Empire Offshore Wind LLC

and

EW Offshore Wind Transport Corporation

Empire Wind 2 Project

Article VII Application

Exhibit E-1

Description of Proposed Transmission Line

August 2023

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ACRONYMS AND ABBREVIATIONS

Empire or the Applicant	Empire Offshore Wind LLC and EW Offshore Wind Transport Corporation
EW 2	Empire Wind 2
ft	foot
HVAC	high-voltage alternating-current
in	inch
in^2	square inch
km	kilometer
kV	kilovolt
LIPA	Long Island Power Authority
LIRR	Long Island Rail Road
m	meter
mi	mile
mm	millimeter
mm^2	square millimeter
nm	nautical mile
NY Project	EW 2 Project transmission facilities in New York
POI	Point of Interconnection at the Hampton Road substation
PSEG-LI	PSEG Long Island
PSL	New York Public Service Law
XLPE	cross-linked polyethylene

EXHIBIT E-1: DESCRIPTION OF PROPOSED TRANSMISSION LINE

E-1.1 Introduction

Empire Offshore Wind LLC and EW Offshore Wind Transport Corporation (collectively, Empire or the Applicant) proposes to construct and operate the Empire Wind 2 (EW 2) Project as one of two separate offshore wind projects to be located within the Bureau of Ocean Energy Management (BOEM) designated Renewable Energy Lease Area OCS-A 0512 (Lease Area). The EW 2 Project will require an electric transmission system to connect the offshore wind farm to the point of interconnection (POI) to the New York State Transmission System. An electric transmission line with a design capacity of 125-kilovolt (kV) or more, extending a distance of one mile or more, is subject to review and approval by the New York State Public Service Commission (Commission or NYSPSC) as a major electric transmission facility pursuant to Article VII of the New York Public Service Law (PSL). The EW 2 Project transmission system will extend a total of approximately 12.2 miles (mi) (19.6 kilometers [km]) within the State of New York and includes two 345-kV cable circuits.

The POI will be located on a parcel located along Hampton Road in Oceanside, within the Town of Hempstead, New York. The POI facilities (referred to herein collectively as the Hampton Road substation) will include both 345-kV and 138-kV substation facilities. The Applicant is proposing to permit all of these facilities, as well as the 138-kV "loop-in / loop-out" lines that will connect the substation facilities to two existing 138-kV cable circuits located under Lawson Boulevard owned by the Long Island Power Authority (LIPA) and operated by PSEG Long Island (PSEG-LI). LIPA will own and PSEG-LI will operate these loop-in / loop-out lines and the 138-kV facilities at the Hampton Road substation site. The ownership and/or operation of the 345-kV facilities at the Hampton Road substation will be determined through a mutually acceptable Interconnection Agreement between the Applicant and LIPA, as developed through the New York Independent System Operator, Inc. (NYISO) interconnection process.

This application is being submitted to the Commission pursuant to Article VII of the PSL for the portions of the EW 2 Project transmission system that are located within the State of New York (the NY Project). The onshore portion of the NY Project will be located entirely within Nassau County, New York.

The NY Project includes:

- Two three-core 345-kV high-voltage alternating-current (HVAC) submarine export cables located within an approximately 7.7-nautical mile (nm, 14.2-km)-long submarine export cable corridor from the boundary of New York State waters 3 nm (5.6 km) offshore to the cable landfall;
- A cable landfall in the City of Long Beach, New York;
- Two 345-kV onshore export cable circuits, each with three single-core HVAC onshore export cables within an approximately 1.6-mi (2.5 -km)-long onshore export cable corridor from the cable landfall to the onshore substation;
- An onshore substation in the Village of Island Park, within the Town of Hempstead, New York, which will house major control components for the electrical system and perform functions such as voltage regulation, reactive power compensation, and harmonic filtering;

- Two 345-kV interconnection cable circuits, each with three single-core HVAC interconnection cables within an approximately 1.7-mi (2.8-km)-long interconnection cable corridor from the onshore substation to the Hampton Road substation;

- The new Hampton Road substation in Oceanside in the Town in Hempstead, New York, which will include substation facilities that will provide the necessary breaker arrays and 345-kV/138-kV transformers; and

- Four 138-kV loop-in / loop-out line cable circuits, located within an approximately 0.1-mi (0.2-km) long cable corridor from the Hampton Road substation to existing LIPA transmission lines located under Lawson Boulevard in Oceanside, New York.

This Exhibit addresses the requirements of 16 New York Codes, Rules and Regulations § 88.1 and provides a description of the NY Project's proposed transmission lines, including the submarine export cables, onshore export cables, interconnection cables, and loop-in / loop-out lines. All proposed transmission lines for the Project are submarine or underground, as described in **Exhibit E-3: Underground Construction**, with the exception of a short segment of the transmission line that will cross Barnums Channel via a cable bridge, parallel to the Long Island Rail Road (LIRR) bridge trestle, and aboveground transmission facilities that are part of the onshore substation and the Hampton Road substation (see **Exhibit E-2: Other Facilities**). There are no towers associated with the proposed transmission lines.

E-1.2 Description of the Proposed Transmission Line

Table E-1.2-1 summarizes the characteristics of the proposed transmission lines, including the submarine export cables, onshore export cables, interconnection cables, and loop-in / loop-out lines.

Table E-1.2-1 Characteristics of Proposed Transmission Lines

Characteristics	Submarine Export Cables a/	Onshore Export Cables	Interconnection Cables	Loop-in / Loop-out Cables
Number of circuits	2	2	2	4
Number of cables per circuit	1	3	3	3
Number of cables (total)	2	6 + 2 fiber optic	6 + 2 fiber optic	12 b/
Design voltage c/	362 kV	362 kV	362 kV	145 kV
Voltage of initial operation	345 kV	345 kV	345 kV	138 kV
Length of each cable route	8.8 mi (14.2 km)	1.6 mi (2.5 km)	1.7 mi (2.8 km)	0.1 mi (0.2 km)
Cable diameter	11.4 in (290 mm)	5.26 in (134 mm)	5.26 in (134 mm)	4.0 in (102 mm)
Cable cross-sectional area	102 in^2 (661 cm^2)	21.7 in^2 (140.4cm^2)	21,7 in^2 (140.4 cm^2)	12.6 in^2 (81.1 cm^2)
Number of conductors per cable	3	1	1	1
Conductor characteristics				
Diameter	2.15 in (54.6 mm)	2.25 in (57 mm)	2.25 in (57 mm)	1.3 in (33.6 mm)
Cross-section	3.1 in^2 (2,000 mm^2)	3.9 in^2 (2,500 mm^2) d/	3.9 in^2 (2,500 mm^2) d/	1.4 in^2 (887 mm^2)
Material	copper	copper	copper	copper

Characteristics	Submarine Export Cables a/	Onshore Export Cables	Interconnection Cables	Loop-in / Loop-out Cables
Insulator design	XLPE	XLPE	XLPE	XPLE

Notes:
a/ Fiber optic elements are bundled within each submarine export cable.
b/ Information regarding use of fiber optic cable or radio communications for these lines is pending.
c/ Design voltage is based on the highest voltage that can be sustained under normal operating conditions at any time and at any point in a system.
d/ This value represents the maximum scenario. Appendix G Electric- and Magnetic-field assessment is based on the expected case of 2,000 mm^2.

E-1.2.1 Submarine Export Cables

From the southeastern portion of Renewable Energy Lease Area OCS-A 0512, two 345-kV submarine export cables will be installed within a single cable corridor that runs northwest traversing the New York Bight toward Long Island. The submarine export cable corridor crosses the state boundary 3 nm (3.5 mi, 5.6 km) offshore, directly south of Jones Beach in western Long Island. After crossing the New York State boundary, the submarine cable route continues approximately northwest and turns north to the landfall at Riverside Boulevard in the City of Long Beach, New York.

The submarine export cable corridor in New York is approximately 7.7 nm (8.8 miles, 14.2 km) long from the state boundary offshore to the cable landfall. The submarine export cables will be HVAC. Each of the HVAC submarine export cables will consist of a three-core cable with copper conductors enclosed in a cross-linked polyethylene (XLPE) insulation system, and up to two integrated optical fibers for communication and monitoring. The cable insulation is rated for voltage levels up to 362 kV.

Each of the 3.1-square-inch (in^2) (2,000 square-millimeter [mm^2]) bundled copper power conductors will be within insulated power cores. Each conductor will be made of stranded copper wires and will be protected against longitudinal water ingress by means of a water-blocking compound, yarns, and/or tapes. Each power core within the bundled submarine export cable will incorporate a single conductor with a semi-conductive lead alloy inner sheath together with a polymeric sheathing, which will prevent radial water ingress into the power core. A semi-conductive water swellable tape will be applied over the insulation screen to prevent longitudinal water ingress.

The three insulated power cores within each submarine export cable will be laid together in a trefoil formation together with fiber optic elements and extruded polymeric-shaped fillers. The extruded fillers are placed in the interstices between the power cores to give a substantially round shape to the power core bundle. The fiber optic elements will be placed within the extruded fillers that provide mechanical protection. An armoring package made of an armoring bedding and a layer of either steel, or steel and polymeric armor wires flushed with bitumen, will be applied over the bundle. Finally, an outer serving (defined as a layer of protective covering over the exterior) made of black polypropylene yarns will be applied over the armoring package.

Colored polypropylene yarns will be applied helically over the outer serving; the cable will be marked at specified lengths every 0.62 mi (1 km), as well as every 328 feet (ft) (100 meters [m]) of the first and last kilometer. The entire three-core submarine export cable will be up to approximately 11.4 inches (in) (290 millimeters [mm]) in outer diameter. A cross-section of the submarine export cable is provided in **Exhibit E-3.**

E-1.2.2 Onshore Export Cables

The submarine export cables will transition to the onshore export cables at a jointing location at the cable landfall at Riverside Boulevard in the City of Long Beach, New York. The jointing location is expected to be a

buried jointing chamber/pull-in pit, with manholes at ground level; however, final design is ongoing. A link box chamber may be required at the surface level. All components will be underground. A representative example of export cable transition components is provided in **Exhibit 5: Design Drawings.**

From the jointing location at the cable landfall in the City of Long Beach, the approximately 1.6-mi (2.5-km)-long onshore export cable route will traverse east along E Broadway, north on Lincoln Boulevard, and then west on E Harrison Street. At the western end of E Harrison Street, the route turns north on Long Beach Road, and briefly west on Park Place before turning north to cross Reynolds Channel to the onshore substation, which is located on the north side of Reynolds Channel. The onshore export cable corridor will contain two circuits of three single-core HVAC cables with copper conductors enclosed in XLPE insulation, for a total of six cables, with a voltage of 345 kV. The conductor within each single-core cable will have a cross-sectional area of approximately 3.9 in^2 (2,500 mm^2). Semi-conductive swelling tape will be applied over the insulation screen, and each dielectric cable will be sheathed in polyethylene, with a metallic laminated or lead sheath as a longitudinal water barrier. The onshore export cables will each be approximately 5.26 in (134 mm) in outer diameter. A cross-section of a typical onshore export cable is provided in **Exhibit E-3**. At least two separate fiber optic cables, each approximately 1.1 in (30 mm) in outer diameter, will also be installed alongside the onshore export cables for communications and monitoring.

The onshore export cables and associated fiber optic cables will be housed in duct banks and will be buried to a minimum target depth of 3 ft (0.9 m) beneath the surface. The configuration of the six export cables and fiber optic cables within the duct banks may vary along the installation corridor. Each of the concrete duct banks will be approximately 3 ft (0.9 m) high by 5 ft (1.5 m) wide. In certain areas, there may be a separation between duct banks due to site conditions and spacing constraints. Joint pits/pull-in pits (manholes) will be located approximately every 800 to 5,000 ft (244 to 1,524 m) along the onshore export cable corridor to provide access to the cables. The actual length between joint pits/pull-in pits will vary due to site-specific and cable installation constraints. Duct bank and joint pit layouts, and preliminary locations of vaults, are provided in **Exhibit 5**.

E-1.2.3 Interconnection Cables

The proposed onshore substation will provide voltage regulation for the interconnection cable route to the POI at the Hampton Road Substation in Oceanside, New York. Details on the proposed onshore substation and Hampton Road substation are provided in **Exhibit E-2**. From the onshore substation, the approximately 1.7-mi (2.8-km) -long interconnection cable route will traverse north through the Village of Island Park and Barnum Island approximately parallel to the LIRR railroad, traversing existing parking lots in the vicinity of the Island Park Station. It will continue along the west side of the LIRR corridor north of Island Park Station until Parente Lane, where the interconnection cable route will follow Parente Lane, then continue north onto D'Amato Drive and cross Long Beach Road. The route will then immediately turn north on North Nassau Lane. At the end of North Nassau Lane, the interconnection cables will continue north across private property and continue along or adjacent to the west side of the LIRR corridor. From there, the route will continue north under Daly Boulevard until reaching the Hampton Road substation. The interconnection cables will enter Hampton Road substation at 345 kV; the voltage will be converted to 138 kV within the Hampton Road substation.

The interconnection cable corridor will contain two circuits of three single-core HVAC cables with copper conductors enclosed in XLPE insulation, for a total of six cables, with a voltage of 345 kV. The conductor within each single-core cable will have a cross-sectional area of approximately 3.9 in^2 (2,500 mm^2). Semi-conductive swelling tape will be applied over the insulation screen, and each dielectric cable will be sheathed in polyethylene, with a metallic laminated or lead sheath as a longitudinal water barrier. The interconnection cables will each be approximately 5.26 in (134 mm) in outer diameter. A cross-section of a typical onshore

interconnection cable is found in **Exhibit E-3**. At least two separate fiber optic cables, each approximately 1.1 in (30 mm) in outer diameter, will also be installed alongside the interconnection cables for communications.

The interconnection cables and fiber optic cables will be housed in duct banks and will be buried to a minimum target depth of 3 ft (0.9 m) beneath the surface. The configuration of the six interconnection cables and the fiber optic cables within the duct banks may vary along the installation corridor. Each of the concrete duct banks will be approximately 3 ft (0.9 m) high by 5 ft (2.1 m) wide. In certain areas, there may be a separation between duct banks within the interconnection cable corridor, due to site conditions and spacing constraints. Joint pits/pull-in pits (manholes) will be located approximately every 1,250 to 5,000 ft (381 to 1,524 m) along the interconnection cable corridor to provide access to the cables. The actual length between joint pits/pull-in pits will vary due to site-specific and cable installation constraints. Duct bank and joint pit layouts and preliminary location of vaults are provided in **Exhibit 5**.

E-1.2.4 Loop-in / Loop-out Line Cables

From the Hampton Road substation, the approximately 0.1-mi (0.2 km)-long loop-in /loop-out line cables will exit the northeastern portion of the Hampton Road substation and traverse the LIRR right-of way to the east, and travel east/northeast to Lawson Boulevard. Within Lawson Boulevard, the loop-in / loop-out lines will connect to LIPA's existing 138-kV transmission lines.

The loop-in / loop-out line cable corridor will contain up to four circuits of either three single-core cross-linked polyethylene solid dielectric cables or oil-filled cables, for a total of 12 cables, with a voltage of 138-kV. The conductor within each single-core cable will have a cross-sectional area of approximately 1.4 in^2 (887 mm^2). The loop-in / loop-out line cables will each be approximately 4.0 in (102 mm) outer diameter. Information regarding the use of fiber optic cable or radio communications for these lines is pending; if required, separate fiber optic cables will be installed alongside the loop-in / loop-out line cable circuits for communications.

The loop-in / loop-out line cables and fiber optic cables (if needed) will be housed in duct banks and will be buried to a minimum target depth of 4 ft (1.2 m) beneath the surface. The configuration of the loop-in / loop-out line cables and the fiber optic cables within the duct banks may vary along the installation corridor. Each of the single-circuit duct banks will be up to approximately 3 ft (0.9 m) wide by 2 ft (6 m) high and will consist of thermal concrete or thermal fill. Including spacing, the 2-circuit duct banks are expected to be approximately 6 ft (1.8 m) wide. The four circuits may be combined in a single duct bank up to 32 ft (10 m) wide. In certain areas, there may be a separation between duct banks within the loop-in / loop-out line cable corridor due to site conditions and spacing constraints. At this time, joint pits/pull-in pits or vaults are not anticipated. Duct bank layouts are provided in **Exhibit 5**.