APPENDIX D

Project Design Envelope and Maximum-Case Scenario

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Introduction

This environmental impact statement (EIS) assesses the impacts of the reasonable range of Revolution Wind Farm (RWF) and Revolution Wind Export Cable (RWEC) Project (the Project) designs that are described in the Revolution Wind construction and operations plan (COP) by using the maximum-case scenario process. The maximum-case scenario analyzes the aspects of each design parameter that would result in the greatest impact for each physical, biological, and socioeconomic resource. This EIS considers the interrelationship among aspects of the project design envelope (PDE) rather than simply viewing each design parameter independently. Additional information and guidance related to the PDE concept can be found in Chapter 1 of the EIS and on BOEM's website available at https://www.boem.gov/Draft-Design-Envelope-Guidance/. Table D-1 details the full range of maximum-case design parameters for the proposed Project and which parameters are relevant to the analysis for each EIS resource section (denoted with an *X*) in Chapter 3 of the EIS.

Table D-1. Maximum-Case Scenario List of Parameter Specifications

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Other Waters of the United States
WIND FARM																					
Wind farm capacity	704 megawatt (MW)	880 MW	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WIND TURBINE GENERATOR (WTG) AND MONOPILE FOUNDATION																					
Turbine size	8 MW	12 MW	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Number of WTG positions	59	100	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Distance between positions	1 nautical mile (nm) between WTGs on an east–west, north–south grid	1 nm between WTGs along north–south rows, and 0.7 mile between WTGs within east–west rows	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Total tip height	647.6 feet (197.4 meters [m])	872.7 feet (266 m)		X		X		X	X						X	X	X		X		
Hub height	377 feet (115 m)	512 feet (156 m)		X		X		X	X						X	X	X		X		
Turbine height	646 feet (197 m)	873 feet (266 m)		X		X		X	X						X	X	X		X		
Rotor diameter	538 feet (164 m)	722 feet (220 m)		X		X		X	X						X	X	X		X		
Base height (foundation height–top of transition piece)	19.7 feet (6 m)	26 feet (8 m)		X		X		X	X						X	X	X		X		
Base (tower) width (at the top)	13 feet (4 m)	21 feet (6.4 m)		X		X		X	X						X	X	X		X		

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Nacelle dimensions (length × width × height)	46 × 23 × 20 feet (14 × 7 × 6 m)	72 × 33 × 39 feet (22 × 10 × 12 m)		X		X		X	X						X	X	X		X		
Rotor swept zone area	5.2 acres (21,100 square meters [m^2])*	9.7 acres (39,400 m^2)*		X		X		X	X						X	X	X		X		
Blade length	259 feet (79 m)	351 feet (107 m)		X		X		X	X						X	X	X		X		
Blade width	16 feet (5 m)	26 feet (8 m)		X		X		X	X						X	X	X		X		
Base height (foundation height–top of transition piece)	82 feet (25 m)	128 feet (39 m)		X		X		X	X						X	X	X		X		
Air gap (mean sea level to bottom of blade tip)	93.5 feet (28.5 m)	151 feet (46 m)		X		X		X	X						X	X	X		X		
Foundation construction method	Pile driving	Pile driving	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Foundation and WTG vessel type	Jack-up vessel or derrick barge, vessel on dynamic positioning with feeder barges	Jack-up vessel or derrick barge, vessel on dynamic positioning with feeder barges	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Jack-up vessel seabed penetration of spudcans (WTG and OSS)	52 feet	52 feet	X		X			X	X			X		X	X	X	X	X	X	X	
Jack-up radius around foundations (WTG and OSS)	656 feet	656 feet	X		X			X	X			X		X	X	X	X	X	X	X	
Jack-up seabed preparation (WTG and OSS)	18.36 acres (assume all foundations need one jack up; 0.18 acre per jack up x 102 foundations = 18.36 acres)	21.14 acres (assume 15% of all foundations will need one additional jack up; 18.36 acres + 0.18*(0.15 x 102) = 21.14 acres)	X		X			X	X			X		X	X	X	X	X	X	X	
WTG coloring	RAL 9010 Pure White	RAL 7035 Light Grey				X			X						X	X	X		X		

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Bureau of Ocean Energy Management (BOEM) aviation and navigation safety recommendations (BOEM 2021)	Two synchronized L-864 aviation medium-intensity red flashing obstruction lights mounted on the WTG nacelle at a height of approximately 530 feet (161.5 m); up to three L-810 low-intensity red flashing obstruction lights mounted on the WTG tower midsection at a height of approximately 312 feet (95 m); all lights would synchronize with 30 flashes per minute for air navigation lighting	Two synchronized L-864 aviation medium-intensity red flashing obstruction lights mounted on the WTG nacelle at a height of approximately 530 feet (161.5 m); up to three L-810 low-intensity red flashing obstruction lights mounted on the WTG tower midsection at a height of approximately 312 feet (95 m); all lights would synchronize with 30 flashes per minute for air navigation lighting		X		X		X	X						X	X	X		X		
BOEM aviation and navigation safety recommendations (BOEM 2021); U.S. Coast Guard (USCG) District 1 offshore structure marking guidance (USCG 2020a)	Two white flashing obstruction lights (color to be determined depending on structure classification) on each turbine approximately 20 to 23 meters above mean lower low water on opposite corners along the same horizontal plane, each visible from all approach directions to 3 nm	Two white flashing obstruction lights (color to be determined depending on structure classification) on each turbine approximately 20 to 23 meters above mean lower low water on opposite corners along the same horizontal plane, each visible from all approach directions to 3 nm		X		X		X	X						X	X	X		X		
BOEM aviation and navigation safety recommendations; USCG District 1 offshore structure Private Aids to Navigation (PATON) marking guidance (USCG 2020b)	Flashing white light visible to 1 nm for Class C structure (to be determined by USCG)	Flashing white light visible to 5 nm for Class A structure (to be determined by USCG)		X		X		X	X						X	X	X		X		
WTG foundation coloring	RAL 1023 Yellow from water line to height of at least approximately 50 feet	RAL 1023 Yellow from water line to height of at least approximately 50 feet		X		X		X	X						X	X	X		X		
Nautical hazard prevention device	Foghorns audible to 2 nm and emit 134 decibels at 3 feet (1 m) and a tone at a frequency of 660 hertz (Hz)	Foghorns audible to 2 nm and emit 134 decibels at 3 feet (1 m) and a tone at a frequency of 660 Hz		X	X	X		X				X		X	X	X	X				

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Number of monopile foundations	61	102	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Monopile diameter	20–39 feet (tapered)	20–39 feet (tapered)	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Number of piles per foundation	1	1	X		X			X	X			X		X	X	X	X	X	X	X	
Seabed disturbance—no scour protection—per monopile foundation	0.027 acre	0.027 acre	X		X			X	X			X		X	X	X	X	X	X	X	
Monopole and scour protection area per foundation	0.7 acre	0.7 acre	X		X			X	X			X		X	X	X	X	X	X	X	
Seabed preparation per foundation	7.2 acres	7.2 acres	X		X			X	X			X		X	X	X	X	X	X	X	
Vessel anchoring/mooring per foundation	Not provided	Not provided	X		X			X	X			X		X	X	X	X	X	X	X	
Hammer size for monopile foundation	4,000 kilojoules (kJ)	4,000 kJ	X		X			X	X			X		X	X	X	X	X	X	X	
Maximum penetration depth into seabed	98 feet (monopile)	164 feet (monopile)	X		X			X	X			X		X	X	X	X	X	X	X	
Duration of pile driving (hours/pile)	1–4 hours	6–12 hours	X		X			X	X			X		X	X	X	X	X	X	X	
Duration of installation (per WTG)	36 hours	36 hours	X		X			X	X			X		X	X	X	X	X	X	X	
Duration of installation (foundations/day)	3	3	X		X			X	X			X		X	X	X	X	X	X	X	
Period of all WTG foundation pile driving	5 months	5 months	X		X			X	X			X		X	X	X	X	X	X	X	

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OFFSHORE SUBSTATION (OSS)																					
Number of OSSs	1	2	X	X	X	X		X	X			X		X	X	X	X	X	X	X	
Period of installation and commissioning	8 months	8 months	X		X			X	X			X		X	X	X	X	X	X	X	
OSS height, excluding lighting protection	82 + 108 feet = 190 feet	190 feet		X		X		X	X						X	X	X		X		
OSS height, including lighting protection	82 + 180 feet = 262 feet	262 feet		X		X		X	X						X	X	X		X		
Topside length and width	321.5 × 216.5 feet	321.5 × 216.5 feet		X		X		X	X						X	X	X		X		
USCG lighting	See monopile turbine requirements	See monopile turbine requirements		X		X		X	X						X	X	X		X		
OSS number of piles per foundation	1	1	X		X			X	X			X		X	X	X	X	X	X	X	
Scour protection area (per monopile)	0.7 acre	0.7 acre	X		X			X	X			X		X	X	X	X	X	X	X	
Seabed preparation per foundation	7.2 acres	7.2 acres	X		X			X	X			X		X	X	X	X	X	X	X	
OSS foundation construction method	Pile driving	Pile driving	X		X			X	X			X		X	X	X	X	X	X	X	
Diameter (minimum top to maximum bottom)	20–49 feet (tapered)	20–49 feet (tapered)	X		X			X	X			X		X	X	X	X	X	X	X	
Maximum hydraulic hammer energy	4,000 kJ	4,000 kJ	X		X			X	X			X		X	X	X	X	X	X	X	
INTER-ARRAY CABLE (IAC)																					
IAC capacity	72 kilovolts (kV)	72 kV	X		X			X	X			X		X	X	X	X	X		X	
IAC diameter	8 inches	8 inches																			
IAC length	155 miles	155 miles	X		X			X	X			X		X	X	X	X	X		X	

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Maximum disturbance depth	10 feet	10 feet	X		X			X	X			X		X	X	X	X	X		X	
Target burial depth	4 feet	6 feet	X		X			X	X			X		X	X	X	X	X		X	
Disturbance corridor-cable only (width)	131 feet	131 feet	X		X			X	X			X		X	X	X	X	X		X	
Period of installation of the complete IAC system	5 months	5 months	X		X			X	X			X		X	X	X	X	X		X	
IAC installation rate	400 m/hour	400 m/hour	X		X			X	X			X		X	X	X	X	X		X	
IAC general disturbance corridor	2,471 acres	2,471 acres	X		X			X	X			X		X	X	X	X	X		X	
IAC seabed disturbance due to boulder clearance (80% of total length)	1,976.8 acres	1,976.8 acres	X		X			X	X			X		X	X	X	X	X		X	
IAC seabed disturbance due to sandwave leveling/ dredging (10% of total length)	247.1 acres	247.1 acres	X		X			X	X			X		X	X	X	X	X		X	
IAC secondary cable protection (10% of total length)	74.1 acres	74.1 acres	X		X			X	X			X		X	X	X	X	X		X	
OFFSHORE SUBSTATION-LINK CABLE (OSS-LINK CABLE)																					
OSS-link cable capacity	275 kV	275 kV	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable length	9 miles	9 miles	X		X			X	X			X		X	X	X	X	X		X	
Number of OSS-link cables	1	1	X		X			X	X			X		X	X	X	X	X		X	
Cable diameter	11.8 inches	11.8 inches	X		X			X	X			X		X	X	X	X	X		X	

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Target burial depth	4 feet	6 feet	X		X			X	X			X		X	X	X	X	X		X	
Disturbance corridor (width)	131 feet	131 feet	X		X			X	X			X		X	X	X	X	X		X	
Maximum disturbance depth	10 feet	10 feet	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable installation rate	400 m/hour	400 m/hour	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable general disturbance corridor	148.0 acres	148.0 acres	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable seabed disturbance due to boulder clearance (60% of total length)	89 acres	89 acres	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable seabed disturbance due to sandwave leveling/ dredging (10% of total length)	14.8 acres	14.8 acres	X		X			X	X			X		X	X	X	X	X		X	
OSS-link cable protection (10% of total length)	4.4 acres	4.4 acres	X		X			X	X			X		X	X	X	X	X		X	
SUMMARY OF RWEC SEGMENT LENGTHS OFFSHORE																					
RWEC: OCS	Up to 19 miles (per cable)		X	X		X			X	X			X		X	X	X	X	X		X
RWEC: Rhode Island	23 miles (per cable)		X	X		X			X	X			X		X	X	X	X	X		X
Total RWEC segment lengths offshore	Approximately 42 miles (per cable)		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X

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RWEC OFFSHORE																					
RWEC capacity	275 kV	275 kV	X		X			X	X			X		X	X	X	X	X		X	
Number of RWECs	1	2	X		X			X	X			X		X	X	X	X	X		X	
RWEC diameter	11.8 inches	11.8 inches	X		X			X	X			X		X	X	X	X	X		X	
Disturbance corridor (width)	131 feet, up to 673 feet at joint locations	131 feet, up to 673 feet at joint locations	X		X			X	X			X		X	X	X	X	X		X	
Operational right-of-way (ROW)	1,640 feet	1,640 feet	X		X			X	X			X		X	X	X	X	X		X	
Target burial depth (offshore)	4 feet	6 feet	X		X			X	X			X		X	X	X	X	X		X	
RWEC installation rate	400 m/hour	400 m/hour	X		X			X	X			X		X	X	X	X	X		X	
Period of installation	8 months	8 months	X		X			X	X			X		X	X	X	X	X		X	
RWEC: trench width	up to 43 feet	up to 43 feet	X		X			X	X			X		X	X	X	X	X		X	
RWEC: Outer Continental Shelf (OCS) submarine cable general disturbance corridor	593.1 acres	593.1 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: OCS boulder clearance (40% of route, included in general disturbance corridor amount)	237.2 acres	237.2 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: OCS sandwave leveling (45% of route, included in general disturbance corridor amount)	266.9 acres	266.9 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: OCS cable protection (10% of route for each cable)	17.8 acres	17.8 acres	X		X			X	X			X		X	X	X	X	X		X	

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RWEC: OCS cable omega joints (two total)	20.4 acre	20.4 acre	X		X			X	X			X		X	X	X	X	X		X	
RWEC: cable protection per crossing (with existing submarine assets)	20.8 acres	20.8 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: Rhode Island (RI) submarine cable general disturbance corridor	731.4 acres	731.4 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: RI boulder clearance (70% of route, included in general disturbance corridor amount)	512 acres	512 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: RI sandwave leveling (7% of route, included in general disturbance corridor amount)	51.2 acres	51.2 acres	X		X			X	X			X		X	X	X	X	X		X	
RWEC: RI cable protection (10% of route for each cable)	21.9 acres	21.9 acres	X		X			X	X			X		X	X	X	X	X		X	
Vessel anchoring corridor	1,640 feet	1,640 feet																			

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RWEC AT LANDFALL																					
Landfall work area	3.1 acres	3.1 acres	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transition join bays (located within the landfall work area)	1,340 square feet	1,340 square feet	X				X		X				X				X			X	X
Temporary cofferdam exit pits (2X) for horizontal directional drilling (HDD) construction (located within landfall work area)	0.24 acre	0.94 acre	X				X		X				X				X			X	X
ONSHORE TRANSMISSION CABLE AND PROJECT COMPONENTS																					
Landfall sites	Multiple landfall sites are currently being evaluated within the approximate 20-acre landfall envelope, located at Quonset Point in North Kingstown, Rhode Island.		X	X	X		X	X		X	X	X		X				X		X	X
Landfall work area	3.1 acres within the landfall envelope, located at Quonset Point in North Kingstown, Rhode Island		X	X	X		X	X		X	X	X		X				X		X	X
Landfall transition method	HDD with possible cofferdam		X	X	X		X	X		X	X	X		X				X		X	X
Temporary anchor wall driven depth	20 feet		X	X	X		X	X		X	X	X		X				X		X	X
HDD cable duct diameter	3 feet		X	X	X		X	X		X	X	X		X				X		X	X
HDD cable duct length	0.6 mile		X	X	X		X	X		X	X	X		X				X		X	X

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Landfall transition	Underground concrete transition vault		X	X	X		X	X		X	X	X		X				X		X	X
Onshore construction location	Single thermal concrete duct bank and splice vaults		X	X	X		X	X		X	X	X		X				X		X	X
Onshore construction method	Open trench (8-foot-wide trench within 25-foot-wide temporary disturbance corridor that expands to 30 × 75 feet at splice vaults) with HDD or other trenchless technology as needed		X	X	X		X	X		X	X	X		X				X		X	X
Onshore cable route	Landfall work area to The Narragansett Electric Company d/b/a National Grid (TNEC) Davisville Substation		X	X	X		X	X		X	X	X		X				X		X	X
Transition joint bays	67 × 10 × 10 feet																				
Onshore transmission cable corridor length	Approximately 1 mile		X	X	X		X	X		X	X	X		X				X		X	X
Onshore interconnection facility location	Immediately adjacent to the existing Davisville Substation in North Kingstown, Rhode Island		X	X	X		X	X		X	X	X		X				X		X	X
Length of underground ROW connecting the onshore substation (OnSS) to the interconnection facility	527 feet		X	X	X		X	X		X	X	X		X				X		X	X
Length of overhead ROW connecting the interconnection facility to the Davisville Substation	474 feet		X	X	X		X	X		X	X	X		X				X		X	X

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Other Waters of the United States
Onshore interconnection facility limit of work size	4 acres		X	X	X		X	X		X	X	X		X				X		X	X
OnSS (property size)	15 acres		X	X	X		X	X		X	X	X		X				X		X	X
OPERATIONS AND MAINTENANCE (O&M) FACILITY																					
Port of Montauk	A new building with up to 1,000 square feet of office space and up to 6,000 square feet of equipment storage space would be constructed at the Port of Montauk.	A new building with up to 1,000 square feet) of office space and up to 6,000 square feet of equipment storage space would be constructed at the Port of Montauk.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Port of Davisville at Quonset Point	A new building with up to 1,000 square feet of office space and up to 11,000 square feet of equipment storage space would be constructed at the Port of Davisville at Quonset Point.	A new building with up to 1,000 square feet of office space and up to 11,000 square feet of equipment storage space would be constructed at the Port of Davisville at Quonset Point.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Port of Brooklyn	There are no plans to establish an O&M building at, or otherwise implement improvements to, the Port of Brooklyn, and use of this port is assumed to be limited to existing facilities maintained by the port.	There are no plans to establish an O&M building at, or otherwise implement improvements to, the Port of Brooklyn, and use of this port is assumed to be limited to existing facilities maintained by the port.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Port of Galilee	There are no plans to establish an O&M building at, or otherwise implement improvements to, the Port of Galilee, and use of this port is assumed to be limited to existing facilities maintained by the port.	There are no plans to establish an O&M building at, or otherwise implement improvements to, the Port of Galilee, and use of this port is assumed to be limited to existing facilities maintained by the port.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Design Parameter	Minimum Design Size	Maximum Design Size	3.4 Air Quality	3.5 Bats	3.6 Benthic Habitat and Invertebrates	3.7 Birds	3.8 Coastal Habitats and Fauna	3.9 Commercial Fisheries and For-Hire Recreational Fishing	3.10 Cultural Resources	3.11 Demographics, Employment, and Economics	3.12 Environmental Justice	3.13 Finfish and Essential Fish Habitat	3.14 Land Use and Coastal Infrastructure	3.15 Marine Mammals	3.16 Navigation and Vessel Traffic	3.17 Other Uses	3.18 Recreation and Tourism	3.19 Sea Turtles	3.20 Visual Resources	3.21 Water Quality	3.22 Wetlands and Other Waters of the United States
Port Jefferson	An existing upland building within an office park located approximately 6 miles from Port Jefferson. This building would serve as a regional O&M hub and headquarters for Orsted and multiple offshore wind projects. The building was recently purchased by Northeast Offshore, LLC, and has internal upgrades planned to establish office and warehouse space.	An existing upland building within an office park located approximately 6 miles from Port Jefferson. This building would serve as a regional O&M hub and headquarters for Orsted and multiple offshore wind projects. The building was recently purchased by Northeast Offshore, LLC, and has internal upgrades planned to establish office and warehouse space.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Notes: In this appendix, distances in miles are in statute miles (miles used in the traditional sense) or nautical miles (miles used specifically for marine navigation). Statute miles are more commonly used and are referred to simply as miles, whereas nautical miles are referred to by name or by their abbreviation “nm.” Numbers that were calculated are rounded to the closest whole number.
* This value was calculated based on information provided.

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