectation that Point Beach would continue to comply with Federal radiation protection standards during the subsequent license renewal period; and the continued regulation of any future development or actions in the vicinity of the Point Beach site by the NRC and the State of Wisconsin.

3.16.5 Environmental Justice

This cumulative impacts analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from past, present, and reasonably foreseeable future actions, including the effects from the continued operation of Point Beach Units 1 and 2 during the subsequent license renewal term. As discussed in Section 3.12.1 of this SEIS, there would be no disproportionately high and adverse impacts on minority and low-income populations from the continued operation of Point Beach during the subsequent license renewal term.

Everyone living near Point Beach, including minority and low-income populations, currently experiences its operational effects. The NRC addresses environmental justice matters for license renewal by identifying the location of minority and low-income populations, determining whether there would be any potential human health or environmental effects, and whether any of the effects may be disproportionately high and adverse on these populations.

Adverse health effects are measured in terms of the risk and rate of fatal or nonfatal adverse impacts on human health. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risks of impacts in the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Some of these potential effects have been identified in resource areas presented in preceding sections of this SEIS. As previously discussed in this SEIS, the impact from license renewal for all resource areas (e.g., land, air, water, and human health) would be SMALL.

As discussed in Section 3.12.1, there would be no disproportionately high and adverse impacts on minority and low-income populations from the continued operation of Point Beach during the subsequent license renewal term. Because NextEra has no plans to hire additional workers during the subsequent license renewal term, employment levels at Point Beach would remain relatively constant, and there would be no additional demand for housing or increases in traffic. Based on this information and the analysis of human health and environmental impacts presented in the preceding sections, it is not likely that there would be any disproportionately high and adverse contributory effect on minority and low-income populations from the continued operation of Point Beach during the subsequent license renewal term. Therefore, the only contributory effects would come from the other reasonably foreseeable future planned activities at the Point Beach site unrelated to the proposed action (subsequent license renewal) and other reasonably foreseeable future planned offsite activities in the vicinity of Point Beach.

NextEra has no planned activities at Point Beach beyond continued reactor operations and maintenance. When combined with other past, present, and reasonably foreseeable future activities, the contributory effects of continuing reactor operations and maintenance at Point Beach would not likely cause disproportionately high and adverse human health and environmental effects on minority and low-income populations residing near Point Beach beyond what those populations have already experienced.

3.16.6 Waste Management and Pollution Prevention

This section considers the incremental waste management impacts of the subsequent license renewal term when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. In Section 3.13.3 of this SEIS, the NRC staff concluded that the potential waste management impacts from Point Beach's continued operations during the subsequent license renewal term would be SMALL.

As discussed in Sections 2.1.4 and 2.1.5 of this SEIS, NextEra maintains waste management programs for radioactive and nonradioactive waste generated at Point Beach and is required to comply with Federal and state permits and other regulatory waste management requirements. All industrial facilities, including nuclear power plants and other facilities within a 50-mi (80-km) radius of Point Beach, are also required to comply with appropriate NRC, EPA, and state requirements for the management of radioactive and nonradioactive waste. Current waste management activities at Point Beach would likely remain unchanged during the subsequent license renewal term, and continued compliance with Federal and state requirements for radioactive and nonradioactive waste is expected.

In summary, the NRC staff concludes that there is no significant cumulative effect from the proposed action due to continued radioactive and nonradioactive waste generation. This is based on Point Beach's expected continued compliance with Federal and State of Wisconsin requirements for radioactive and nonradioactive waste management and the expected regulatory compliance of other waste producers in the area.

3.17 <u>Resource Commitments Associated with the Proposed Action</u>

This section describes the NRC staff's consideration of potentially unavoidable adverse environmental impacts that could result from implementation of the proposed action and alternatives; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and the irreversible and irretrievable commitments of resources.

3.17.1 Unavoidable Adverse Environmental Impacts

Unavoidable adverse environmental impacts are impacts that would occur after implementation of all workable mitigation measures. Carrying out any of the replacement energy alternatives considered in this SEIS, including the proposed action, would result in some unavoidable adverse environmental impacts.

Minor unavoidable adverse impacts on air quality would occur due to the emission and release of various chemical and radiological constituents from power plant operations. Nonradiological emissions resulting from power plant operations are expected to comply with EPA and state emissions standards. Chemical and radiological emissions would not exceed the national emission standards for hazardous air pollutants.

Continued plant operation would result in industrial wastewater discharges to Lake Michigan containing small amounts of water treatment chemical additives. Discharges are expected to comply with limits set in the WPDES permit.

During nuclear power plant operations, workers and members of the public would face unavoidable exposure to low levels of radiation as well as hazardous and toxic chemicals. Workers would be exposed to radiation and chemicals associated with routine plant operations and the handling of nuclear fuel and waste material. Workers would have higher levels of exposure than members of the public, but doses would be administratively controlled and would not exceed regulatory standards or administrative control limits. In comparison, the alternatives involving the construction and operation of a nonnuclear power generating facility would also result in unavoidable exposure to hazardous and toxic chemicals for workers and the public.

The generation of spent nuclear fuel and waste material, including low-level radioactive waste, hazardous waste, and nonhazardous waste, would be unavoidable. Hazardous and nonhazardous wastes would be generated at some nonnuclear power generating facilities. Wastes generated during plant operations would be collected, stored, and shipped for suitable treatment, recycling, or disposal in accordance with applicable Federal and State regulations. Due to the costs of handling these materials, the NRC staff expects that power plant operators would optimize all waste management activities and operations in a way that generates the smallest possible amount of waste.

3.17.2 Relationship between Short-Term Use of the Environment and Long-Term Productivity

The operation of power generating facilities would result in short-term uses of the environment, as described in Sections 3.2 through 3.13 of this SEIS (see subsections titled, "Proposed Action," "No-Action," and "Replacement Power Alternatives: Common Impacts"). Short term is the period of time that continued power generating activities take place.

Power plant operations require short-term use of the environment and commitment of resources (e.g., land and energy) indefinitely or permanently. Certain short-term resource commitments are substantially greater under most energy alternatives, including subsequent license renewal, than under the no-action alternative because of the continued generation of electrical power and the continued use of generating sites and associated infrastructure. During operations, all energy alternatives entail similar relationships between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Air emissions from nuclear power plant operations introduce small amounts of radiological and nonradiological emissions to the region around the plant site. Over time, these emissions would result in increased concentrations and exposure, but the NRC staff does not expect that these emissions would impact air quality or radiation exposure to the extent that they would impair public health and long-term productivity of the environment.

Continued employment, expenditures, and tax revenues generated during power plant operations directly benefit local, regional, and state economies over the short term. Local governments investing project-generated tax revenues into infrastructure and other required services could enhance economic productivity over the long term.

The management and disposal of spent nuclear fuel, low-level radioactive waste, hazardous waste, and nonhazardous waste require an increase in energy and consume space at treatment, storage, or disposal facilities. Regardless of the location, the use of land to meet waste disposal needs would reduce the long-term productivity of the land.

Power plant facilities are committed to electricity production over the short term. After these facilities are decommissioned and the area restored, the land could be available for other future productive uses.

3.17.3 Irreversible and Irretrievable Commitment of Resources

Resource commitments are irreversible when primary or secondary impacts limit the future options for a resource. For example, the consumption or loss of nonrenewable resources is irreversible. An irretrievable commitment refers to the use or consumption of resources for a period of time (e.g., for the duration of the action under consideration) that are neither renewable nor recoverable for future use. Irreversible and irretrievable commitments of resources for electrical power generation include the commitment of land, water, energy, raw materials, and other natural and manmade resources required for power plant operations. In general, the commitments of capital, energy, labor, and material resources are also irreversible.

The implementation of any of the replacement energy alternatives considered in this SEIS would entail the irreversible and irretrievable commitments of energy, water, chemicals, and—in some cases—fossil fuels. These resources would be committed during the subsequent license renewal term and over the entire life cycle of the power plant, and they would be unrecoverable.

Energy expended would be in the form of fuel for equipment, vehicles, and power plant operations and electricity for equipment and facility operations. Electricity and fuel would be purchased from offsite commercial sources. Water would be obtained from existing water supply systems or withdrawn from surface water or groundwater. Continued plant operation would result in continued consumptive water use from Lake Michigan, but withdrawn cooling water is returned to Lake Michigan though a once-through cooling system and water loss is minimal. These resources are readily available, and the NRC staff does not expect that the amounts required would deplete available supplies or exceed available system capacities.

4 CONCLUSION

This draft supplemental environmental impact statement (DSEIS) contains the NRC staff's environmental review of the NextEra Energy Point Beach, LLC (NextEra) application for subsequent renewed operating licenses for Point Beach Nuclear Plant, Units 1 and 2 (Point Beach), as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." The regulations in 10 CFR Part 51 implement the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.). This chapter briefly summarizes the environmental impacts of subsequent license renewal, lists and compares the environmental impacts of alternatives to subsequent license renewal, and presents the NRC staff's preliminary conclusions and recommendation.

4.1 Environmental Impacts of License Renewal

After reviewing the site-specific (Category 2) environmental issues in this DSEIS, the NRC staff concluded that issuing subsequent renewed licenses for Point Beach would have SMALL impacts for the applicable Category 2 issues applicable to the subsequent license renewal at Point Beach. The NRC staff considered mitigation measures for each Category 2 issue, as applicable. The NRC staff concluded that no additional mitigation measure is warranted.

4.2 Comparison of Alternatives

In Chapter 3 of this DSEIS, the NRC staff considered the following alternatives to issuing subsequent renewed operating licenses for Point Beach:

- no-action alternative
- new nuclear (small modular reactor) alternative
- combination (small modular reactor, solar, and onshore wind) alternative

Based on the review presented in this DSEIS, the NRC staff concludes that the environmentally preferred alternative is the proposed action. The NRC staff recommends that subsequent renewed operating licenses be issued for Point Beach. As shown in Table 2-2, all other power generation alternatives have impacts in at least two resource areas that are greater than subsequent license renewal, in addition to the environmental impacts inherent with new construction projects. To make up the lost power generation if the NRC does not issue subsequent renewed licenses for Point Beach (i.e., the no-action alternative), energy decisionmakers may implement one of the replacement power alternatives discussed in Chapter 3, or a comparable alternative capable of replacing the power generated by Point Beach.

4.3 Recommendation

The NRC staff's preliminary recommendation is that the adverse environmental impacts of subsequent license renewal for Point Beach are not so great that preserving the option of subsequent license renewal for energy-planning decisionmakers would be unreasonable. This preliminary recommendation is based on the following:

- the analysis and findings in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
- the environmental report submitted by NextEra

- the NRC staff's consultation with Federal, State, Tribal, and local governmental agencies
- the NRC staff's independent environmental review
- the NRC staff's consideration of public comments

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6 LIST OF PREPARERS

Members of the U.S. Nuclear Regulatory Commission's (NRC's) Office of Nuclear Reactor Regulation (NMSS) prepared this draft supplemental environmental impact statement with assistance from other NRC organizations. Table 6-1 identifies each contributor's name, education and experience, and function or expertise.

Table 6-1 List of Preparers

Name	Education and Experience	Function or Expertise
Briana Arlene	Masters Certification, National Environmental Policy Act; B.S. Conservation Biology; 16 years of experience in ecological impact analysis, Endangered Species Act Section 7 consultations, and Essential Fish Habitat consultations	Aquatic Resources, Special Status Species and Habitats, Microbiological Hazards; Endangered Species Act Section 7 Consultation; Essential Fish Habitat Consultation
Daniel Barnhurst	M.S. Geology; B.S. Environmental Geology; Licensed Professional Geologist; 18 years of experience with geological and environmental reviews	Groundwater Hydrology
Phyllis Clark	M.S. Nuclear Engineering; M.B.A Business Administration; B.S. Physics; 39 years of industry and Government experience including nuclear power plant and production reactor operations, systems engineering, reactor engineering, fuels engineering, criticality, power plant emergency response, and project management	Radiological Nonradiological Waste Management, Uranium Fuel Cycle, Spent Fuel, Postulated Accidents and Lead Project Manager
Peyton Doub	M.S. Plant Physiology (Botany); B.S. Plant Sciences (Botany); Duke NEPA Certificate; Professional Wetland Scientist; Certified Environmental Professional; 30 years of experience in terrestrial and wetland ecology and NEPA	Terrestrial Ecology, Land Use, and Visual Resources
Jerry Dozier	M.S. Reliability Engineering; M.B.A. Business Administration; B.S. Mechanical Engineering; 30 years of experience including operations, reliability engineering, technical reviews, and NRC branch management	Severe Accident Mitigation Alternative (SAMA), Postulated Accidents
Robert Elliott	B.S. Marine Engineering; Licensed Professional Engineer; 29 years of Government experience including containment systems analysis, balance of plant analysis, evaluation of integrated plant operations/technical specifications, and project management, with 13 years of management experience	Management Oversight

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Name	Education and Experience	Function or Expertise
Kevin Folk	M.S. Environmental Biology; B.A. Geoenvironmental Studies; 32 years of experience in NEPA compliance; geologic, hydrologic, and water quality impacts analysis; utility infrastructure analysis, environmental regulatory compliance; and water supply and wastewater discharge permitting	Geologic Environment, Cooling and Auxiliary Water Systems Surface Water Resources, Termination of Operations and Decommissioning
Lifeng Guo	Ph.D., M.S. Geology; B.S. Hydrogeology and Engineering Geology; Certified Professional Geologist; Over 30 years of combined experience in hydrogeologic investigation, remediation, and research.	Groundwater Hydrology
Robert Hoffman	B.S. Environmental Resource Management; 35 years of experience in NEPA compliance, environmental impact assessment, alternatives identification and development, and energy facility siting	Cumulative Impacts, Replacement Power Alternatives
Caroline Hsu	B.S. Molecular Biology; B.A. English Literature; 12 years of government experience; 3 years of management experience	Terrestrial Ecology, Land Use, and Visual Resources
Stacey Imboden	B.S. Meteorology; M.S. Environmental Engineering; 20 years of experience in NEPA reviews	Project Management
Nancy Martinez	B.S. Earth and Environmental Science; A.M. Earth and Planetary Science; 9 years of experience in environmental impact analysis	Air Quality, Meteorology and Climatology, Noise, Greenhouse Gases, Climate Change, Historic and Cultural Resources
Donald Palmrose	B.S. Nuclear Engineering; M.S. Nuclear Engineering; Ph.D. Nuclear Engineering; 34 years of experience including operations on U.S. Navy nuclear powered surface ships, technical and NEPA analyses, nuclear authorization basis support for DOE, and NRC project management.	Human Health
Jeffrey Rikhoff	M.R.P. Regional Planning; M.S. Economic Development and Appropriate Technology; B.A. English; 41 years of combined industry and Government experience including 33 years of NEPA compliance, socioeconomics and environmental justice impact analyses, cultural resource impact assessments, consultations with American Indian Tribes, and comprehensive land-use and development planning studies	Environmental Justice and Socioeconomics

7 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM THE NRC SENDS COPIES OF THIS SEIS

Table 7-1 List of Agencies, Organizations, and Persons to Whom the NRC Sends Copies of this SEIS

Name and Title	Affiliation and Address
Michael Strope Site Vice President	NextEra Energy Point Beach, LLC 6610 Nuclear Road Two Rivers, WI 54241
Elizabeth Poole Tribal and Multimedia Programs Office - NEPA Team	U.S. Environmental Protection Agency, Region 5 77 W. Jackson Blvd. Chicago, IL 60604 poole.elizabeth@epa.gov
Mr. Jason Knutson Wastewater Section Chief	Wisconsin Department of Natural Resources P.O. Box 7921 Madison, WI 53707-7921 Jason.Knutson@wisconsin.gov
Ms. Kate Angel	Wisconsin Coastal Management Program P.O. Box 8944 Madison, WI 53708 Kathleen.angel@wisconsin.gov
U.S. Fish and Wildlife Service	Green Bay Ecological Services Field Office 2661 Scott Tower Drive New Franken, WI 54229-9565
Mr. Reid Nelson Director	Office of Federal Agency Programs Advisory Council on Historic Preservation 401 F Street NW, Suite 308 Washington, DC 20001-2637
Ms. Daina Penkiunas State Historic Preservation Officer	State Historic Preservation Office Wisconsin Historical Society 816 State Street Madison, WI 53706
Tyler B. Howe, PhD State Archaeologist Compliance Section Manager	State Historic Preservation Office Wisconsin Historical Society 816 State Street Madison, WI 53706
Mr. Mike Wiggins, Jr. Chairman	Bad River Band of Lake Superior Chippewa P.O. Box 39 Odanah, WI 54861
Mr. John Barrett Chairman	Citizen Potawatomi Nation 1601 S. Gordon Cooper Drive Shawnee, OK 74801
Mr. Ned Daniels, Jr. Chairman	Forest County Potawatomi Community P.O. Box 340 Crandon, WI 54520
Mr. Andrew Werk Jr. President	Fort Belknap Indian Community 656 Agency Main Street Harlem, MT 59526

Table 7-1 List of Agencies, Organizations, and Persons to Whom the NRC Sends Copies of this SEIS (cont.)

Name and Title	Affiliation and Address
Mr. Kenneth Meshigaud Chairperson	Hannahville Indian Community N14911 Hannahville B-1 Road Wilson, MI 49896
Mr. Marlon WhiteEagle President	Ho-Chunk Nation P.O. Box 667 Black River Falls, WI 54615
Mr. Louis Taylor Chairman	Lac Courte Oreilles Band of Lake Superior Chippewa Indians 13394 West Trepania Road Building #1 Hayward, WI 54843
Mr. Joseph Wildcat, Sr. President	Lac Du Flambeau Band of Lake Superior Indians P.O. Box 67 Lac du Flambeau, WI 54538
Ms. Regina Gasco-Bentley Chairperson	Little Traverse Bay Bands of Odawa Indians 7500 Odawa Circle Harbor Springs, MI 49740
Mr. Bob Peters Chairman	Match-e-be-nash-she-wish Band of Pottawatomi 2872 Mission Drive Shelbyville, MI 49344
Ms. Joan Delabreau Chairman	Menominee Indian Tribe of Wisconsin P.O. Box 910 Keshena, WI 54135
Mr. Douglas G. Lankford Chief	Miami Tribe of Oklahoma P.O. Box 1326 Miami, OK 74355
Mr. Jamie Stuck Chairperson	Nottawaseppi Huron Band of the Potawatomi 1474 Mno-Bmadzewen Way Fulton, MI 49052
Mr. Tehassi Hill Chairman	Oneida Nation of Wisconsin P.O. Box 365 Oneida, WI 54155
Ms. Ethel E. Cook Chief	Ottawa Tribe of Oklahoma P.O. Box 110 Miami, OK 74355
Mr. Matt Wesaw Chairman	Pokagon Band of Potawatomi Indians P.O. Box 180 Dowagiac, Michigan 49047
Mr. Joseph Rupnick Chairperson	Prairie Band Potawatomi Nation 16281 Q Road Mayetta, KS 66509
Mr. Richard Peterson Chairman	Red Cliff Band of Lake Superior Chippewa Indians 88455 Pike Road, Bayfield, WI 54814
Mr. Robert VanZile, Jr. Chairman	Sokaogon Chippewa Community 3051 Sand Lake Road Crandon, WI 54520

Table 7-1 List of Agencies, Organizations, and Persons to Whom the NRC Sends Copies of this SEIS (cont.)

Name and Title	Affiliation and Address
Ms. Susan Lowe Chairwoman	St. Croix Chippewa Indians of Wisconsin 24663 Angeline Avenue Webster, WI 54893
Ms. Shannon Holsey President	Stockbridge-Munsee Community Band of Mohican Indians N8476 MohHeConNuck Road Bowler, WI 54416
Ms. Victoria Kitcheyan Chairwoman	Winnebago Tribe of Nebraska 100 Bluff Street Winnebago, NE 68071

[a] The NRC staff has listed the names of commenters during the scoping period in the scoping summary report (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21194A166). The staff sent a copy of this SEIS to those commenters who provided contact information. Appendix C, "Consultation Correspondence," lists the correspondences to agencies and Tribes, including distribution of the SEIS.

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APPENDIX A

COMMENTS RECEIVED ON THE POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2 ENVIRONMENTAL REVIEW

A COMMENTS RECEIVED ON THE POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2 ENVIRONMENTAL REVIEW

A.1 Comments Received During the Scoping Period

The U.S. Nuclear Regulatory Commission (NRC) staff began the scoping process for the environmental review of the Point Beach Nuclear Plant, Units 1 and 2 (Point Beach) subsequent license renewal application in February 2021, in accordance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) (NEPA). On February 1, 2021, the NRC published in the *Federal Register* a notice of intent to conduct an environmental scoping process for the proposed subsequent license renewal of Point Beach (86 FR 7747). In its notice of intent, the NRC requested that members of the public and stakeholders submit comments on the environmental review for the proposed subsequent license renewal of Point Beach to the Federal Rulemaking Web site at Regulations.gov.

The Point Beach scoping process also included a public meeting that was held on February 17, 2021. Because of the COVID-19 public health emergency, the public meeting took the form of an online webinar that was accessible by phone and computer. To advertise this public meeting, the NRC issued press releases, posted on NRC social media and on the NRC public Web site, and purchased newspaper advertisements in the *Manitowoc Herald Times Reporter*. In addition to the NRC staff, NextEra staff, local officials, and members of the public attended the public meeting. After the NRC staff presented its prepared statements on the license renewal process, the staff opened the meeting for public comments. Attendees made oral statements that were recorded and transcribed by a certified court reporter. A summary and a transcript of the public scoping meeting are available in the NRC's Agencywide Documents Access and Management System (ADAMS) under Accession No. ML21075A333. The ADAMS Public Electronic Reading Room is accessible at https://www.nrc.gov/reading-rm/adams.html.

At the conclusion of the scoping period, the NRC staff issued the Point Beach Scoping Summary Report, dated August 2021 (ADAMS Accession No. ML21194A166). The report contains (a) comments received during the public meeting and through Regulations.gov, (b) public comments grouped by subject area, and (c) NRC staff responses to those comments.

APPENDIX B

APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

B APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

There are several Federal laws and regulations that affect environmental protection, health, safety, compliance, and consultation at every NRC-licensed nuclear power plant. Some of these laws and regulations require permits by or consultations with other Federal agencies or State, Tribal, or local governments. Certain Federal environmental requirements have been delegated to state authorities for enforcement and implementation. Furthermore, States have also enacted laws to protect public health and safety and the environment. It is the NRC's policy to make sure nuclear power plants are operated in a manner that provides adequate protection of public health and safety and protection of the environment through compliance with applicable Federal and state laws, regulations, and other requirements, as appropriate.

The Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.) (AEA), authorizes the NRC to enter into an agreement with any state that allows the state to assume regulatory authority for certain activities (see 42 U.S.C. 2021). A state that enters into such an agreement with the NRC is called an Agreement State. Wisconsin is one such NRC Agreement State. In Wisconsin, the Department of Health Services Division of Public Health has regulatory responsibility over certain byproduct, source, and quantities of special nuclear materials not sufficient to form a nuclear critical mass.

In addition to carrying out some Federal programs, state legislatures develop their own laws. state statutes can supplement, as well as implement, Federal laws for protection of air, surface water, and groundwater. State legislation may address solid waste management programs, locally rare or endangered species, and historic and cultural resources.

The U.S. Environmental Protection Agency (EPA) has the primary responsibility to administer the Clean Water Act (33 U.S.C. 1251 et seq.) (CWA). The National Pollutant Discharge Elimination System (NPDES) program addresses water pollution by regulating the discharge of potential pollutants to waters of the United States. The CWA, as administered by the EPA, allows for primary enforcement and administration through state agencies, as long as the state program is at least as stringent as the Federal program.

The EPA has delegated the authority to issue NPDES permits to the State of Wisconsin, which uses the terminology Wisconsin Pollutant Discharge Elimination System (WPDES) permits. The Wisconsin Coastal Management Program provides oversight for public water supplies, provides permits to regulate the discharge of industrial and municipal wastewaters—including discharges to groundwater—and monitors State water resources for water quality.

B.1 Federal and State Requirements

Point Beach Nuclear Plant, Units 1 and 2 (Point Beach), is subject to various Federal and State requirements. Table B-1 lists the principal Federal and State regulations and laws that are used or mentioned in this supplemental environmental impact statement (SEIS) for Point Beach.

1 **Table B-1 Federal and State Requirements**

Law or Regulation	Requirements
	Current Operating License and License Renewal
Atomic Energy Act, 42 U.S.C. 2011 et seq.	The Atomic Energy Act (AEA) of 1954, as amended, and the Energy Reorganization Act of 1974 (42 U.S.C. 5801 et seq.) give the NRC the licensing and regulatory authority for commercial nuclear energy use. They allow the NRC to establish dose and concentration limits for protection of workers and the public for activities under NRC jurisdiction. The NRC implements its responsibilities under the AEA through regulations set forth in Title 10, "Energy," of the *Code of Federal Regulations* (CFR).
National Environmental Policy Act of 1969, 42 U.S.C. 4321 et seq.	The National Environmental Policy Act (NEPA), as amended, requires Federal agencies to integrate environmental values into their decisionmaking process by considering the environmental impacts of proposed Federal actions and reasonable alternatives to those actions. NEPA establishes policy, sets goals (in Section 101), and provides means (in Section 102) for carrying out the policy. NEPA Section 102(2) contains action-forcing provisions to ensure that Federal agencies follow the letter and spirit of the Act. For major Federal actions significantly affecting the quality of the human environment, Section 102(2)(C) of NEPA requires Federal agencies to prepare a detailed statement that includes the environmental impacts of the proposed action and other specified information.
10 CFR Part 20	Regulations in 10 CFR Part 20, "Standards for Protection Against Radiation," establish standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the NRC. These regulations are issued under the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended. The purpose of these regulations is to control the receipt, possession, use, transfer, and disposal of licensed material by any licensee in such a manner that the total dose to an individual (including doses resulting from licensed and unlicensed radioactive material and from radiation sources other than background radiation) does not exceed the standards for protection against radiation prescribed in the regulations in this part.
10 CFR Part 50	Regulations in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," are NRC regulations issued under the Atomic Energy Act, as amended, and Title II of the Energy Reorganization Act of 1974, to provide for the licensing of production and utilization facilities, including power reactors.
10 CFR Part 51	Regulations in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," contain the NRC's regulations that implement NEPA.
10 CFR Part 54	NRC regulations in 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," govern the issuance of renewed operating licenses and renewed combined licenses for nuclear power plants licensed under Sections 103 or 104b of the AEA, as amended, and Title II of the Energy Reorganization Act of 1974. The regulations focus on managing adverse effects of aging. The rule is intended to ensure that important systems, structures, and components will continue to perform their intended functions during the period of extended operation.

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Table B-1 Federal and State Requirements (cont.)

Law or Regulation	Requirements
Air Quality Protection	
Clean Air Act, 42 U.S.C. 7401 et seq.	The Clean Air Act (CAA) is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." The CAA establishes regulations to ensure maintenance of air quality standards and authorizes individual States to manage permits. Section 118 of the CAA requires each Federal agency, with jurisdiction over properties or facilities engaged in any activity that might result in the discharge of air pollutants, to comply with all Federal, State, inter-State, and local requirements with regard to the control and abatement of air pollution. Section 109 of the CAA directs the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for criteria pollutants. The EPA has identified and set NAAQS for the following criteria pollutants: particulate matter, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead. Section 111 of the CAA requires the establishment of national performance standards for new or modified stationary sources of atmospheric pollutants. Section 160 of the CAA requires that specific emission increases must be evaluated before permit approval to prevent significant deterioration of air quality. Section 112 requires specific standards for release of hazardous air pollutants (including radionuclides). These standards are implemented through plans developed by each state and approved by the EPA. The CAA requires sources to meet standards and obtain permits to satisfy those standards. Nuclear power plants may be required to comply with the CAA Title V, Sections 501–507, for sources subject to new source performance standards or sources subject to National Emission Standards for Hazardous Air Pollutants. EPA regulates the emissions of air pollutants using 40 CFR Parts 50 to 99.
Water Resources Protection	
Clean Water Act, 33 U.S.C. 1251 et seq., and the NPDES (40 CFR 122)	The Clean Water Act (CWA) was enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's water." The Act requires all branches of the Federal Government with jurisdiction over properties or facilities engaged in any activity that might result in a discharge or runoff of pollutants to surface waters, to comply with Federal, State, inter-State, and local requirements. As authorized by the CWA, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The NPDES program requires all facilities that discharge pollutants from any point source into waters of the United States to obtain an NPDES permit. A nuclear power plant may also participate in the NPDES General Permit for Industrial Stormwater due to stormwater runoff from industrial or commercial facilities to waters of the United States. EPA is authorized under the CWA to directly implement the NPDES program; however, EPA has authorized many States to implement all or parts of the national program. Section 401 of the CWA requires States to certify that the permitted discharge would comply with all limitations necessary to meet established state water quality standards, treatment standards, or schedules of compliance. The U.S. Army Corps of Engineers (USACE) is the lead agency for enforcement of CWA wetland requirements (33 CFR Part 320, "General Regulatory Policies"). Under Section 401 of the CWA, EPA or a delegated state agency has the authority to review and approve, condition, or deny all permits or licenses that might result in a discharge to waters of the State, including wetlands.

Table B-1 Federal and State Requirements (cont.)

Law or Regulation	Requirements
Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451 et seq.)	Congress enacted the Coastal Zone Management Act (CZMA) in 1972 to address the increasing pressures of over-development upon the Nation's coastal resources. The National Oceanic and Atmospheric Administration administers the Act. The CZMA encourages States to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. Participation by States is voluntary. To encourage States to participate, the CZMA makes Federal financial assistance available to any coastal state or territory, including those on the Great Lakes, as long as the state or territory is willing to develop and implement a comprehensive coastal management program.
Waste Management and Pollution Prevention	
Resource Conservation and Recovery Act, 42 U.S.C. 6901 et seq.	The Resource Conservation and Recovery Act (RCRA) requires EPA to define and identify hazardous waste; establish standards for its transportation, treatment, storage, and disposal; and require permits for persons engaged in hazardous waste activities. Section 3006, "Authorized State Hazardous Waste Programs" (42 U.S.C. 6926), allows States to establish and administer these permit programs with EPA approval. EPA regulations implementing RCRA are found in 40 CFR Parts 260 through 283. Regulations imposed on a generator or on a treatment, storage, and/or disposal facility vary according to the type and quantity of material or waste generated, treated, stored, and/or disposed. The method of treatment, storage, and/or disposal also impacts the extent and complexity of the requirements.
Pollution Prevention Act, 42 U.S.C. 13101 et seq.	The Pollution Prevention Act establishes a national policy for waste management and pollution control that focuses first on source reduction, then on environmental issues, safe recycling, treatment, and disposal.
Protected Species	
Endangered Species Act, 16 U.S.C. 1531 et seq.	The Endangered Species Act (ESA) was enacted to prevent the further decline of endangered and threatened species and to restore those species and their critical habitats. Section 7, "Interagency Cooperation," of the Act requires Federal agencies to consult with the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) on Federal actions that may affect listed species or designated critical habitats.
Magnuson–Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 et seq.	The Magnuson–Stevens Fishery Conservation and Management Act, as amended, governs marine fisheries management in U.S. Federal waters. The Act created eight regional fishery management councils and includes measures to rebuild overfished fisheries, protect essential fish habitat, and reduce bycatch. Under Section 305 of the Act, Federal agencies are required to consult with the National Marine Fisheries Service for any Federal actions that may adversely affect essential fish habitat.

Table B-1 Federal and State Requirements (cont.)

Law or Regulation	Requirements
	Historic Preservation and Cultural Resources
National Historic Preservation Act, 54 U.S.C. 100101 et seq. (formerly 16 U.S.C. 470 et seq.)	The National Historic Preservation Act was enacted to create a national historic preservation program, including the National Register of Historic Places and the Advisory Council on Historic Preservation (ACHP). Section 106 of the Act requires Federal agencies to take into account the effects of their undertakings on historic properties. The Advisory Council on Historic Preservation regulations implementing Section 106 of the Act are found in 36 CFR Part 800, "Protection of Historic Properties." The regulations call for public involvement in the Section 106 consultation process, including involvement from Indian Tribes and other interested members of the public, as applicable.

B.2 Operating Permits and Other Requirements

Table B-2 lists the permits and licenses issued by Federal, State, and local authorities for activities at Point Beach, as identified in Chapter 9 of NextEra's Environmental Report.

Table B-2 Operating Permits and Other Requirements

Permit	Responsible Agency	Number	Expiration Date	Authorized Activity
Point Beach Nuclear License to Operate Unit 1	NRC	DPR-24	10/5/2030	Operation of Unit 1
Point Beach Nuclear License to Operate Unit 2	NRC	DPR-27	3/8/2033	Operation of Unit 2
General license for storage of spent fuel at power reactor sites	NRC	General Permit	NA	Storage of power reactor spent fuel and other associated radioactive materials in an ISFSI.
Notification of Regulated Waste Activity	EPA	EPA ID Number: WID093422657	NA	Hazardous Waste Generation and Transport
Clean Water Act Section 404	USACE	MVP-2014-01045-SJW	3/18/2022	Permit to perform bank stabilization activities on the shoreline of Lake Michigan at PBN.
Generator Site Access Permit	State of Utah DEQ	0906005280	7/26/2022	Radioactive waste disposal at site in Utah
License to ship radioactive material	TN Dept. of Environment and Conservation	T-WI002-L21	12/31/2021	Shipment of radioactive material to processing facility in Tennessee.
Hazardous waste transportation/ shipment	U.S. Department of Transportation	051121550052D	6/30/2022	Hazardous materials shipments

Table B-2 Operating Permits and Other Requirements (cont.)

Permit	Responsible Agency	Number	Expiration Date	Authorized Activity
Underground Storage Tank Registration	WI Department of Commerce	Owner ID: 1114232 Site ID: 652382 Tank IDs: 285454, 764837, 764843	NA	Storage of flammable material in underground tanks
Aboveground Storage Tank Registration	WI Department of Commerce	Owner ID: 1114232 Site ID: 652382. Tank IDs: 206578, 206579, 206581, 206582, 206583, 206615, 206616, 206690, 455264, 455274, 1131794, 1131800, 1131801, 1131802, 1131803, 1131804, 1131805, 1131806, 1131807, 1325478, 1325484, 1370484, 1599013		Storage of flammable material in aboveground tanks
Scientific Collectors Permit	WDNR	SCP-FM-2021-006	Expires 12/31/2021	Collection of fish for scientific purposes.
Permit	WDNR	IP-NE-2019-36-03112	10/23/2024	Permit to install riprap on the banks of Lake Michigan at PBN.
Individual WPDES permit	WDNR	WI-0000957-08-0	6/30/2021 (Applied for under current permit, awaiting new permit)	PBN discharges to Lake Michigan
General WPDES industrial stormwater discharge permit (Tier 2)	WDNR	WI-S067857-5	6/2/2025	Stormwater runoff from industrial facilities.

Table B-2 Operating Permits and Other Requirements (cont.)

Permit	Responsible Agency	Number	Expiration Date	Authorized Activity
Air Pollution Control Operation Permit and Air Operation Permit Compliance Certification	WDNR	436034500-P32	7/6/2022	Air emissions from gas turbines, boilers, generators, and fire pumps; certification that PBN complies with Wisconsin's administrative code.
Registration	WDNR	61469 60465 61745	5/1/2022 2/1/2024 11/1/2021	Non-transient non-community water supply registration/ small water system operator certification.
Registration/License	WDNR	Laboratory ID: 436034500	Expect confirmation of permit renewal in August 2021; Expected Expiration 8/31/2022	Registers NextEra Point Beach as a laboratory licensed to perform environmental sample analysis in support of covered environmental programs.
Drinking water/ groundwater wells	WDNR	36-3-0017, Approval numbers: 52826, 68865, 52824, 71777, 01176	NA	Approval for high-capacity well with listing of previously approved wells.
Registration to withdrawal water in an amount averaging 100,000 gallons per day or more in any 30-day period from the Great Lakes Basin	WDNR	10208	5/23/2023	Groundwater withdrawal for use as potable, process, and cooling water.
Authorization to operate a wastewater treatment plant	WDNR	23750 18490 34859	7/1/2024 12/1/2023 5/1/2022	Wastewater treatment plant operating permit.
Manitowoc County Zoning Ordinance	Manitowoc County	66-66	NA	Use of property for electric power plant.

NA = not applicable

Source: NextEra 2021c

APPENDIX C

CONSULTATION CORRESPONDENCE

C CONSULTATION CORRESPONDENCE

C.1 Endangered Species Act Section 7 Consultation

As a Federal agency, the U.S. Nuclear Regulatory Commission (NRC) must comply with the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA), as part of any action authorized, funded, or carried out by the agency. In this case, the proposed agency action is whether to issue subsequent renewed licenses for the continued operation of Point Beach Nuclear Plant, Units 1 and 2 (Point Beach). The proposed action would authorize NextEra Energy Point Beach, LLC (NextEra) to operate Point Beach for an additional 20 years beyond the current renewed license term. Under Section 7 of the ESA, the NRC must consult with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) ("the Services" (collectively) or "Service" (individually)), as appropriate, to ensure that the proposed action is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

C.2 Federal Agency Obligations under Section 7 of the Endangered Species Act

The ESA and the regulations that implement ESA Section 7 at Title 50 of the *Code of Federal Regulations* (50 CFR) Part 402 describe the consultation process that Federal agencies must follow in support of agency actions. As part of this process, the Federal agency shall either request that the Services (1) provide a list of any listed or proposed species or designated or proposed critical habitats that may be present in the action area or (2) request that the Services concur with a list of species and critical habitats that the Federal agency has created (50 CFR 402.12(c)). If any such species or critical habitats may be present, the Federal agency prepares a biological assessment to evaluate the potential effects of the action and determine whether the species or critical habitats are likely to be adversely affected by the action (50 CFR 402.12(a); 16 U.S.C. 1536(c)).

Biological assessments are required for any agency action that is a "major construction activity" (50 CFR 402.12(b)). A major construction activity is a construction project or other undertaking having construction-type impacts that is a major Federal action significantly affecting the quality of the human environment under the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.) (NEPA) (51 FR 19926). Federal agencies may fulfill their obligations to consult with the Services under ESA Section 7 and to prepare a biological assessment, if required, in conjunction with the interagency cooperation procedures required by other statutes, including NEPA (50 CFR 402.06(a)). In such cases, the Federal agency should include the results of ESA Section 7 consultation(s) in the NEPA document (50 CFR 402.06(b)).

C.3 Biological Evaluation

Subsequent license renewal does not require the preparation of a biological assessment because it is not a major construction activity. Nonetheless, the NRC staff must consider the impacts of its actions on federally listed species and designated critical habitats. In cases where the staff finds that subsequent license renewal "may affect" ESA-protected species or habitats, ESA Section 7 requires the NRC to consult with the relevant Service(s).

To support such consultations, the NRC staff has incorporated its analysis of the potential impacts of the proposed subsequent license renewal into Section 3.8 of this supplemental environmental impact statement (SEIS). The NRC staff refers to its ESA analysis as a "biological evaluation."

The NRC staff structured its evaluation in accordance with the Services' suggested biological assessment contents described at 50 CFR 402.12(f). Section 3.8.1 of this SEIS describes the action area as well as the ESA-protected species and habitats potentially present in the action area. Section 3.8.2 assesses the potential effects of the proposed subsequent license renewal on the ESA-protected species and habitats present in the action area and contains the NRC's effect determinations for each of those species and habitat. This section also addresses cumulative effects. Finally, Sections 3.8.3 through 3.8.6 address the potential effects of the no-action alternative and the replacement power alternatives.

C.4 Chronology of Endangered Species Act Section 7 Consultation

Endangered Species Act Section 7 Consultation with the U.S. Fish and Wildlife Service

As part of its environmental review, the NRC staff considered whether any federally listed, proposed, or candidate species or proposed or designated critical habitats may be present in the action area (as defined at 50 CFR 402.02 and described in Section 3.8.1.1 of this SEIS) for the proposed action of Point Beach subsequent license renewal. With respect to species under the FWS's jurisdiction, the NRC staff submitted project information to the FWS's Environmental Conservation Online System Information for Planning and Conservation system. The FWS provided the NRC with a list of threatened and endangered species that may occur in the action area. The list included two species: the northern long-eared bat (*Myotis septentrionalis*) and the piping plover (*Charadrius melodus*). In addition to these species, the NRC considered whether federally listed species assessed in previous NRC reviews in connection with Point Beach actions were relevant to the current review. However, the NRC staff determined that those species had been delisted or did not have the potential to occur in the action area based on available survey or ecological information. The staff also performed a preliminary analysis of piping plover critical habitat. Critical habitat Unit WI-5 lies approximately 3 mi (5 km) south of the Point Beach action area. However, the staff determined that this critical habitat is not relevant to the current subsequent license renewal review because it is outside of the action area and would be unaffected by the proposed action.

The NRC staff evaluated the potential impacts of the proposed action on northern long-eared bat and piping plover in Section 3.8.2 of this SEIS. The staff concluded that the proposed license renewal *may affect but is not likely to adversely affect* these species.

In a letter dated February 9, 2021, the FWS concurred with the northern long-eared bat determination, based on the basis that activities associated with the proposed subsequent license renewal with the potential to affect the northern long-eared bat are consistent with the activities analyzed in a 2016 programmatic biological opinion. The FWS's February 9, 2021, letter documents that the NRC staff has fulfilled its ESA Section 7(a)(2) obligations with respect to this species.

Following issuance of this draft SEIS, the NRC staff will submit a request to the FWS for concurrence with the staff's determination concerning the piping plover. Results of this consultation will be documented in the final SEIS.

Table C-1 lists the correspondence relevant to the NRC's ESA Section 7 consultation with the FWS.

Table C-1 Endangered Species Act Section 7 Consultation Correspondence with the U.S. Fish and Wildlife Service

Date	Description	ADAMS Accession No.[a]
Feb 9, 2021	Wisconsin Ecological Services Field Office (FWS) to NRC, List of threatened and endangered species for the proposed Point Beach subsequent license renewal	ML21040A484
Feb 9, 2021	Wisconsin Ecological Services Field Office (FWS) to NRC, Verification letter for the proposed Point Beach subsequent license renewal under the January 5, 2016, programmatic biological opinion on final 4(d) rule for northern long-eared bat and activities excepted from take prohibition	ML21040A485

[a] These documents are accessible through the NRC's Agencywide Documents Access and Management System (ADAMS) at https://adams.nrc.gov/wba/ .

Endangered Species Act Section 7 Consultation with the National Marine Fisheries Service

As discussed in Sections 3.8.1.3 and 3.8.2.3 of this SEIS, no federally listed species or critical habitats under NMFS's jurisdiction occur within the action area. Therefore, the NRC did not engage the NMFS pursuant to ESA Section 7 for the proposed Point Beach subsequent license renewal.

C.5 Magnuson–Stevens Act Essential Fish Habitat Consultation

The NRC must comply with the Magnuson–Stevens Fishery Conservation and Management Act of 1996, as amended (16 U.S.C. Section 1801 et seq.) (MSA), for any actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect any essential fish habitat (EFH) identified under the MSA.

In Sections 3.8.1.4 and 3.8.2.4 of this SEIS, the NRC staff concludes that the NMFS has not designated any EFH under the MSA in Lake Michigan and that the proposed Point Beach subsequent license renewal would have no effect on EFH. Thus, the MSA does not require the NRC to consult with the NMFS for the proposed action.

C.6 National Marine Sanctuaries Act Consultation

The National Marine Sanctuaries Act of 1966, as amended (16 U.S.C. 1431 et seq.), authorizes the Secretary of Commerce to designate and protect areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, or aesthetic qualities as national marine sanctuaries. Under Section 304(d) of the act, Federal agencies must consult with the National Oceanic and Atmospheric Administration's (NOAA) Office of National Marine Sanctuaries if a Federal action is likely to destroy, cause the loss of, or injure any sanctuary resources.

In Sections 3.8 and 4.8 of the SEIS, the NRC staff considers the potential effects of the Point Beach subsequent license renewal on sanctuary resources of the Wisconsin Shipwreck Coast National Marine Sanctuary. The NRC staff determined in Section 3.8.2.5 of this SEIS that the proposed Point Beach subsequent license renewal would not affect sanctuary resources. The NRC staff concludes that the proposed action is not likely to destroy, cause the loss of, or injure any sanctuary resources. Therefore, consultation is not required and the NRC staff considers its obligations related to consultation under Section 304(d) of the National Marine Sanctuaries Act to be fulfilled with respect to the proposed Point Beach subsequent license renewal.

C.7 National Historic Preservation Act Section 106 Consultation

The National Historic Preservation Act of 1966, as amended (54 U.S.C. 100101 et seq.) (NHPA), requires Federal agencies to consider the effects of their undertakings on historic properties and consult with applicable state and Federal agencies, Tribal groups, individuals, and organizations with a demonstrated interest in the undertaking before taking action. Historic properties are defined as resources that are eligible for listing on the National Register of Historic Places. The historic preservation review process (Section 106 of the NHPA) is outlined in regulations issued by the Advisory Council on Historic Preservation (ACHP) in 36 CFR Part 800, "Protection of Historic Properties." In accordance with 36 CFR 800.8(c), "Use of the NEPA Process for Section 106 Purposes," the NRC has elected to use the NEPA process to comply with its obligations under Section 106 of the NHPA.

Table C-2 lists the chronology of consultation and consultation documents related to the NRC's NHPA Section 106 review of the proposed Point Beach subsequent license renewal. The NRC staff is required to consult with the noted agencies and organizations in accordance with the above discussion.

Table C-2 National Historic Preservation Act Correspondence

Date	Sender and Recipient	Description	ADAMS Accession No.[(a)]
2/1/2021	R. Elliott (NRC) to R. Nelson, Director, Office of Federal Agency Programs, Advisory Council on Historic Preservation	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A315
2/1/2021	R. Elliott (NRC) to D. Penkiunas, State Historic Preservation Officer, Wisconsin Historical Society	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Units 1 and 2 Subsequent License Renewal Application	ML21022A316
2/1/2021	R. Elliott (NRC) to M. Wiggins, Chairman, Bad River Band of Lake Superior Chippewa	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to J. Barrett, Chairman, Citizen Potawatomi Nation	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312

Table C-2 National Historic Preservation Act Correspondence (cont.)

Date	Sender and Recipient	Description	ADAMS Accession No.[(a)]
2/1/2021	R. Elliott (NRC) to N. Daniels, Jr., Chairman, Forest County Potawatomi Community	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to A. Werk Jr., President, Fort Belknap Indian Community	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to K. Meshigaud, Chairperson, Hannahville Indian Community	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to M. WhiteEagle, President, Ho-Chunk Nation	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Units 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to L. Taylor, Chairman, Lac Courte Oreilles Band of Lake Superior Chippewa Indians	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to J. Wildcat, Sr., President, Lac Du Flambeau Band of Lake Superior Indians	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to R. Gasco-Bentley, Chairperson, Little Traverse Bay Bands of Odawa Indians	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312

Table C-2 National Historic Preservation Act Correspondence (cont.)

Date	Sender and Recipient	Description	ADAMS Accession No.[a]
2/1/2021	R. Elliott (NRC) to B. Peters, Chairman, Match-e-be-nash-she-wish Band of Pottawatomi	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to J. Delabreau, Chairman, Menominee Indian Tribe of Wisconsin	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to D. Lankford, Chief, Miami Tribe of Oklahoma	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to J. Stuck, Chairperson, Nottawaseppi Huron Band of Potawatomi	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to T. Hill, Chairman, Oneida Nation of Wisconsin	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to E. Cook, Chief, Ottawa Tribe of Oklahoma	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to M. Wesaw, Chairman, Pokagon Band of Potawatomi Indians	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312

Table C-2 National Historic Preservation Act Correspondence (cont.)

Date	Sender and Recipient	Description	ADAMS Accession No.[a]
2/1/2021	R. Elliott (NRC) to J. Rupnick, Chairperson, Prairie Band of Potawatomi Nation	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to R. Peterson, Chairman, Red Cliff Band of Lake Superior Chippewa Indians	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to R. VanZile, Jr., Chairman, Sokaogon Chippewa Community	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to S. Lowe, Chairwoman, St. Croix Chippewa Indians of Wisconsin	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to S. Holsey, President, Stockbridge-Munsee Community Band of Mohican Indians	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
2/1/2021	R. Elliott (NRC) to V. Kitchenyan, Chairman, Winnebago Tribe of Nebraska	Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21022A312
3/5/2021	T. Howe, State Archaeologist, Wisconsin Historical Society to N. Martinez (NRC)	Response to NRC Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Units 1 and 2 Subsequent License Renewal Application	ML21069A220

Table C-2 National Historic Preservation Act Correspondence (cont.)

Date	Sender and Recipient	Description	ADAMS Accession No.[(a)]
3/8/2021	D. Hunter, Tribal Historic Preservation Officer, Miami Tribe of Oklahoma	Response to NRC Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Unit Nos. 1 and 2 Subsequent License Renewal Application	ML21069A224
3/18/2021	D. Taylor, Tribal Historic Preservation Officer, Nottawaseppi Huron Band of Potawatomi	Response to NRC Request for Scoping Comments Concerning the Environmental Review of Point Beach Nuclear Plant, Units 1 and 2 Subsequent License Renewal Application	ML21077A197
3/19/2021	N. Martinez (NRC) to D. Hunter, Tribal Historic Preservation Officer, Miami Tribe of Oklahoma	Response to Scoping Comments	ML21082A024
10/5/2021	T. Howe, State Archaeologist, Wisconsin Historical Society to N. Martinez and R. Hoffman (NRC)	SHPO Review Point Beach Nuclear Plant Relicensing	ML21279A120

(a) These documents are accessible through the NRC's Agencywide Documents Access and Management System (ADAMS) at https://adams.nrc.gov/wba/

APPENDIX D

CHRONOLOGY OF ENVIRONMENTAL REVIEW CORRESPONDENCE

D CHRONOLOGY OF ENVIRONMENTAL REVIEW CORRESPONDENCE

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and external parties as part of the agency's environmental review of the Point Beach Nuclear Plant Units 1 and 2 (Point Beach) subsequent license renewal application. This appendix does not include consultation correspondence or comments received during the scoping process. For a list and discussion of consultation correspondence, see Appendix C of this supplemental environmental impact statement (SEIS). For scoping comments, see Appendix A of this SEIS and the NRC's, "Scoping Summary Report" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21194A166. All documents are available electronically from the NRC's Public Electronic Reading Room at https://www.nrc.gov/reading-rm.html. From this site, the public can gain access to ADAMS, which provides text and image files of the NRC's public documents. The ADAMS accession number for each document is included in the following table.

D.1 Environmental Review Correspondence

Table D-1 lists the environmental review correspondence, by date, beginning with the request by NextEra for subsequent renewal of the operating licenses for Point Beach.

Table D-1 Environmental Review Correspondence

Date	Correspondence Description	ADAMS Accession No.
11/16/2020	Point Beach Nuclear Plant, Units 1 and 2–Transmittal Letter regarding Application for Subsequent License Renewal	ML20329A293
11/16/2020	Point Beach Nuclear Plant, Units 1 and 2 Subsequent License Renewal Application	ML20329A247
11/16/2020	Appendix E: Applicant's Environmental Report Subsequent Operating License Renewal Point Beach Nuclear Plant, Units 1 and 2	ML20329A248
12/22/2020	Letter from NRC to NextEra regarding receipt and availability of Point Beach subsequent license renewal application	ML20328A075
1/8/2021	E-mail from NRC to NextEra transmitting acceptance of Point Beach Nuclear Plant, Units 1 and 2 Subsequent License Renewal Application for docketing	ML21012A365
1/15/2021	Point Beach Nuclear Plant, Units 1 and 2–Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Notice of Opportunity to Request a Hearing Regarding the NextEra Energy Point Beach, LLC Application For Subsequent License Renewal (EPID NO. L-2020-SLR-0002)	ML21006A417
1/15/2021	Point Beach Units 1 and 2 Subsequent License Renewal Application Online Reference Portal	ML21005A058
1/22/2021	*Federal Register* Notice for Opportunity to Request a Hearing and Petition for Leave to Intervene	ML21015A214; 86 FR 6684
1/26/2021	Meeting Notice: Environmental Scoping Meeting Related to the Point Beach Nuclear Plant, Unit Nos. 1 and 2 (Point Beach), Subsequent License Renewal Application	ML21034A458

1 **Table D-1 Environmental Review Correspondence (cont.)**

Date	Correspondence Description	ADAMS Accession No.
1/26/2021	Point Beach Nuclear Plant, Unit Nos. 1 and 2: Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process	ML20351A392
2/1/2021	Federal Register Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process for Point Beach Nuclear Plant Units 1 and 2	ML20351A395; 86 FR 7747
2/8/2021	Letter to Wisconsin Department of Natural Resources regarding Point Beach Nuclear Plant, Units 1 and 2, Clean Water Act Section 401 Permit	ML21033B090
2/17/2021	Environmental Scoping Meeting Related to Point Beach Nuclear Plant, Units 1 and 2, Meeting Presentation Slides	ML21042B945
3/3/2021	Environmental Scoping Comments from EPA Region 5	ML21069A228
3/15/2021	Site Audit Plan for Environmental Site Audit	ML21070A207
3/17/2021	Summary of February 17, 2021 Scoping Meeting	ML21075A333
5/10/2021	Letter from NextEra to NRC Document Control Desk transmitting Subsequent License Renewal Application- Environmental Report Supplement 1	ML21131A105
5/11/2021	Summary of Environmental Site Audit	ML21124A031
5/15/2021	Point Beach Nuclear Plant, Units 1 and 2, Requests for Confirmation of Information and Requests for Additional Information	ML21134A058; ML21134A061
6/10/2021	Point Beach Nuclear Plant, Units 1 and 2, Response to Requests for Confirmation of Information and Requests for Additional Information	ML21161A214
8/4/2021	Submittal of Subsequent License Renewal Application-Environmental Report Environmental Authorizations Update	ML21006A417
8/12/2021	Issuance of Scoping Summary Report	ML21194A166

APPENDIX E

PROJECTS AND ACTIONS CONSIDERED IN THE CUMULATIVE IMPACTS ANALYSIS

E PROJECTS AND ACTIONS CONSIDERED IN THE CUMULATIVE IMPACTS ANALYSIS

E.1 Overview

Table E-1 identifies other past, present, and reasonably foreseeable future projects and actions that the U.S. Nuclear Regulatory Commission (NRC) staff considered when analyzing potential cumulative environmental impacts related to the continued operation of Point Beach Nuclear Plant, Units 1 and 2 (Point Beach) for an additional 20 years. The staff generally considered projects and actions within a 30-mi (48-km) radius of the Point Beach site. The staff's analysis of potential cumulative impacts associated with the proposed action (subsequent license renewal) is presented in Section 3.16 of this supplemental environmental impact statement. However, because of the uniqueness of each environmental resource area evaluated and its associated geographic area of analysis, Section 3.16 does not consider or explicitly evaluate every project and action listed in Table E-1.

Table E-1 Projects and Actions NRC Staff Considered in the Point Beach Cumulative Impacts Analysis

Project Name	Summary of Project	Location (Relative to Point Beach)	Status
Onsite Facilities/Projects			
Point Beach Bank Stabilization Project	Installation of approximately 430 linear ft. (130 m) of shoreline riprap, and 1,200 linear ft (370 m) fill material to create offshore wave barrier/breakwater	Onsite, along, and in Lake Michigan	Project completed August 2020 (NextEra 2021)
Point Beach Solar Facility	Solar photovoltaic facility with 100 MW generating capacity on approximately 500 ac (200 ha)	Onsite, spread across multiple areas south, southwest, and northwest of the Point Beach power block	Under construction, with operations scheduled to commence in late 2021 (NextEra 2020, 2021; PSCW 2021a)
Two Creeks Solar Facility	Solar photovoltaic facility with 150 MW generating capacity on approximately 800 ac (320 ha)	Located primarily on acreage adjacent to the Point Beach site, with supporting components traversing portions of the property	Commenced operations in 2020 (NextEra 2020, 2021; PSCW 2021b; WSJ 2021)

Table E-1 Projects and Actions NRC Staff Considered in the Point Beach Cumulative Impacts Analysis (cont.)

Project Name	Summary of Project	Location (Relative to Point Beach)	Status
Nuclear Energy Facilities			
Kewaunee Power Station	Nuclear plant with 590 MW generating capacity from one unit	Carlton, WI, approximately 5 mi (8 km) north	Operating License terminated in 2013. Undergoing SAFSTOR decommissioning with estimated closure date of 2073 (NextEra 2020; NRC 2021)
Fossil Fuel Energy Facilities			
Manitowoc Plant	Petroleum and Biomass-fueled plant with 102 MW generating capacity from two units	Manitowoc County, approximately 15 mi (24 km) south-southwest	Operational (EIA 2021; EPA 2021)
Custer Energy Center	Natural gas-fueled peaking unit with 22 MW generating capacity	Brown County, approximately 17 mi (27 km) southwest	Operational (EIA 2021; EPA 2021)
De Pere Energy Center	Natural gas-fueled peaking unit with 16 MW generating capacity	Brown County, approximately 29 mi (46 km) northwest	Operational (EIA 2021; EPA 2021)
Georgia-Pacific Consumer Operations LLC	Natural gas-fueled unit with 79 MW generating capacity	Brown County, approximately 29 mi (46 km) northwest	Operational (EIA 2021; EPA 2021)
J.P. Pulliam Generating Station	Natural gas-fueled peaking unit with 80 MW generating capacity	Brown County, WI, approximately 29 mi (46 km) northwest	Operational; collocated coal units decommissioned in 2018 (EIA 2021; EPA 2021; GBPG 2021)
Fox Energy Center	Natural gas-fueled plant with 568 MW generating capacity from two units	Outagamie County, approximately 33 mi (56 km) west	Operational (EIA 2021; EPA 2021)
Renewable Energy Facilities			
Ridgeview	Landfill-gas (biomass)-fueled plant (at Ridgeview Landfill) with 6.4 MW generating capacity	Manitowoc County, approximately 16 mi (26 km) west-southwest	Operational (EIA 2021; EPA 2021)
Shirley Wind LLC	8-unit wind farm with 20 MW generating capacity	Brown County, approximately 20 mi (32 km) west-northwest	Operational (EIA 2021)
Rosiere Wind	17-unit wind farm with 11 MW generating capacity	Kewaunee County, approximately 27 mi (16 km) north-northwest	Operational (EIA 2021; MGE 2021)

Table E-1 Projects and Actions NRC Staff Considered in the Point Beach Cumulative Impacts Analysis (cont.)

Project Name	Summary of Project	Location (Relative to Point Beach)	Status
Dairyland WTE Biomass Plant	Waste-to-energy biomass-fueled facility with 1.4 MW generating capacity	Brown County, approximately 22 mi (36 km) northwest	Operational (EIA 2021; EPA 2021)
Mining and Manufacturing Facilities			
Badgerland Aggregates, LLC	Quarrying/Mining Operation	Two Rivers, WI, approximately 8 mi (13 km) west-southwest	Operational (EPA 2021; Badgerland Aggregates 2021)
Orion Energy Systems	Lighting System Manufacturer	Two Rivers, WI, approximately 8 mi (13 km) southwest	Operational (EPA 2021; Orion 2021)
Carmeuse Lime and Stone–Rockwell Operation	Quarrying/Mining Operation	Rockwood, WI, approximately 11 mi (18 km) southwest	Operational (EPA 2021)
Valders Stone and Marble	Quarrying/Mining Operation	Valders, WI, approximately 23 mi (36 km) south-southwest	Operational (EPA 2021; EVS 2017)
Broadwind Towers and Heavy Industries	Large-scale industrial metal fabrication	Manitowoc, WI, approximately 14 mi (23 km) south-southwest	Operational (EPA 2021; Broadwind 2021)
JBS Foods	Beef Packing/Production Facility	Green Bay, WI, approximately 29 mi (46 km) northwest	Operational (EPA 2021; JBS 2021)
Georgia-Pacific Corporation	Paper Product Manufacturer	Green Bay, WI, approximately 29 mi (46 km) northwest	Operational (EPA 2021; Georgia-Pacific 2021)
P&G Corporation	Paper Product Manufacturer	Green Bay, WI, approximately 29 mi (46 km) northwest	Operational (EPA 2021)
Landfills			
Ridgeview Recycling and Disposal	Municipal (nonhazardous) solid waste landfill	Whitelaw, WI, approximately 16 mi (26 km) west-southeast	Operational (WM 2021)
Water Supply and Treatment Facilities			
Two Rivers Waterworks	Municipal water supply with groundwater source	Two Rivers, WI, approximately 10 mi (16 km) south	Operational (EPA 2021; NextEra 2020)
Reedsville Waterworks	Municipal water supply with groundwater source	Reedsville, WI, approximately 21 mi (34 km) southwest	Operational (EPA 2021)

Table E-1 Projects and Actions NRC Staff Considered in the Point Beach Cumulative Impacts Analysis (cont.)

Project Name	Summary of Project	Location (Relative to Point Beach)	Status
Mishicot Waterworks	Municipal water supply with groundwater source	Mishicot, WI, approximately 6 mi (10 km) southwest	Operational (EPA 2021)
Manitowoc Public Utilities	Municipal water supply with surface water (Lake Michigan) source	Manitowoc, WI, approximately 15 mi (24 km) south-southwest	Operational (MPU 2021; NextEra 2020)
Cleveland Waterworks	Municipal water supply with groundwater source	Cleveland, WI, approximately 27 mi (44 km) south-southwest	Operational (EPA 2021)
Luxemburg Waterworks	Municipal water supply with groundwater source	Luxemburg, WI, approximately 20 mi (32 km) north-northwest	Operational (EPA 2021)
Demark Waterworks	Municipal water supply with groundwater source	Denmark, WI, approximately 15 mi (24 km) northwest	Operational (EPA 2021)
Central Brown County Water Authority	Municipal water authority supplying six member communities from surface water (Lake Michigan) source	Multiple locations within Brown County, WI	Operational (CBCWA 2021; NextEra 2020)
Green Bay Water Utility	Municipal water supply with surface water (Lake Michigan) source	Green Bay, WI, approximately 28 mi (46 km) northwest	Operational (GBWU 2021; NextEra 2020)
Two Rivers Wastewater Treatment Plant	Wastewater treatment plant	Two Rivers, WI, approximately 10 mi (16 km) south	Operational (EPA 2021; City of Two Rivers 2021)
Kewaunee Wastewater Treatment Plant	Wastewater treatment plant	Kewaunee, WI, approximately 13 mi (21 km) north-northeast	Operational (EPA 2021; City of Kewaunee 2021)
Manitowoc Wastewater Treatment Plant	Wastewater treatment plant	Manitowoc, WI, approximately 14 mi (23 km) south-southwest	Operational (EPA 2021; City of Manitowoc 2021)
Denmark Wastewater Treatment Plant	Wastewater treatment plant	Denmark, WI, approximately 15 mi (24 km) northwest	Operational (EPA 2021)
Whitelaw Wastewater Treatment Plant	Wastewater treatment plant	Whitelaw, WI, approximately 17 mi (28 km) southwest	Operational (EPA 2021)
Green Bay New Water Treatment Plant	Wastewater treatment plant	Green Bay, WI, approximately 28 mi (46 km) northwest	Operational (EPA 2021)

Table E-1 Projects and Actions NRC Staff Considered in the Point Beach Cumulative Impacts Analysis (cont.)

Project Name	Summary of Project	Location (Relative to Point Beach)	Status
De Pare New Water Treatment Plant	Wastewater treatment plant	De Pare, WI, approximately 28 mi (46 km) northwest	Operational (EPA 2021)
Parks and Recreation Sites			
Ice Age National Scenic Trail	Off-road hiking and backpacking trail winding for over 1,000 mi (1,600 km) along the former edge of the last continental glacier in Wisconsin	Nearest segment approximately 2 mi (3 km) south-southeast	Operational; Co-managed by the Wisconsin Department of Natural Resources, National Park Service, and Ice Age Trail Alliance (NextEra 2020; WDNR 2021a)
Pietroske Waterfowl Production Area	120-ac (48-ha) component of the National Wildlife Refuge System maintained for the benefit of migratory birds and other wildlife, and open to hunting, trapping, and fishing	Approximately 3 mi (5 km) south	Operational; Managed by the U.S. Fish and Wildlife Service (USFWS 2011; NextEra 2020)
Two Creeks Waterfowl Production Area	136-ac (55-ha) component of the National Wildlife Refuge System maintained for the benefit of migratory birds and other wildlife, and open to hunting, trapping, and fishing	Approximately 3 mi (5 km) west	Operational; Managed by the U.S. Fish and Wildlife Service (USFWS 2011; NextEra 2020)
Two Creeks Buried Forest State Natural Area	16-ac (6-ha) natural area featuring exposed geology along a steep bluff on Lake Michigan's western shore illustrating the effect of multiple historic glacial advances and retreats on this formerly forested area. Offering hiking, fishing, cross-country skiing, hunting, trapping, scientific research, and outdoor education opportunities	Approximately 3 mi (5 km) north	Operational; Managed by Wisconsin Department of Natural Resources (NextEra 2020; WDNR 2021b)
Point Beach State Forest	1,400-ac (570-ha) state forest featuring historic Rawley Point lighthouse, and offering hiking, biking, boating, swimming, picnicking, camping, hunting, and fishing	Approximately 4 mi (6 km) south	Operational; Managed by Wisconsin Department of Natural Resources (NextEra 2020; WDNR 2021c)

Table E-1 Projects and Actions NRC Staff Considered in the Point Beach Cumulative Impacts Analysis (cont.)

Project Name	Summary of Project	Location (Relative to Point Beach)	Status
Woodland Dunes State Natural Area	387-ac (156-ha) natural area featuring ridge and swale topography with a wide variety of tree and plant species, offering hiking and birding	Approximately 10 mi (16 km) south-southwest	Operational; Privately owned and managed by Woodland Dunes Nature Center (WDNR 2021d)
Cherney Maribel Caves County Park and State Natural Area	75 ac (30 ha) featuring several caves along a rugged cliff line that runs parallel with the West Twin River. Offering hiking caving, birding, and picnicking	Manitowoc County, Approximately 12 mi (19 km) west	Operational; Managed by Manitowoc Parks and Planning Commission (Manitowoc County 2021; NextEra 2020; WDNR 2021e)
Collins Marsh State Wildlife Area	4,200-ac (1,700-ha) property containing a wetland wildlife refuge and offering hiking, birding, canoeing, dog-training, snowmobiling, wild edibles gathering, hunting, trapping, and fishing	Approximately 24 mi (39 km) southwest	Operational; Managed by Wisconsin Department of Natural Resources (WDNR 2021f)
Holland State Wildlife Area	536-ac (216-ha) property consisting of bottomland hardwood forest, cedar forest, and open grassland. Offering hunting, trapping, skiing, hiking, birding, and wild edibles gathering	Approximately 25 mi (40 km) west	Operational; Managed by Wisconsin Department of Natural Resources (WDNR 2021g)
Brillion State Wildlife Area	4,800-ac (1,940-ha) property consisting primarily of bottomland hardwoods, prairie, marsh, and wetlands, and offering hiking, birding, canoeing, skiing, dog-training, snowmobiling, wild edibles gathering, hunting, trapping, and model airplane flying	Approximately 28 mi (45 km) southwest	Operational; Managed by Wisconsin Department of Natural Resources (WDNR 2021h)
Killsnake State Wildlife Area	7,000-ac (2,830-ha) property consisting primarily of prairie grasslands, uplands with large wetland-grassland complex, and bottomland hardwood forest. Offering birding, canoeing, skiing, hiking, hunting, trapping, and wild edibles gathering	Approximately 29 mi (47 km) southwest	Operational; Managed by Wisconsin Department of Natural Resources (WDNR 2021i)

Table E-1 Projects and Actions NRC Staff Considered in the Point Beach Cumulative Impacts Analysis (cont.)

Project Name	Summary of Project	Location (Relative to Point Beach)	Status
Wisconsin Shipwreck Coast National Marine Sanctuary	962 square mile sanctuary containing nationally significant underwater cultural resources	Offshore of Point Beach property; encompasses a portion of the waters and submerged lands of Lake Michigan adjacent to Kewaunee, Manitowoc, Ozaukee, and Sheboygan counties	Final Rule implementing designation issued in 2021; to be co-managed by National Oceanic and Atmospheric Administration (NOAA) and the State of Wisconsin (NextEra 2020; NOAA 2021)
Other Recreational Areas	Local parks, trails, boat ramps, golf courses, and other recreational attractions	Within 10 mi (16 km)	Operational (NextEra 2020)
Transportation Facilities			
Port of Manitowoc	Deep draft commercial harbor providing marine services, bulk commodity transport, and seasonal ferry service across Lake Michigan	Approximately 14 mi (23 km) south-southwest	Operational (NextEra 2020; Port of Manitowoc 2020)
Green Bay-Austin Straubel International Airport	Full-service commercial airport	Approximately 32 mi (52 km) northwest	Operational (AirNav 2021; NextEra 2020)
Other Aviation Facilities	Two private airfields and one public general aviation airport	Within 13 mi (21 km) of Point Beach site	Operational (AirNav 2021; NextEra 2020)
Other Facilities/Project/Trends			
Concentrated Animal Feeding Operations	Large agricultural meat, dairy, or egg facilities subject to WPDES regulation of waste storage structures and manure application	Multiple locations within 30 mi (48 km) of Point Beach	Operational (WDHS 2019; WDNR 2021j)
Various minor air pollutant emissions, National Pollutant Discharge Elimination System permitted wastewater discharges, and hazardous waste small-quantity generators	Various businesses with smaller effluent discharges and waste streams	Within 10 mi (16 km)	Operational (EPA 2021)

Table E-1 Projects and Actions NRC Staff Considered in the Point Beach Cumulative Impacts Analysis (cont.)

Project Name	Summary of Project	Location (Relative to Point Beach)	Status
Future Development	Construction of housing units and associated commercial buildings; roads, bridges, and rail; water and/or wastewater treatment and distribution facilities; and associated pipelines as described in local land use planning documents	Throughout region	Construction would occur in the future, as described in State and local land use planning documents

E.2 References

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APPENDIX F

ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS

F ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS

This appendix describes the environmental impacts from postulated accidents that may occur at Point Beach Nuclear Plant Units 1 and 2 (Point Beach) during the subsequent license renewal period. The term "accident" refers to any unintentional event outside the normal plant operational envelope that could result in either (a) an unplanned release of radioactive materials into the environment, or (b) the potential for an unplanned release of radioactive materials into the environment.

NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996, 2013a), evaluates in detail the following two classes of postulated accidents as they relate to license renewal. The GEIS conclusions are codified in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

- Design-Basis Accidents: Postulated accidents that a nuclear facility must be designed and built to withstand without loss to the systems, structures, and components necessary to ensure public health and safety.
- Severe Accidents: Postulated accidents that are more severe than design-basis accidents because they could result in substantial damage to the reactor core, with or without serious offsite consequences.

This appendix first describes the U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of new and significant information related to design-basis accidents at Point Beach and then describes the staff's evaluation of new and significant information related to postulated severe accidents at Point Beach.

F.1 <u>Background</u>

Although this supplemental environmental impact statement (SEIS) documents the NRC staff's review of an subsequent license renewal application, it is helpful to keep in mind that, long before any license renewal actions, an operating reactor has already completed the NRC licensing process for the original 40-year operating license. To receive a license to operate a new nuclear power reactor, an applicant must submit to the NRC an operating license application that includes, among many other requirements, a safety analysis report. The applicant's safety analysis report presents the design criteria and design information for the proposed reactor and includes comprehensive data on the proposed site. The applicant's safety analysis report also describes various design-basis accidents and the safety features designed to prevent or mitigate their impacts. The NRC staff reviews the operating license application to determine if the plant's design—including designs for preventing or mitigating accidents—meets the NRC's regulations and requirements. At the conclusion of that review, an operating license would be issued only if the NRC finds, in part, that there is reasonable assurance that the activities authorized by the license can be conducted without endangering the health and safety of the public and that the activities will be conducted in accordance with the NRC's regulations.

F.1.1 Design-Basis Accidents

Design-basis accidents are postulated accidents that a nuclear facility must be designed and built to withstand without loss to the systems, structures, and components necessary to ensure public health and safety. Planning for design-basis accidents ensures that the proposed plant can withstand normal transients (e.g., rapid changes in the reactor coolant system temperature or pressure, or rapid changes in reactor power), as well as a broad spectrum of postulated accidents without an undue hazard to the health and safety of the public. Many of these design-basis accidents may occur but are unlikely to occur even once during the life of the plant; nevertheless, carefully evaluating each design-basis accident is crucial to establishing the design basis for the preventive and mitigative safety systems of the proposed nuclear power plant. Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR Part 100, "Reactor Site Criteria," describe the NRC's acceptance criteria for design-basis accidents.

Before the NRC will issue an operating license for a new nuclear power plant, the applicant must demonstrate the ability of its proposed reactor to withstand all design-basis accidents. The applicant and the NRC staff evaluate the environmental impacts of design-basis accidents for the hypothetical individual exposed by the maximum postulated amount of radiation (maximum exposed individual). The results of these evaluations of design-basis accidents are found in the reactor's original licensing documents, such as the applicant's final safety analysis report, the NRC staff's safety evaluation report, and the final environmental statement. Once the NRC issues the operating license for the new reactor, the licensee is required to maintain the acceptable design and performance criteria (which include withstanding design-basis accidents) throughout the operating life of the nuclear power plant, including any license renewal periods of extended operation. The consequences for design-basis accidents are evaluated for the hypothetical maximum exposed individual; as such, changes in the plant environment will not affect these evaluations.

The NRC regulation at paragraph (a) of 10 CFR 54.29, "Standards for issuance of a renewed license," requires license renewal applicants to demonstrate that identified actions have been or will be taken to manage the effects of aging and perform any required time-limited aging analyses (as further described in the regulation), such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the plant's current licensing basis (CLB) (10 CFR 54.3(a)). Furthermore, the applicant must show that any changes made to the plant's CLB comply with paragraph (a) of 10 CFR 54.29 are in accordance with the Atomic Energy Act of 1954, as amended, and the NRC's regulations. In other words, because of the requirements that the plant's existing design-basis and aging management programs be in effect for license renewal, the environmental impacts of design-basis accidents, as calculated for the original operating license application, should not differ significantly from the environmental impacts of design-basis accidents at any other time during plant operations, including during the initial license renewal and subsequent renewal periods. Accordingly, the design of the nuclear power plant, relative to design-basis accidents during the period of extended operation, is considered to remain acceptable.

F.1.2 Design-Basis Accidents and License Renewal

Consistent with Regulatory Issue Summary (RIS)-2014-06, "Consideration of Current Operating Issues and Licensing Actions in License Renewal," the early and adequate identification of the design-basis accidents mitigation (before subsequent license renewal) makes them a part of the CLB of the plant as defined at 10 CFR 54.3(a), "Current licensing basis (CLB)." The NRC requires licensees to maintain the CLB of the plant under the current operating license, as well as during any license renewal period. Therefore, under the provisions of 10 CFR 54.30, "Matters not subject to a renewal review," design-basis accidents are not subject to review under license renewal (NRC 2014a).

As stated in Section 5.3.2 of the 1996 GEIS, the NRC staff assessed the environmental impacts from design-basis accidents in individual plant-specific environmental impact statements (EISs) at the time of the initial license application review. Consistent with the NRC Reactor Oversight

Process, a licensee is required to maintain the plant within acceptable design and performance criteria, including during any license renewal term. As such, the NRC staff would not expect environmental impacts to change significantly, and accordingly, additional assessment of the environmental impacts from design-basis accidents is not necessary (10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," Appendix B to Subpart A, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant"). The GEIS concludes that the environmental impacts of design-basis accidents are of SMALL significance for all nuclear power plants, because the plants were designed to withstand these accidents. For the purposes of initial or subsequent license renewal, the NRC designates design-basis accidents as a Category 1 (generic) issue applicable to all nuclear power plants (see 10 CFR Part 51, Appendix B to Subpart A). During the license renewal review process, the NRC staff adopts the applicable Category 1 issue conclusions from the GEIS (unless new and significant information about the issue has been identified). Hence, the NRC staff need not address Category 1 issues (like design-basis accidents) in the site-specific SEIS for license renewal, unless new and significant information has been identified for those issues.

In its environmental report (ER) for the Point Beach subsequent license renewal application, NextEra did not identify any new and significant information related to design-basis accidents at Point Beach (NextEra 2020). The NRC staff also did not identify any new and significant information related to design-basis accidents during its independent review of NextEra's ER, through the scoping process, or in its evaluation of other available information.

Therefore, the NRC staff concludes that there are no environmental impacts related to design-basis accidents at Point Beach during the subsequent license renewal period beyond those already discussed generically for all nuclear power plants in the GEIS.

F.1.3 Severe Accidents

Severe accidents are postulated accidents that are more severe than design-basis accidents because severe accidents can result in substantial damage to the reactor core, with or without serious offsite consequences. Severe accidents can entail multiple failures of equipment or functions. The likelihood of a severe accident occurring is generally even lower than the likelihood of a design-basis accident occurring.

F.1.4 Severe Accidents and License Renewal

Chapter 5 of the 1996 GEIS (NRC 1996) conservatively predicts the environmental impacts of postulated severe accidents that may occur during the period of extended operations at nuclear power plants. In the 2013 GEIS, the NRC staff updated the agency's 1996 plant-by-plant severe accident environmental impact assessments (NRC 2013a, Appendix E). In the GEIS, the NRC considered impacts of severe accidents, including:

- dose and health effects of accidents
- economic impacts of accidents
- effect of uncertainties on the results

The NRC staff calculated these estimated impacts by studying the risk analysis of severe accidents as reported in the environmental impact statements (EISs) and final environmental statements that the NRC staff had prepared in support of each plant's original reactor operating license review. When the NRC staff prepared the 1996 GEIS, 28 nuclear power plant sites (44 units) had EISs or final environmental statements that contained a severe accident analysis. Not all original operating reactor licenses contained a severe accident analysis because the NRC had not always required them. The 1996 GEIS assessed the environmental impacts of severe accidents during the license renewal period for all plants by using the results of existing analyses and site-specific information to make conservative predictions. With few exceptions, the severe accident analyses evaluated in the 1996 GEIS were limited to consideration of reactor accidents caused by internal events. The 1996 GEIS addressed the impacts from external events (e.g., earthquake, flooding) qualitatively.

For its severe accident environmental impact analysis for each plant, the 1996 GEIS used very conservative 95th percentile upper confidence bound estimates for environmental impacts whenever available. This approach provides conservatism to cover uncertainties, as described in Section 5.3.3.2.2 of the 1996 GEIS. The 1996 GEIS concluded that the probability-weighted consequences of severe accidents as related to license renewal are SMALL compared to other risks to which the populations surrounding nuclear power plants are routinely exposed. Since issuing the 1996 GEIS, the NRC's understanding of severe accident risk has continued to evolve. The updated 2013 GEIS assesses more recent information and developments in severe accident analyses and how they might affect the conclusions in Chapter 5 of the 1996 GEIS. The 2013 GEIS also provides comparative data where appropriate. Based on information in the 2013 GEIS, the NRC staff determined that, for all nuclear power plants, the probability-weighted consequences of severe accidents are SMALL. However, the GEIS determined that alternatives to mitigate severe accidents must be considered as a Category 2 issue for all plants that have not considered such alternatives. See Table B-1, "Summary of Findings on NEPA [National Environmental Policy Act] Issues for License Renewal of Nuclear Power Plants," of Appendix B to Subpart A of 10 CFR Part 51, which states:

> The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are SMALL for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.

An analysis of the severe accident mitigation alternative (SAMA) was performed for Point Beach at the time of initial license renewal (NextEra 2004). The NRC staff documented its review of this SAMA analysis in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 23, Regarding Point Beach, Units 1 and 2* (NRC 2005a). Per 10 CFR 51.53(c)(3)(ii)(L), an applicant is not required to provide a consideration of alternatives to mitigate severe accidents if the NRC staff has previously considered severe accident mitigation alternatives for the applicant's plant. Instead, for its review of SAMA for the Point Beach subsequent license renewal, the NRC staff considered any new and significant information that might alter the conclusions of its review of SAMA for the Point Beach initial license renewal, as discussed below.

The NRC's regulations in 10 CFR Part 51, which implement Section 102(2) of NEPA, require that all applicants for license renewal submit an ER to the NRC, in which they identify any ''new and significant information regarding the environmental impacts of license renewal of which the applicant is aware'' (10 CFR 51.53(c)(3)(iv)). This includes new and significant information that could affect the environmental impacts related to postulated severe accidents or that could affect the results of a previous SAMA analysis. Accordingly, in its subsequent license renewal application ER, NextEra evaluates areas of new and significant information that could affect the environmental impact of postulated severe accidents during the subsequent license renewal period of extended operation and possible new and significant information as it relates to SAMAs.

F.2 Severe Accident Mitigation Alternatives (SAMAs)

In a SAMA analysis, the NRC requires license renewal applicants to consider the environmental impacts of severe accidents, their probability of occurrence, and the potential means to mitigate those accidents. As quoted above, 10 CFR Part 51, Table B-1, states, "alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives." This NRC requirement to consider alternatives to mitigate severe accidents can be fulfilled by a SAMA analysis. The purpose of the SAMA analysis is to identify design alternatives, procedural modifications, or training activities that may further reduce the risks of severe accidents at nuclear power plants and that are also potentially cost beneficial to implement. The SAMA analysis includes the identification and evaluation of SAMAs that may reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment if substantial core damage occurs (i.e., mitigating the impacts of a severe accident) (NRC 2013a). The regulation at 10 CFR 51.53(c)(3)(ii)(L) states that each license renewal applicant must submit an ER that considers alternatives to mitigate severe accidents "[i]f the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment."

F.2.1 Point Beach Initial License Renewal Application and SAMA Analysis in 2004

As part of its initial license renewal application submitted in 2004, NextEra's ER included an analysis of SAMAs for Point Beach Units 1 and 2 (NextEra 2004). NextEra based this SAMA analysis on (1) the Point Beach probabilistic risk assessment (PRA) for total accident frequency, core damage frequency (CDF), and containment large early release frequency (LERF) and (2) a supplemental analysis of offsite consequences and economic impacts for risk determination. The Point Beach PRA included a Level 1 analysis to determine the CDF from internally initiated events and a Level 2 analysis to determine containment performance during severe accidents. The offsite consequences and economic impacts analyses (Level 3 PRA) used the MELCOR Accident Consequence Code System 2 (MACCS2) code to determine the offsite risk impacts on the surrounding environment and the public. Inputs for the latter analysis included plant- and site-specific values for core radionuclide inventory, source term and release fractions, meteorological data, projected population distribution (based on 1990 census data, projected out to 2035), emergency response evacuation modeling, and economic data. To help identify and evaluate potential SAMAs, NextEra considered insights and recommendations from SAMA analyses for other plants, potential plant improvements discussed in NRC and industry documents, and documented insights that the Point Beach staff provided.

In its 2004 ER, NextEra considered 202 SAMA candidates. NextEra then performed a qualitative screening of those SAMAs, eliminating SAMAs that were not applicable to Point Beach or had already been implemented at Point Beach. Based on this qualitative screening, 137 SAMAs were eliminated, leaving 65 SAMAs subject to the final screening and evaluation process. The 65 remaining SAMAs are listed in Table F.2-2 of Appendix F of the 2004 ER (NextEra 2004). The final screening process involved identifying and eliminating those SAMAs where the cost exceeded twice their benefit. Ultimately, NextEra concluded that there were no potentially cost-beneficial SAMAs in the baseline case associated with the Point Beach initial license renewal (NextEra 2004).

As part of its review of the Point Beach initial license renewal application, the NRC staff reviewed NextEra's 2004 analysis of SAMAs for Point Beach, as documented in the staff's SEIS for the initial license renewal (NRC 2005a). Appendix G of the SEIS for the Point Beach initial license renewal contains the NRC staff's evaluation of the potential environmental impacts of plant accidents and examines each SAMA (individually and, in some cases, in combination) to determine the SAMA's individual risk reduction potential. The NRC staff then compared this potential risk reduction against the cost of implementing the SAMA to quantify its cost-benefit value.

In Section G.7 of the SEIS for the Point Beach initial license renewal, the NRC staff found that NextEra had used a systematic and comprehensive process for identifying potential plant improvements for Point Beach Units 1 and 2, and that its bases for calculating the risk reductions afforded by these plant improvements were reasonable and generally conservative. Further, the NRC staff found that NextEra's estimates of the costs of implementing each SAMA were reasonable and consistent with estimates developed for other operating reactors. In addition, the NRC staff concluded that NextEra's cost-benefit comparisons were performed appropriately. Therefore, the NRC staff agreed with NextEra's conclusion that NextEra's SAMA methods and the implementation of those methods were sound and agreed with NextEra's conclusion that none of the candidate SAMAs were potentially cost beneficial in the baseline cases.

The NRC staff did find that one SAMA could be potentially cost beneficial using a more conservative discount rate sensitivity case to account for uncertainties. However, this SAMA did not relate to adequately managing the effects of aging during the period of extended operation. Therefore, it did not need to be implemented as part of license renewal under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." With the exception of this one SAMA, the NRC staff found NextEra's conclusions to be consistent with the low residual level of risk indicated in the Point Beach PRA and also consistent with the fact that Point Beach had already implemented many plant improvements identified during two risk analysis processes—(1) the individual plant examination (IPE), a risk analysis that considers the unique aspects of a particular nuclear power plant, identifying the specific vulnerabilities to severe accidents of that plant, and (2) the individual plant examination of external events (IPEEE), a risk analysis that considers external events such as earthquakes, internal fires, and high winds (NRC 2005a).

F.2.2 Subsequent License Renewal Application and New and Significant Information as It Relates to the Probability-Weighted Consequences of Severe Accidents

As discussed above, a license renewal application must include an ER that describes SAMAs if the NRC staff has not previously considered SAMAs for that plant in an EIS, in a related supplement to an EIS, or in an environmental assessment. As also discussed above, the NRC staff performed a site-specific analysis of Point Beach SAMAs in the SEIS for that plant's initial license renewal (NRC 2005a). Therefore, in accordance with 10 CFR 51.53(c)(3)(ii)(L) and Table B-1 of Appendix B to Subpart A of 10 CFR Part 51, NextEra is not required to provide another SAMA analysis in its ER for the Point Beach subsequent license renewal application. However, in accordance with 10 CFR 51.53(c)(3)(iv), NextEra is required to provide in its ER for the Point Beach subsequent license renewal application any new and significant information regarding the environmental impacts of license renewal of which it is aware, including new and significant information that could affect the environmental impacts related to postulated severe accidents or that could affect the results of a previous SAMA analysis.

In its assessment of new and significant information related to SAMAs in its subsequent license renewal application, NextEra used the guidance in Nuclear Energy Institute (NEI) 17-04, Revision 1, "Model SLR New and Significant Assessment Approach for SAMA" (NEI 2019). NEI developed a model approach for license renewal applicants to use in assessing the significance of new information, of which the applicant is aware, that relates to a prior SAMA analysis that was performed in support of the issuance of an initial license, renewed license, or combined license. NEI 17-04 provides a tiered approach that entails a three-stage screening process for the evaluation of new information.

In this screening process, new information is deemed to be “potentially significant” to the extent that it results in the identification in Stage 1 (involving the use of PRA risk insights or risk model quantifications) of an unimplemented SAMA that reduces the maximum benefit by 50 percent or more. Maximum benefit is defined in Section 4.5 of NEI 05-01, Revision A, “Severe Accident Mitigation Alternatives (SAMA) Analysis Guidance Document” (NEI 2005b), as the benefit a SAMA could achieve if it eliminated all risk. The total offsite dose and total economic impact are the baseline risk measures from which the maximum benefit is calculated.

If a SAMA is found to result in a 50-percent reduction in maximum benefit in Stage 1, a Stage 2 assessment would then be performed (involving an updated averted cost-risk estimate for implementing that SAMA). A Stage 3 assessment (involving a cost-benefit analysis) would be required only for “potentially significant” SAMAs (i.e., those that are shown by the Stage 2 assessment to reduce the maximum benefit by 50 percent or more). Finally, if the Stage 3 assessment shows that a “potentially significant” SAMA is “potentially cost beneficial,” thus indicating the existence of “new and significant” information, then the applicant must supplement the previous SAMA analysis. The NRC staff endorsed NEI 17-04, Revision 1, for use by license renewal applicants on December 11, 2019 (NRC 2019a). Section F.5 of this appendix discusses NextEra’s assessment of new and significant information related to its SAMA cost-benefit analysis.

Below, the NRC staff summarizes possible areas of new and significant information and assesses NextEra’s conclusions.

F.3 Evaluation of New Information Concerning Severe Accident Consequences for Point Beach as It Relates to the GEIS

The 2013 GEIS considers developments in plant operation and accident analysis that could have changed the assumptions made in the 1996 GEIS concerning severe accident consequences. The 2013 GEIS confirmed the determination in the 1996 GEIS that the probability-weighted consequences of severe accidents are SMALL for all plants. In the 2013 GEIS, Appendix E provides the NRC staff’s evaluation of the environmental impacts of postulated accidents. Table E-19, “Summary of Conclusions,” of the 2013 GEIS shows the developments that the NRC staff considered, as well as its conclusions. Consideration of the items listed in Table E-19 was the basis for the NRC staff’s overall determination in the 2013 GEIS that the probability-weighted consequences of severe accidents remain SMALL for all plants.

For the Point Beach subsequent license renewal, the NRC staff confirmed that there is no new and significant information that would change the 2013 GEIS conclusions on the probability-weighted consequences of severe accidents. The NRC staff evaluated NextEra’s information related to the 2013 GEIS, Table E-19, “Summary of Conclusions,” during the Point Beach audit (NRC 2021) and by reviewing docketed information. The results of that review follow.

F.3.1 New Internal Events Information (Section E.3.1 of the 2013 GEIS)

After NextEra submitted the Point Beach initial license renewal application ER in 2004, and the NRC staff issued its corresponding SAMA review in its 2005 SEIS for the Point Beach initial license renewal, there have been many improvements to the Point Beach risk profile. The Point Beach internal events CDF in the initial license renewal SAMA was approximately 3.59×10^{-5}/year (NextEra 2004). The current Point Beach internal events PRA model of record has a CDF of approximately 6.50×10^{-6}/year for Unit 1 and 6.10×10^{-6}/year for Unit 2 (NextEra

2020). Using the more conservative CDF value of Unit 1, this change represents a greater than 80-percent reduction or a factor of 5.5 reduction in CDF. This substantial improvement in CDF makes any proposed new SAMA or previously evaluated SAMA less likely to be cost beneficial.

In the 2013 GEIS, the NRC staff reviewed the updated boiling-water reactor (BWR) and pressurized-water reactor (PWR) internal event CDFs. The CDF is an expression of the likelihood that, given the way a reactor is designed and operated, an accident could cause the fuel in the reactor to be damaged. The 2013 GEIS addresses new information on the risk and environmental impacts of severe accidents caused by internal events that had emerged following issuance of the 1996 GEIS and includes consideration of the Point Beach plant-specific PRA analysis. The new information addressed in the 2013 GEIS indicates that PWR and BWR CDFs evaluated for the 2013 GEIS are generally comparable to or less than the CDFs that formed the basis of the 1996 GEIS (NRC 2013a).

Therefore, the NRC staff concludes that the offsite consequences of severe accidents initiated by internal events during the subsequent license renewal term at Point Beach would not exceed the impacts predicted in the 2013 GEIS. For these issues, the GEIS predicted that the impacts would be small for all nuclear plants. The NRC staff identified no new and significant information on internal events during its review of NextEra's ER, during the SAMA audit, through the scoping process, or through the evaluation of other available information. Thus, the NRC staff concludes that no new and significant information exists for Point Beach concerning offsite consequences of severe accidents initiated by internal events that would alter the conclusions reached in the 2013 GEIS.

F.3.2 External Events (Section E.3.2 of the 2013 GEIS)

The 1996 GEIS concluded that severe accidents initiated by external events (such as earthquakes) could have potentially high consequences but also found that the risks from these external events are adequately addressed through a consideration of severe accidents initiated by internal events (such as a loss of cooling water). Therefore, the 1996 GEIS concluded that an applicant for license renewal need only analyze the environmental impacts from an internal event to characterize the environmental impacts from either internal or external events.

The 2013 GEIS expanded the scope of the evaluation in the 1996 GEIS and used more recent technical information that included both internally and externally initiated event CDFs. Section E.3.2.3 of the 2013 GEIS concludes that the CDFs from severe accidents initiated by external events, as quantified in NUREG-1150, *Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants* (NRC 1990), and other sources documented in the GEIS, are comparable to CDFs from accidents initiated by internal events but lower than the CDFs that formed the basis for the 1996 GEIS.

The fire and seismic CDFs (5.1×10^{-5} per reactor-year and 6.24×10^{-6} per reactor-year, respectively) for Point Beach Units 1 and 2, as well as the sum of the two, were less than 8.4×10^{-5} per reactor-year. This value (8.4×10^{-5}) was the internal events mean value CDF for PWRs that the 2013 GEIS used to estimate probability-weighted, offsite consequences from airborne, surface water, and groundwater pathways, as well as the resulting economic impacts from such pathways. Other external event PRA analyses were one-time analyses for the IPEEE. These historical models do not reflect the plant safety improvements, since they were performed during the time of the original IPEEE. Therefore, the offsite consequences of severe accidents initiated by external events during the subsequent license renewal term would not exceed the impacts predicted in the GEIS.

NextEra indicated that quantitative evaluations performed for the SAMA analysis included the Point Beach internal events, internal flood, and fire PRA models (NextEra 2020b). NextEra indicated that this PRA model reflected the most up-to-date understanding of plant risk at the time of analysis. During the audit, a site-level seismic evaluation using 2013 Electric Power Research Institute data was discussed that demonstrated that the current plant-level seismic CDF is approximately half of that estimated in the initial license renewal. Therefore, the original Point Beach IPEEE information would bound an updated evaluation because it was more conservative and the updated seismic information would not identify any new and significant information. Therefore, use of the seismic model would not identify more significant information than that found in the original SAMA evaluation. The NRC staff determined that this approach is sufficient to evaluate the SAMAs for new and significant information since the use of the model was consistent with the NEI 17-04 methodology.

On March 12, 2012, the NRC issued a request under 10 CFR 50.54(f), as part of implementing lessons learned from the accident at Fukushima, that, among other things, requested licensees to reevaluate the seismic hazards at their sites using present-day methodologies and guidance to develop a ground motion response spectrum (GMRS)(NRC 2012). Enclosure 1 of the 10 CFR 50.54(f) letter requested that each operating power reactor licensee complete a reevaluation of the seismic hazard that could affect its sites using updated seismic hazard information and present-day regulatory guidance and methodologies to develop a GMRS. The licensees were asked to compare their results to the safe-shutdown earthquake ground motion and then report to the NRC in a seismic hazard screening report. The NRC staff completed and documented its review of the NextEra's reevaluated seismic hazard for Point Beach in a staff assessment (NRC 2018b). To complete its response to the 10 CFR 50.54(f) letter, NextEra submitted a high-frequency evaluation and a spent fuel pool evaluation for Point Beach (NextEra 2014). The NRC reviewed the high-frequency confirmation submittal and confirmed that Point Beach met the limited high-frequency criteria. The NRC staff concluded that no additional seismic evaluations were needed in response to the 10 CFR 50.54(f) letter. The NRC staff reviewed the information provided and, as documented in its assessments, determined that NextEra had provided sufficient information in response to Enclosure 1 of the 10 CFR 50.54(f) letter. The NRC staff acknowledges that Point Beach has completed all seismic hazard reevaluation activities requested by Enclosure 1 of the 10 CFR 50.54(f) letter and that no further information related to the reevaluated seismic hazard is required (NRC 2018b).

In conclusion, there was a greater than a factor of 5.5 decrease in the Point Beach internal events CDF and the site-level seismic evaluation using 2013 Electric Power Research Institute data showed that the current plant-level seismic CDF is approximately half of that estimated in the initial license renewal. Therefore, the offsite consequences of severe accidents initiated by external events during the subsequent license renewal term would not exceed the impacts predicted in the 2013 GEIS. For these issues, the GEIS predicts that the impacts would be small for all nuclear plants. The NRC staff identified no new and significant information on external events during its review of NextEra's ER, through the SAMA audit, during the scoping process, or through the evaluation of other available information. Thus, the NRC staff concludes that no new and significant information exists for Point Beach concerning offsite consequences of severe accidents initiated by external events that would alter the conclusions reached in the 2013 GEIS.

F.3.3 New Source Term Information (Section E.3.3. of the 2013 GEIS)

The source term refers to the magnitude and mix of the radionuclides released from the fuel (expressed as fractions of the fission product inventory in the fuel), as well as their physical and chemical form, and the timing of their release following an accident. The 2013 GEIS concludes that, in most cases, more recent estimates give significantly lower release frequencies and release fractions than was assumed in the 1996 GEIS. Thus, the environmental impacts of radioactive materials released during severe accidents, used as the basis for the 1996 GEIS (i.e., the frequency-weighted release consequences), are higher than the environmental impacts that would be estimated today using more recent source term information. The NRC staff also notes that results from the NRC's State-of-the-Art Reactor Consequence Analysis (SOARCA) project (which represents a significant ongoing effort to re-quantify realistic severe accident source terms) confirm that source term timing and magnitude values calculated in the SOARCA reports are significantly lower than those quantified in previous studies. The NRC staff expects to incorporate the information gleaned from the SOARCA project in future revisions of the GEIS (NRC 2013a).

For the reasons described above, current source term timing and magnitude at Point Beach are likely to be significantly lower than had been quantified in previous studies and the Point Beach initial license renewal SAMA analysis (NRC 2005a). Therefore, the offsite consequences of severe accidents initiated by the new source term during the subsequent license renewal period would not exceed the impacts predicted in the GEIS. For these issues, the GEIS predicts that the impacts would be small for all nuclear plants. The NRC staff identified no new and significant information on internal events during its review of NextEra's ER, through the SAMA audit, during the scoping process, or through the evaluation of other available information. Thus, the NRC staff concludes that no new and significant information exists for Point Beach concerning the source term that would alter the conclusions reached in the 2013 GEIS.

F.3.4 Power Uprate Information (Section E.3.4 of the 2013 GEIS)

Operating at a higher reactor power level results in a larger fission product radionuclide inventory in the core than if the reactor were operating at a lower power level. In the event of an accident, the larger radionuclide inventory in the core would result in a larger source term. If the accident is severe, the release of radioactive materials from this larger source term could result in higher doses to offsite populations.

The containment LERF represents the frequency of event sequences that could result in early fatalities. The impact of a power uprate on early fatalities can be measured by considering the impact of the uprate on the LERF calculated value. To this end, Table E-14 of the 2013 GEIS presents the change in LERF calculated by each licensee that has been granted a power uprate of greater than 10 percent. Table E-14 shows that the increase in LERF ranges from a minimal impact to an increase of about 30 percent (with a mean of 10.5 percent). The 2013 GEIS, Section E.3.4.3, "Conclusion," determines that power uprates will result in a small to (in some cases) moderate increase in the environmental impacts from a postulated accident. However, taken in combination with the other information presented in the GEIS, the increases would be bounded by the 95-percent upper confidence bound values in Table 5.10 and Table 5.11 of the 1996 GEIS.

The NRC staff approved a 1.4-percent measurement uncertainty recapture (MUR) power uprate for Point Beach in 2002. The change in plant risk due to the MUR power uprate is insignificant. This determination is supported by NRC RIS-2002-03, "Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications" (NRC 2002a). The NRC staff's safety evaluation of the MUR power uprate concluded that the CLB dose consequence analyses for design-basis accidents will remain bounding at the proposed MUR uprated power level with a margin that is within the assumed uncertainty associated with the leading-edge flow meter system (NMC 2002).

In 2011, the NRC staff approved an extended power uprate (EPU) for Point Beach of 17 percent. As part of the uprate, NextEra implemented some plant changes to offset any potential increase in CDF and LERF and ultimately reduced the CDF and LERF compared to pre-EPU values (NRC 2011). In addition, since the EPU, the PRA was updated to include impacts that are related to the EPU and so are also included in the quantitative subsequent license renewal SAMA evaluations.

Therefore, the NRC staff finds that the offsite consequences from power uprates would not exceed the consequences predicted in the 2013 GEIS. The NRC staff has identified no new and significant information regarding power uprates during its review of NextEra's ER, through the SAMA audit, during the scoping process, or through the evaluation of other available information. Thus, the NRC staff concludes that no new and significant information exists for Point Beach concerning offsite consequences due to power uprates that would alter the conclusions reached in the 2013 GEIS.

F.3.5 Higher Fuel Burnup Information (Section E.3.5 of the 2013 GEIS)

According to the 2013 GEIS, increased peak fuel burnup from 42 to 75 gigawatt days per metric ton uranium (GWd/MTU) for PWRs, and 60 to 75 GWd/MTU for BWRs, results in small to moderate increases (up to 38 percent) in environmental impacts in the event of a severe accident. However, taken in combination with the other information presented in the 2013 GEIS, the increases would be bounded by the 95 percent upper confidence bound values in Table 5.10 and Table 5.11 of the 1996 GEIS.

In ER Section 4.13.4.4, NextEra indicated that the average burnup level of the peak rod is not planned to exceed 62,000 megawatt days (MWd)/MTU during the proposed subsequent license renewal operating term. Therefore, the offsite consequences from higher fuel burnup would not exceed the impacts predicted in the 2013 GEIS. For these issues, the GEIS predicted that the impacts would be small for all nuclear plants. The NRC staff identified no new and significant information on higher fuel burnup during its review of NextEra's ER, through the SAMA audit, during the scoping process, or through the evaluation of other available information. Thus, the NRC staff concludes that no new and significant information exists for Point Beach concerning offsite consequences due to higher fuel burnup that would alter the conclusions reached in the 2013 GEIS.

F.3.6 Low Power and Reactor Shutdown Event Information (Section E.3.6 of the 2013 GEIS)

The 2013 GEIS concludes that the environmental impacts from accidents under low power and shutdown conditions are generally comparable to those from accidents at full power, based on a comparison of the values in NUREG/CR-6143, *Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Grand Gulf, Unit 1* (NRC 1995a), and NUREG/CR-6144, *Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1* (NRC 1995b), with the values in NUREG-1150 (NRC 1990). The 1996 GEIS estimates of the environmental impact of severe accidents bound the potential impacts from accidents at low power and reactor shutdown, with margin. NUREG-1150 and NUREG/CR-6144 evaluated Surry, a Westinghouse-designed plant. Point Beach is similarly a Westinghouse-designed plant; thus, there are no plant configurations in low power and shutdown conditions likely to distinguish Point Beach from the evaluated plants such that the assumptions in the 2013 and 1996 GEISs would not apply.

Finally, as discussed in SECY-97-168, "Issuance for Public Comment of Proposed Rulemaking Package for Shutdown and Fuel Storage Pool Operation" (NRC 1997), industry initiatives taken during the early 1990s have also contributed to the improved safety of low power and shutdown operations for all plants. Therefore, the offsite consequences of severe accidents, considering low power and reactor shutdown events, would not exceed the impacts predicted in either the 1996 or 2013 GEIS. For these issues, the GEIS predicts that the impacts would be small for all nuclear plants. The NRC staff identified no new and significant information on low power and reactor shutdown events during its review of NextEra's ER, through the NRC staff's SAMA audit, during the scoping process, or through the evaluation of other available information. Thus, the NRC staff concludes that no new and significant information exists for Point Beach concerning low power and reactor shutdown events that would alter the conclusions reached in the 2013 GEIS.

F.3.7 Spent Fuel Pool Accident Information (Section E.3.7 of the 2013 GEIS)

The 2013 GEIS concludes that the environmental impacts from accidents involving spent fuel pools (as quantified in NUREG-1738, *Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants* (NRC 2001)) can be comparable to those from reactor accidents at full power (as estimated in NUREG-1150 (NRC 1990b)). Subsequent analyses performed, and mitigative measures employed since 2001, have further lowered the risk of accidents involving spent fuel pools. In addition, even the conservative estimates from NUREG-1738 (published in 2001) are much lower than the impacts from full power reactor accidents estimated in the 1996 GEIS. Therefore, the environmental impacts stated in the 1996 GEIS bound the impact from spent fuel pool accidents for all plants. For these issues, the GEIS predicts that the impacts would be small for all nuclear plants. There are no spent fuel configurations that would distinguish Point Beach from the evaluated plants such that the assumptions in the 2013 and 1996 GEISs would not apply. The NRC staff identified no new and significant information on spent fuel pool accidents during its review of NextEra's ER, through the SAMA audit, during the scoping process, or through the evaluation of other available information. Thus, the NRC staff concludes that no new and significant information exists for Point Beach concerning spent fuel pool accidents that would alter the conclusions reached in the 2013 GEIS.

F.3.8 Use of Biological Effects of Ionizing Radiation (BEIR) VII Risk Coefficients (Section E.3.8 of the 2013 GEIS)

In 2005, the NRC staff completed a review of the National Academy of Sciences report, "Health Risks from Exposure to Low Levels of Ionizing Radiation: Biological Effects of Ionizing Radiation (BEIR) VII, Phase 2" (BEIR 2005). The NRC staff documented its findings in SECY-05-0202, "Staff Review of the National Academies Study of the Health Risks from Exposure to Low Levels of Ionizing Radiation (BEIR VII)" (NRC 2005b). The SECY paper states that the NRC staff agrees with the BEIR VII report's major conclusion—namely, the current scientific evidence is consistent with the hypothesis that there is a linear, no-threshold, dose response relationship between exposure to ionizing radiation and the development of cancer in humans. The BEIR VII conclusion is consistent with the hypothesis on radiation exposure and human cancer that the NRC uses to develop its standards of radiological protection. Therefore, the NRC staff has determined that the conclusions of the BEIR VII report do not warrant any change in the NRC's radiation protection standards and regulations because the NRC's standards are adequately protective of public health and safety and will continue to apply during the proposed Point Beach subsequent license renewal term. This general topic is discussed further in the NRC's 2007 denial of Petition for Rulemaking (PRM)-51-11 (72 *Federal Register* (FR) 71083), in which the NRC states that it finds no need to modify the 1996 GEIS considering the BEIR VII report. For these issues, the GEIS predicts that the impacts of using the BEIR VII risk coefficients would be small for all nuclear plants.

The NRC staff identified no new and significant information on the risk coefficient used in the BEIR VII report during its review of NextEra's ER, through the SAMA audit, during the scoping process, or through the evaluation of other available information. Thus, the NRC staff concludes that no new and significant information on BEIR exists for Point Beach that would alter the conclusions reached in the 2013 GEIS.

F.3.9 Uncertainties (Section E.3.9 of the 2013 GEIS)

Section 5.3.3 in the 1996 GEIS discusses the uncertainties associated with the analysis in the GEIS and in the individual plant EISs used to estimate the environmental impacts of severe accidents. The 1996 GEIS used 95th percentile upper confidence bound estimates whenever available for its estimates of the environmental impacts of severe accidents. This approach provides conservatism to cover uncertainties, as described in Section 5.3.3.2.2 of the 1996 GEIS. Many of these same uncertainties also apply to the analysis used in the 2013 GEIS update. As discussed in Sections E.3.1 through E.3.8 of the 2013 GEIS, the GEIS update used more recent information to supplement the estimate of environmental impacts contained in the 1996 GEIS. In effect, the assessments contained in Sections E.3.1 through E.3.8 of the 2013 GEIS provided additional information and insights into certain areas of uncertainty associated with the 1996 GEIS. However, as provided in the 2013 GEIS, the impact and magnitude of uncertainties, as estimated in the 1996 GEIS, bound the uncertainties introduced by the new information and considerations addressed in the 2013 GEIS. Accordingly, in the 2013 GEIS, the NRC staff concluded that the reduction in environmental impacts resulting from the use of new information (since the 1996 GEIS analysis) outweighs any increases in impact resulting from the new information. As a result, the findings in the 1996 GEIS remain valid. The NRC staff identified no new and significant information on uncertainties during its review of NextEra's ER, the SAMA audit, the scoping process, or the evaluation of other available information. Accordingly, the NRC staff concludes that no new and significant information exists for Point Beach concerning uncertainties that would alter the conclusions reached in the 2013 GEIS.

Section E.3.9.2 of Appendix E to the 2013 GEIS discusses the impact of population increases on offsite dose and economic consequences. The 2013 GEIS, in Section E.3.9.2, states the following:

> The 1996 GEIS estimated impacts at the mid-year of each plant's license renewal period (i.e., 2030 to 2050). To adjust the impacts estimated in the NUREGs and NUREG/CRs to the mid-year of the assessed plant's license renewal period, the information (i.e., exposure indexes [EIs]) in the 1996 GEIS can be used. The EIs adjust a plant's airborne and economic impacts from the year 2000 to its mid-year license renewal period based on population increases. These adjustments result in anywhere from a 5 to a 30 percent increase in impacts, depending upon the plant being assessed. Given the range of uncertainty in these types of analyses, a 5 to 30 percent change is not considered significant. Therefore, the effect of increased population around the plant does not generally result in significant increases in impacts.

The population used in the Point Beach initial license renewal ER (NextEra 2004, Section F.1.2.4) was extrapolated to the year 2035 and found to be 1,148,757. In the Point Beach subsequent license renewal ER, NextEra extrapolated the population to the year 2053. NextEra projected that the total population estimated for the year 2053 is 1,363,031. As can be seen from the data in Tables 5.10 and 5.11 of the 1996 GEIS, the estimated risk of early and latent fatalities from individual postulated nuclear power plant accidents is small using very conservative 95th percentile upper confidence bound estimates for environmental impact. The early and latent fatalities represent only a small fraction of the risk to which the public is exposed from other sources. The NRC staff further notes that the population dose calculated in the Point Beach initial license renewal ER was only 1.49 person-rem per year.

As provided in Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," the CDF risk metric is used as a surrogate for the individual latent cancer fatality risk, and the LERF risk metric is used as a surrogate for the individual early fatality risk. Given the substantial Point

Beach CDF reduction of a factor of 5.5, as explained in the PRA internal events section above, and the currently SMALL LERF value of 1.73×10-6/yr, the risk of early and latent fatalities from individual postulated nuclear power plant accidents has decreased since the issuance of the 1996 GEIS. Furthermore, as discussed in Section E.3.3 of the 2013 GEIS and in this SEIS, more recent estimates give significantly lower release frequencies and release fractions for the source term than were assumed in the 1996 GEIS. Specifically, the 2013 GEIS states that "a comparison of population dose from newer assessments illustrates a reduction in impact by a factor of 5 to 100 when compared to older assessments, and an additional factor of 2 to 4 due to the conservatism built into the 1996 GEIS values." Thus, the effect of this reduction in total dose impacts far exceeds the effect of a population increase. The NRC staff concludes that the effect of increased population around the plant does not result in significant increases in impacts. Thus, the NRC staff concludes that no new and significant information exists for Point Beach concerning a population increase that would alter the conclusions reached in the 2013 GEIS.

F.3.10 Summary and Conclusion (Section E.5 of the 2013 GEIS)

The 2013 GEIS categorizes "sources of new information" by their potential effect on the best-estimate environmental impacts associated with postulated severe accidents. These effects can do the following:

(1) decrease the environmental impact associated with severe accidents

(2) not affect the environmental impact associated with severe accidents

(3) increase the environmental impact associated with severe accidents

Areas of new and significant information that can result in the first effect (decrease the environmental impacts associated with severe accidents) at Point Beach include the following:

- new internal events information (significant decrease)
- new source term information (significant decrease)
- population (population dose decreases when using more recent studies)

Areas of new and significant information that can result in the second effect (no effect on the environmental impact associated with severe accidents) or the third effect (increase the environmental impact associated with severe accidents) include the following:

- use of BEIR VII risk coefficients
- consideration of external events (comparable to internal event impacts)
- spent fuel pool accidents (could be comparable to full power event impacts)
- higher fuel burnup (small to moderate increases)
- low power and reactor shutdown events (could be comparable to full power event impacts)

The 2013 GEIS states that "[g]iven the difficulty in conducting a rigorous aggregation of these results (due to the differences in the information sources utilized), a fairly simple approach is taken." The GEIS estimated that the net increase from the five areas listed above would be (in a simplistic sense) approximately an increase by a factor of 4.7. At the same time, however, for Point Beach, the reduction in risk due to newer internal event information alone is a decrease in risk by a factor of 5.5. The net effect of an increase by a factor of 4.7 and a decrease by a factor of 5.5 would be an overall lower estimated impact (as compared to the 1996 GEIS assessment) by a factor of 0.8 (5.5-4.7). Thus, the NRC staff finds that there is no new and significant information related to severe accidents at Point Beach that would alter the conclusions reached in the 2013 GEIS.

Other areas of new information related to Point Beach severe accident risk, severe accident environmental impact assessment, and cost-beneficial SAMAs are described below. These areas of new information demonstrate additional conservatism in the evaluations in the GEIS and NextEra's ER, because they result in further reductions in the impact of a severe accident.

F.4 Other New Information Related to NRC Efforts to Reduce Severe Accident Risk Following Publication of the 1996 GEIS

The Commission considers other ways to mitigate severe accidents at a given site than just in the one-time SAMA analysis associated with a license renewal application. The Commission has considered and adopted various regulatory requirements for mitigating severe accident risks at reactor sites through a variety of NRC programs. For example, in 1996, when it issued Table B-1 in Appendix B to Subpart A of 10 CFR Part 51, the Commission explained the following in the final rule for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses (61 FR 28467):

> [T]he Commission has considered containment improvements for all plants pursuant to its Containment Performance Improvement (CPI) program … and the Commission has additional ongoing regulatory programs whereby licensees search for individual plant vulnerabilities to severe accidents and consider cost-beneficial improvements…

These "additional ongoing regulatory programs" that the Commission mentioned, which include the IPE/IPEEE program, consider potential improvements to reduce the frequency or consequences of severe accidents on a plant-specific basis and essentially constitute a broad search for severe accident mitigation alternatives. Further, in the same rule, the Commission observed that the IPEs "resulted in a number of plant procedural or programmatic improvements and some plant modifications that will further reduce the risk of severe accidents" (61 FR 28481). Based on these and other considerations, the Commission stated its belief that it is "unlikely that any site-specific consideration of [SAMAs] for license renewal will identify major plant design changes or modifications that will prove to be cost-beneficial for reducing severe accident frequency or consequences" (61 FR 28481). The Commission noted that it may review and possibly reclassify the issue of severe accident mitigation as a Category 1 issue upon the conclusion of its IPE/IPEEE program but deemed it appropriate to address SAMAs for plants not previously considered, pending further rulemaking on this issue (61 FR 28481).

The Commission reaffirmed its SAMA-related conclusions in Table B-1 of Appendix B to Subpart A of 10 CFR Part 51 and 10 CFR 51.53(c)(3)(ii)(L) in Exelon Generation Co., LLC (Limerick Generating Station, Units 1 and 2), CLI-13-07 (NRC 2013b). In addition, the Commission observed that it had issued those regulations because it had "determined that one SAMA analysis would uncover most cost beneficial measures to mitigate both the risk and the effects of severe accidents, thus satisfying [the NRC's] obligations under NEPA" (NRC 2013b).

The NRC has continued to address severe accident-related issues since the agency published the GEIS in 1996. Combined NRC and licensee efforts have reduced risks from accidents beyond those accidents that were considered in the 1996 GEIS. The 2013 GEIS describes many of those efforts (NRC 2013a). In the remainder of Section F.4 of this SEIS, the NRC staff describes several efforts to reduce severe accident risk (CDF and LERF) following publication of the 1996 GEIS. Each of these initiatives applies to all reactors, including Point Beach. Section F.4.1 describes requirements adopted following the terrorist attacks in September 2001, to address the loss of large areas of a plant caused by fire or explosions. Section F.4.2

describes the SOARCA project, which indicates that source term timing and magnitude values may be significantly lower than source term values quantified in previous studies using other analysis methods. Section F.4.3 describes measures adopted following the Fukushima earthquake and tsunami events of 2013. Section F.4.4 discusses efforts that have been made to use plant operating experience to improve plant performance and design features. These are areas of new information that reinforce the conclusion that the probability-weighted consequences of a severe accident are SMALL for all plants, as stated in the 2013 GEIS, and further reduce the likelihood of finding a cost-beneficial SAMA that would substantially reduce the severe accident risk at Point Beach.

F.4.1 10 CFR 50.54(hh)(2) Requirements Regarding Loss of Large Areas of the Plant Caused by Fire or Explosions

As discussed on page E-7 of the 2013 GEIS, following the terrorist attacks of September 11, 2001, the NRC conducted a comprehensive review of the agency's security program and made further enhancements to security at a wide range of NRC-regulated facilities. These enhancements included significant reinforcement of the defense capabilities for nuclear facilities, better control of sensitive information, enhancements in emergency preparedness, and implementation of mitigating strategies to deal with postulated events potentially causing loss of large areas of the plant due to explosions or fires, including those that an aircraft impact might create. For example, the Commission issued Order EA-02-026, "Interim Compensatory Measures (ICM) Order." The ICM Order provided interim safeguards and security compensatory measures and ultimately led to the issuance of a new regulation in 10 CFR 50.54(hh). This regulation requires commercial power reactor licensees to prepare for a loss of large areas of the facility due to large fires and explosions from any cause, including beyond-design-basis aircraft impacts. In accordance with 10 CFR 50.54(hh)(2), licensees must adopt guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under circumstances associated with the loss of large areas of the plant due to explosion or fire (NRC 2013a).

NRC requirements pertaining to plant security are subject to NRC oversight on an ongoing basis under a plant's current operating license and are beyond the scope of license renewal. As discussed in Section 5.3.3.1 of the 1996 GEIS, the NRC addresses security-related events using deterministic criteria in 10 CFR Part 73, "Physical Protection of Plants and Materials," rather than by risk assessments or SAMAs. However, the implementation of measures that reduce the risk of severe accidents, including measures adopted to comply with 10 CFR 50.54(hh), also have a beneficial impact on the level of risk evaluated in a SAMA analysis, the purpose of which is to identify potentially cost-beneficial design alternatives, procedural modifications, or training activities that may further reduce the risks of severe accidents. NextEra has updated the Point Beach guidelines, strategies, and procedures to meet the requirements of 10 CFR 50.54(hh); therefore, those efforts have contributed to mitigating the risk of a beyond-design-basis event. Accordingly, actions taken by NextEra to comply with those regulatory requirements have further contributed to the reduction of risk at Point Beach.

In sum, the new information on actions that NextEra has taken to prepare for potential loss of large areas of the plant due to fire or explosions has further contributed to the reduction of severe accident risk at Point Beach. Thus, this information does not alter the conclusions reached in the 2013 GEIS on the consequences of a severe accident.

F.4.2 State-of-the-Art Reactor Consequence Analysis

The 2013 GEIS notes that a significant NRC effort is ongoing to re-quantify realistic severe accident source terms under the SOARCA project. Results indicate that source term timing and magnitude values quantified using SOARCA are significantly lower than source term values quantified in previous studies using other analysis methods (NRC 2008). The NRC staff plans to incorporate this new information on source term timing and magnitude using SOARCA in future revisions of the GEIS (NRC 2013a).

The NRC has completed a SOARCA study for Surry (a Westinghouse-designed PWR) (NRC 2013c). The summary concludes that, with SOARCA, the NRC has achieved its objective of developing a body of knowledge for detailed, integrated, state-of-the-art modeling of the more important severe accident scenarios for Point Beach. SOARCA analyses indicate that successful implementation of existing mitigation measures can prevent reactor core damage or delay or reduce offsite releases of radioactive material. All SOARCA scenarios, even when unmitigated, progress more slowly and release much less radioactive material than the potential releases cited in the 1982 Siting Study NUREG/CR–2239, *Technical Guidance for Siting Criteria Development* (NRC 1982). As a result, the calculated risks of public health consequences of severe accidents modeled in SOARCA are very small.

This new information on the SOARCA project's findings has further contributed to the reduction of the calculated severe accident risk at Point Beach, as compared to the 1996 GEIS and the Point Beach SAMA evaluation for the initial license renewal application in 2004. Thus, the NRC staff concludes that there is no new and significant information related to Point Beach SAMAs that would alter the conclusions reached in the 2013 GEIS.

F.4.3 Fukushima-Related Activities

As discussed in Section E.2.1 of the 2013 GEIS, on March 11, 2011, a massive earthquake off the east coast of the main island of Honshu, Japan, produced a tsunami that struck the coastal town of Okuma in Fukushima Prefecture. This event damaged the six-unit Fukushima Dai-ichi nuclear power plant, causing the failure of safety systems needed to maintain cooling water flow to the reactors. Due to the loss of cooling, the fuel overheated, and there was a partial meltdown of fuel in three of the reactors. Damage to the systems and structures containing reactor fuel resulted in the release of radioactive material to the surrounding environment (NRC 2013a).

As further discussed in Section E.2.1 of the 2013 GEIS, in response to the earthquake, tsunami, and resulting reactor accidents at Fukushima Dai-ichi (hereafter referred to as the Fukushima events), the Commission directed the NRC staff to convene an agency task force of senior leaders and experts to conduct a methodical and systematic review of NRC regulatory requirements, programs, and processes (and their implementation) relevant to the Fukushima events. After thorough evaluation, the NRC required significant enhancements to U.S. commercial nuclear power plants. The enhancements included adding capabilities to maintain key plant safety functions following a large-scale natural disaster, updating evaluations on the potential impact from seismic and flooding events, adding new equipment to better handle potential reactor core damage events, and strengthening emergency preparedness capabilities. Additional discussion specific to the Point Beach response to earthquakes is available in Section F.3.2 above.

In sum, the Commission has imposed additional safety requirements on operating reactors, including Point Beach, following the Fukushima events (as described in the preceding paragraphs). The new regulatory requirements have further contributed to the reduction of severe accident risk at Point Beach. Therefore, the NRC staff concludes that there is no new and significant information related to the Fukushima events that would alter the conclusions reached in the 2013 GEIS or the previous Point Beach SAMA analysis.

F.4.4 Operating Experience

Section E.2 of the 2013 GEIS mentions the considerable operating experience that supports the safety of U.S. nuclear power plants. As with the use of any technology, greater user experience generally leads to improved performance and safety. Additional experience at nuclear power plants has contributed to improved plant performance (e.g., as measured by trends in plant-specific performance indicators), a reduction in adverse operating events, and new lessons learned that improve the safety of all operating nuclear power plants.

In sum, the new information related to NRC efforts to reduce severe accident risk described above contributes to improved safety, as do safety improvements not related to license renewal, including the NRC and industry response to generic safety issues (e.g., Generic Safety Issue 191, "Assessment of Debris Accumulation on PWR Sump Pump Performance"; NRC 2002b). Thus, the performance and safety record of nuclear power plants operating in the United States, including Point Beach, continue to improve. This improvement is also confirmed by analysis, which indicates that, in many cases, improved plant performance and design features have resulted in reductions in initiating event frequency, CDF, and containment failure frequency (NRC 2013a).

F.4.5 Conclusion

As discussed above, the NRC and the nuclear industry have addressed and continue to address numerous severe accident-related issues since the publication of the 1996 GEIS and the 2004 Point Beach SAMA analysis. These actions reinforce the conclusion that the probability-weighted consequences of a severe accident are SMALL for all plants, as stated in the 2013 GEIS, and further reduce the likelihood of finding a cost-beneficial SAMA that would substantially reduce the severe accident risk at Point Beach.

F.5 Evaluation of New and Significant Information Pertaining to SAMAs Using NEI 17-04, "Model SLR New and Significant Assessment Approach for SAMA"

In its evaluation of the significance of new information, the NRC staff considers that new information is significant if it provides a seriously different picture of the impacts of the Federal action under consideration. Thus, for mitigation alternatives such as SAMAs, new information is significant if it indicates that a mitigation alternative would substantially reduce an impact of the Federal action on the environment. Consequently, with respect to SAMAs, new information may be significant if it indicates that a given potentially cost-beneficial SAMA would substantially reduce the impacts of a severe accident or the probability or consequences (risk) of a severe accident occurring (NRC 2013a).

As discussed earlier in Section F.2.2, NextEra stated in its ER submitted as part of its subsequent license renewal application that it used the methodology in NEI 17-04, Revision 1, "Model SLR New and Significant Assessment Approach for SAMA" (NEI 2019), to evaluate new and significant information as it relates to the Point Beach subsequent license renewal SAMAs. By letter dated December 11, 2019, the NRC staff reviewed NEI 17-04 and found it acceptable for interim use, pending formal NRC endorsement of NEI 17-04 by incorporation in RG 4.2, Supplement 1, "Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications" (NRC 2019a). In general, as discussed earlier, the NEI 17-04 methodology does not consider a potential SAMA to be significant unless it reduces by at least 50 percent the maximum benefit as defined in Section 4.5, "Total Cost of Severe Accident Risk/Maximum Benefit," of NEI 05-01, Revision A, "Severe Accident Mitigation Alternatives (SAMA) Analysis Guidance Document." NEI 05-01 is endorsed in NRC RG 4.2, Supplement 1 (NRC 2013a).

NEI 17-04 describes the following three-stage process for determining whether there is any new and significant information relevant to a previous SAMA analysis.

- **Stage 1**: The subsequent license renewal applicant uses PRA risk insights and/or risk model quantifications to estimate the percent reduction in the maximum benefit associated with: (1) all unimplemented “Phase 2” SAMAs for the analyzed plant; and (2) those SAMAs identified as potentially cost beneficial for other U.S. nuclear power plants and which are applicable to the analyzed plant. If one or more of those SAMAs are shown to reduce the maximum benefit by 50 percent or more, then the applicant must complete Stage 2. (Applicants that demonstrate through the Stage 1 screening process that there is no potentially significant new information are not required to perform the Stage 2 or Stage 3 assessments.)
- **Stage 2**: The subsequent license renewal applicant develops updated averted cost-risk estimates for implementing those SAMAs. If the Stage 2 assessment confirms that one or more SAMAs reduce the maximum benefit by 50 percent or more, then the applicant must complete Stage 3.
- **Stage 3**: The subsequent license renewal applicant performs a cost-benefit analysis for the “potentially significant” SAMAs identified in Stage 2.

Upon completion of the Stage 1 screening process, NextEra determined that there was no potentially significant new information; thus, it did not perform the Stage 2 or Stage 3 assessments. The following sections summarize NextEra’s application of the NEI 17-04 methodology to Point Beach SAMAs.

F.5.1 Data Collection

NEI 17-04 Section 3.1, “Data Collection,” explains that the initial step of the assessment process is to identify the “new information” relevant to the SAMA analysis and to collect and develop those elements of information that will be used to support the assessment. The guidance document states that each applicant should collect, develop, and document the information elements corresponding to the stage or stages of the SAMA analysis performed for the site. For the Point Beach subsequent license renewal, the NRC staff reviewed the onsite information during an audit and determined that NextEra had considered the appropriate information (NRC 2021).

F.5.2 Stage 1 Assessment

Section E4.15.3, “Methodology for Evaluation of New and Significant SAMAs,” of NextEra’s ER describes the process NextEra used to identify any potentially new and significant SAMAs from the 2004 SAMA analysis (NextEra 2020b). In Stage 1 of the process, NextEra used PRA risk insights and risk model quantifications to estimate the percent reduction in the maximum benefit associated with the following two types of SAMAs:

(1) all unimplemented “Phase 2” SAMAs for Point Beach

(2) those SAMAs identified as potentially cost beneficial for other U.S. nuclear power plants and that are applicable to Point Beach (NextEra 2020b)

F.5.3 NextEra’s Evaluation of Unimplemented Point Beach “Phase 2” SAMAs

In 2004, NextEra submitted an application for initial operating license renewal (NextEra 2004), which the NRC approved in 2005, as described above in Section F.2.1. As part of the subsequent license renewal application, NextEra examined its initial license renewal SAMA analysis and the Point Beach PRA again, for insights. The purpose was to determine if there was any new and significant information on the initial SAMA analyses that were performed to support issuance of the initial renewed operating licenses for Point Beach. NextEra reevaluated the 65 Point Beach-specific SAMAs that were considered "Phase 2" in connection with initial license renewal, using the NEI 17-04 process.

The list of SAMAs collected was evaluated qualitatively to screen any that are not applicable to Point Beach or that already exist at Point Beach. The remaining SAMAs were then grouped (if similar), based on similarities in mitigation equipment or risk reduction benefits, and all were evaluated for the impact that they would have on the Point Beach CDF and source term category frequencies if implemented. In addition, two other screening criteria were applied to eliminate SAMAs that have excessive cost. First, SAMAs were screened if they were found to reduce the Point Beach maximum benefit by greater than 50 percent in the Point Beach initial license renewal but also found to not be cost effective due to high cost in the initial license renewal. Second, SAMAs related to creating a containment vent were screened because this plant modification has been evaluated industrywide and explicitly found to not be cost effective in Westinghouse large dry containments. If any of the SAMAs were found to reduce the total CDF for at least one consequential source term category frequency by at least 50 percent, then the SAMA was retained for a Stage 2 assessment (Level 3 PRA evaluation of the reduction in maximum benefit). As discussed below, all SAMAs were screened as not significant without the need to go to the Stage 2 assessment or PRA Level 3 evaluation.

F.5.4 NextEra Evaluation of SAMAs Identified as Potentially Cost Beneficial at Other U.S. Nuclear Power Plants and Which are Applicable to Point Beach

The 2013 GEIS considered the plant-specific supplemental EISs that document potential environmental impacts and mitigation measures for severe accidents relevant to license renewal for each plant. Some of these plant-specific supplements had identified potentially cost-beneficial SAMAs. NextEra reviewed the SEISs of plants with a similar design to Point Beach (PWRs with large dry containments) to identify 282 potentially cost-beneficial SAMAs from other plants. This large list of industry SAMAs was qualitatively screened using the criteria that a potential SAMA is either not applicable to the Point Beach design or the SAMA has already been implemented at Point Beach. NextEra grouped the remaining SAMAs based on similarities in mitigation equipment or risk reduction benefits. Thus, NextEra evaluated 65 SAMAs specific to Point Beach and 282 potentially cost-beneficial SAMAs identified at similarly designed nuclear power plants (industry SAMAs) for a total of 347 SAMAs.

Section E4.15.4 of NextEra's subsequent license renewal ER provides the Point Beach evaluation using the methodology in NEI 17-04. The industry SAMAs that were not qualitatively screened were then merged with the Point Beach-specific SAMAs collected from the initial license renewal, with similar SAMAs grouped together for further analysis. The combined SAMA list was then quantitatively screened to determine if the CDF for any source term category frequency would be reduced at least 50 percent if the SAMA were implemented. Table E4.15-1 of the ER presents the 88 industry SAMAs that were not qualitatively screened, combined with the 42 SAMAs specific to Point Beach selected for further evaluation. Table E4.15-2 presents the quantitative screening results from the bounding SAMA evaluations. As seen in Table E4.15-2, none of the bounding quantitative screening evaluations resulted in a reduction of total CDF, total LERF, or total large release frequency greater than 50 percent. Since NextEra's Stage 1 analysis demonstrated that none of the SAMAs considered for quantitative evaluation would reduce the Point Beach maximum benefit by 50 or greater, NextEra concluded that no new and significant information relevant to the original SAMA analysis for Point Beach exists, and no further analysis is needed.

The NRC staff reviewed the Point Beach information and its SAMA Stage 1 process during an audit (NRC 2020a). The NRC staff found that NextEra had used a methodical and reasonable approach to identify any SAMAs that might reduce the maximum benefit by at least 50 percent and could be considered potentially significant. Therefore, the NRC staff finds that NextEra properly concluded, in accordance with the NEI 17-04 guidance, that it did not need to conduct a Stage 2 assessment.

F.5.5 Other New Information

As discussed in NextEra's subsequent license renewal application ER and in NEI 17-04, there are some inputs to the SAMA analysis that are expected to change or to potentially change for all plants. Examples of these inputs include the following:

- updated Level 3 PRA model consequence results, which may be impacted by multiple inputs, including, but not limited to, the following:
  - population, as projected within a 50-mi (80-km) radius of the plant
  - value of farm and nonfarm wealth
  - core inventory (e.g., due to power uprate)
  - evacuation timing and speed
  - Level 3 PRA methodology updates
  - cost-benefit methodology updates

In addition, other changes that could be considered new information may be dependent on plant activities or site-specific changes. These types of changes (listed in NEI 17-04) include the following:

- identification of a new hazard (e.g., a fault that was not previously analyzed in the seismic analysis)
  - updated plant risk model (e.g., a fire PRA that replaces the IPEEE analysis)
- impacts of plant changes that are included in the plant risk models to be reflected in the model results and not needed to be assessed separately
- nonmodeled modifications to the plant
  - Modifications determined to have no risk impact need not be included (e.g., replacement of the condenser vacuum pumps) unless they impact a specific input to SAMA (e.g., new low-pressure turbine in the power conversion system that results in a greater net electrical output).

The NEI methodology described in NEI 17-04 uses "maximum benefit" to determine if SAMA-related information is new and significant. Maximum benefit is defined in Section 4.5 of NEI 05-01, Revision A (NEI 2005b), as the benefit a SAMA could achieve if it eliminated all risk. The total offsite dose and total economic impact are the baseline risk measures from which the maximum benefit is calculated. The NEI methodology in NEI 17-04 considers a cost-beneficial SAMA to be potentially significant if it reduces the maximum benefit by at least 50 percent. The NRC staff finds the criterion of exceeding a 50-percent reduction in the maximum benefit a reasonable significance value because it correlates with significance determinations in the American Society of Mechanical Engineers and American Nuclear Society PRA standard (cited in RG 1.200, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications") (ASME/ANS 2009; NRC 2009a), NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" (NRC endorsed in RG 1.160) (NEI 2018; NRC 2018a), and NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline" (NRC endorsed in RG 1.201) (NEI 2005a; NRC 2006), which the NRC has cited or endorsed.

The NRC staff also finds that the NEI methodology criterion is consistent with the qualitative criteria that new information is significant if it presents a seriously different picture of the impacts of the Federal action under consideration (NUREG-0386, United States Nuclear Regulatory Commission Staff Practice and Procedure Digest: Commission, Appeal Board, and Licensing Board Decisions (NRC 2009b)). Furthermore, the NEI methodology is consistent with the criteria that the NRC staff accepted in the Limerick Generating Station license renewal final SEIS (NRC 2014b). The NRC staff finds the approach in NEI 17-04 to be reasonable because, with respect to SAMAs, new information may be significant if it indicates a potentially cost-beneficial SAMA could substantially reduce the probability or consequences (risk) of a severe accident occurring. The implication of this statement is that "significance" is not solely related to whether a SAMA is cost beneficial (which may be affected by, for example, economic factors or increases in population), but it also depends on a SAMA's potential to significantly reduce risk to the public.

F.5.6 Conclusion

As described above, NextEra evaluated a total of 347 SAMAs for the Point Beach subsequent license renewal and did not find any that would reduce the maximum benefit by 50 percent or more. The NRC staff reviewed NextEra's evaluation and concludes that NextEra's methods and results were reasonable. Based on the Point Beach Stage 1 qualitative and quantitative screening results, NextEra demonstrated that none of the plant-specific and industry SAMAs that it considered constituted new and significant information in that none changed the conclusion of the previous Point Beach SAMA analysis. Further, the NRC staff did not otherwise identify any new and significant information that would alter the conclusions reached in the previous SAMA analysis for Point Beach. Therefore, the NRC staff concludes that there is no new and significant information that would alter the conclusions of the SAMA analysis performed for the Point Beach initial license renewal.

Given the low residual risk at Point Beach, its substantial decrease in CDF from the previous SAMA analysis, and the fact that no potentially cost-beneficial SAMAs were identified during the Point Beach initial license renewal review, the NRC staff considers it unlikely that NextEra would have found any potentially cost-beneficial subsequent license renewal SAMAs. Further, NextEra's implementation of actions to satisfy the NRC's orders and regulatory requirements on beyond-design-basis events after the September 11, 2001, terrorist attacks and Fukushima events, as well as the conservative assumptions used in earlier severe accident studies and SAMA analyses, also made it unlikely that NextEra would have found any potentially significant cost-beneficial SAMAs during its subsequent license renewal review.

For all of the reasons stated above, the NRC staff concludes that NextEra reached reasonable SAMA conclusions in its subsequent license renewal application ER and that there is no new and significant information on any potentially cost-beneficial SAMA that would substantially reduce the risks of a severe accident at Point Beach or that would alter the conclusions of the SAMA analysis performed for the Point Beach initial license renewal.

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10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)
The U.S. Nuclear Regulatory Commission (NRC) staff prepared this draft supplemental environmental impact statement in response to NextEra Energy Point Beach LLC’s application to renew the operating licenses for Point Beach Nuclear Plant Units 1 and 2 (Point Beach) for an additional 20 years.

This SEIS includes the NRC staff’s analysis that evaluates the environmental impacts of the proposed action and alternatives to the proposed action. Alternatives considered include: (1) new nuclear (a small modular reactor facility), (2) natural gas combined-cycle facility, (3) combination of small modular reactor, solar, photovoltaic, and onshore wind facilities, and (4) the no-action alternative. The NRC staff’s recommendation is that the adverse environmental impacts of subsequent license renewal for Point Beach are not so great that preserving the option of subsequent license renewal for energy planning decisionmakerswould be unreasonable.

The NRC staff based its recommendation on the following factors: (1) the analysis and findings in NUREG- 1437, (2) the environmental report submitted by NextEra, (3) the NRC staff’s consultation with Federal, State, local, and Tribal government agencies, (4) the NRC staff’s independent environmental review, and, (5) the NRCstaff’s consideration of public comments.

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