Department of Energy Environmental Assessment Public Scoping Process
For Project Icebreaker

Description of the Proposed Project

1.0 Description of the Proposed Project

The Proposed Project (Project Icebreaker) would consist of the design, construction, operation, maintenance, and decommissioning of a demonstration-scale offshore wind facility. Project Icebreaker (Figure 1) would be an approximately 21 megawatt (MW) offshore wind facility consisting of:

- Six wind turbines[1]
- Five submarine cables including a fiber optic communications cable interconnecting the turbines (inter-array cables), in total approximately 2.8 miles
- One 9-mile-long submarine cable, including a fiber optic communications cable (export cable) connecting the demonstration project to the new Project Substation located at the existing Cleveland Public Power (CPP) Lake Road Substation in Cleveland, Ohio
- Installation of equipment including a Project Substation at the CPP Lake Road Substation in Cleveland, Ohio to accept power from the Proposed Project
- Approximately 150 feet of new pole supported overhead transmission line to transmit electricity from the new Project Substation to the existing CPP Lake Road Substation

The offshore components of Project Icebreaker, including the turbines and inter-array cables, would be located approximately eight (8) miles off the coast of Cleveland, Ohio in Lake Erie. The export cable would traverse the lake bottom to shore where it would interconnect with the new Project Substation located at the existing CPP Lake Road Substation. The onshore components, including the Project Substation, onshore interconnection cable, fiber optic cables, and interconnection facilities would be located in Cleveland, Ohio. Construction activities would be supported by a proposed construction staging area at the lakeshore within the Port of Cleveland. The Great Lakes Towing (GLT) facility on the Cuyahoga River in Cleveland, Ohio is proposed as the location for the Operations and Maintenance (O&M) Center due to the quality of the existing infrastructure and its close proximity to the Project Area.

Each turbine would have a name plate capacity of approximately 3.45 MW and a blade rotor diameter of approximately 413 feet. The turbine array would be arranged in a single row

[1] Seven (7) sites were investigated. The six (6) sites exhibiting the most optimal geotechnical characteristics would be selected for the final layout.

generally oriented southeast to northwest. Spacing between each of the turbines would be approximately 2,520 feet. Each of the wind turbines would be supported by a mono bucket (MB) foundation. The inter-array cable from each turbine would be linked to the export cable at the turbine location closest to shore and would then make landfall at the Project Substation located within the CPP Lake Road Substation.

Figure 1: Proposed Project Icebreaker Layout

2.0 Proposed Project Area

The proposed Project Area was selected based on multiple factors. In 2009, the Great Lakes Wind Energy Center conducted a Feasibility Study that looked at a number of factors including: shipping channels, water depth; air navigation and radar; sailing courses, reefs, dumping grounds, and salt mines; wind resource; distance to interconnection locations; shipwrecks; water intake and sewer outfall pipes; review of existing studies of birds and bat activity over the Lake; the 2008 Avian Risk Assessment by Curry & Kerlinger; and geology. The Ohio Department of Natural Resources (ODNR) Wind Turbine Placement Favorability Analysis, created in 2008 and updated in 2009, was another resource used in assessing the suitability of potential sites for the Project. The ODNR analysis mapped limiting factors for wind turbine placement in the Ohio waters of Lake Erie, including: shipping lanes and navigable waterways; distance from shore; fish habitat/community; sport fishery effort; lakebed substrate; commercial fishery effort; and proximity to raptor nests and Important Bird Areas designated by Audubon. Subsequently, additional factors were considered, including additional geophysical analysis in 2010 and geotechnical analysis in 2013 and several additional studies and surveys of bird and bat activity, a second Avian Risk Assessment, and a Bat Risk Assessment. The input of stakeholders within the community was also considered.

LEEDCo has entered into a 50-year submerged land lease (SLL) with the state of Ohio, which commenced on February 1, 2014. The SLL covers the proposed turbine sites, cable right of way, and the Project Substation situated within the CPP Substation. The leased area consists of 0.4 acre for the Project Substation and 4.2 acres for the six wind turbine sites. The cable right of way leased area consists of a 100 foot wide strip along the approximately 11.8 mile cable route (inter-array cables and the export cable).

3.0 Wind Turbine, Foundation, and Cable Design

Turbines

Project Icebreaker would consist of six Mitsubishi Heavy Industries Vestas Offshore Wind (MVOW) - Vestas 3.45 MW wind turbines. Each wind turbine consists of three major components: 1) the tower, 2) the nacelle, and 3) the rotor with blades. Descriptions of the major turbine components are provided below and illustrated in Figure 2. Preliminary analysis indicates that the turbines would operate for approximately 8,000 hours annually, and have an approximate capacity factor of 43%. Capacity factor is the ratio of actual energy produced by a generating unit to the maximum possible that would be produced under theoretical design conditions. Project Icebreaker would generate approximately 77,400 MWh of electricity each year.

As shown in Figure 2, hub height is the height to the center of the rotor, as measured from the chart datum water level, while total turbine height (tip height) is the height of the entire turbine, as measured from the chart datum water level to the tip of the blade when rotated to the highest position.

The tower is comprised of multiple sections of conical steel structures. Each tower would have an access door in the base section assembled on the foundation platform which is approximately 11 meters (3.28 feet) above the water line, internal lighting, and an internal ladder and/or mechanical lifts to access the nacelle. The majority of the turbine components, including the blades, would be painted a neutral color consistent with Federal Aviation Administration and U.S. Coast Guard guidance.

The main mechanical components of the wind turbine are housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle is housed in a steel reinforced fiberglass shell that protects internal machinery from the environment and dampens noise emissions. The housing is designed to allow for adequate ventilation to cool internal machinery. The nacelle is equipped with an external anemometer and a wind vane that signals wind speed and direction information to an electronic controller. Red flashing lights would be mounted on the nacelle of the turbine and would flash synchronously. The nacelle is mounted on a yaw ring bearing that allows it to rotate ("yaw") into the wind to maximize wind capture and energy production.

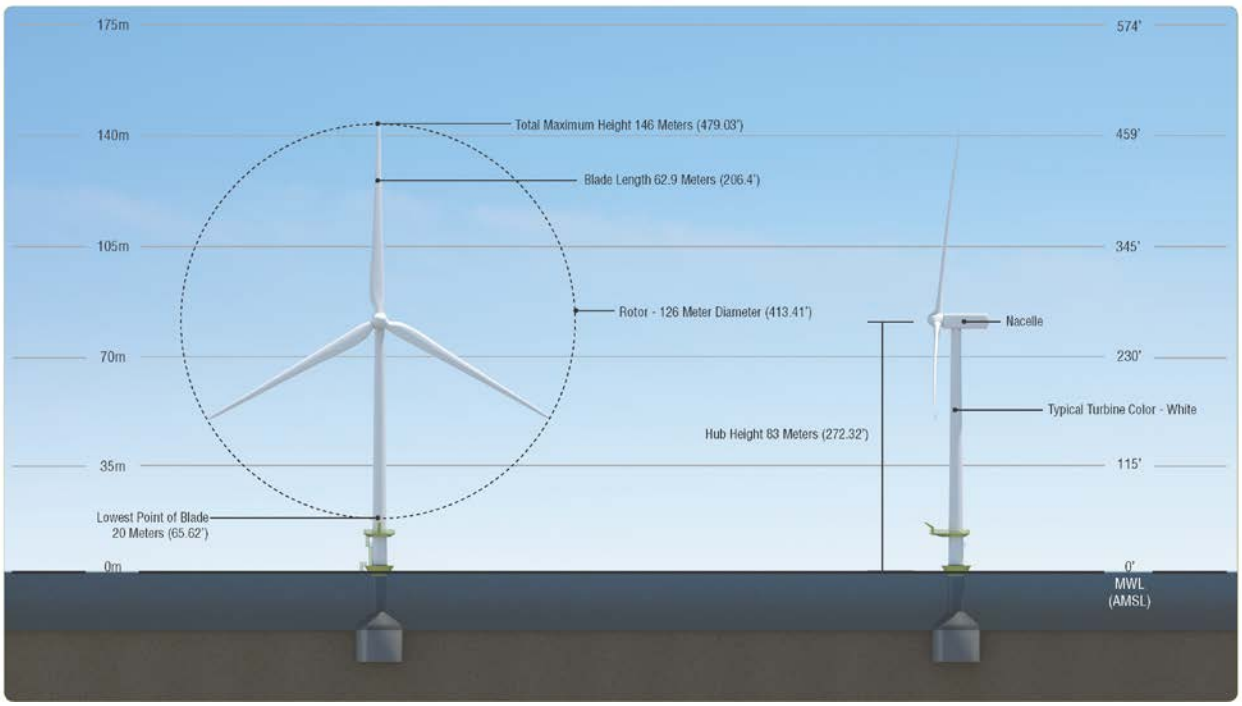

Figure 2: Wind Turbine Diagram

<u>Foundation</u>

The Mono Bucket (MB) would be utilized as the turbine foundation for Project Icebreaker. The MB is a Suction Installed Caisson (SICA) or an “all-in-one” steel foundation system to support offshore wind turbines. The interface with the lakebed is accomplished by means of a steel skirt that penetrates the lakebed. This steel skirt is welded to an upper steel transition piece and tube that resembles the elements above the mudline of a standard monopile. Preliminary design of the MB foundation has been completed. The approximate dimensions are shown in Table 2 and the preliminary design is shown in Figure 3. The final detailed engineering and planning will be advanced during the permitting period and completed prior to construction. The portion of the MB foundation above the water line would be painted yellow.

Table 2. Approximate Foundation Dimensions

Bucket Diameter	Shaft Diameter	Overall Height
17.0 meters (55.8 feet)	4.5 meters (13.8 feet)	36.9 meters (121 feet)

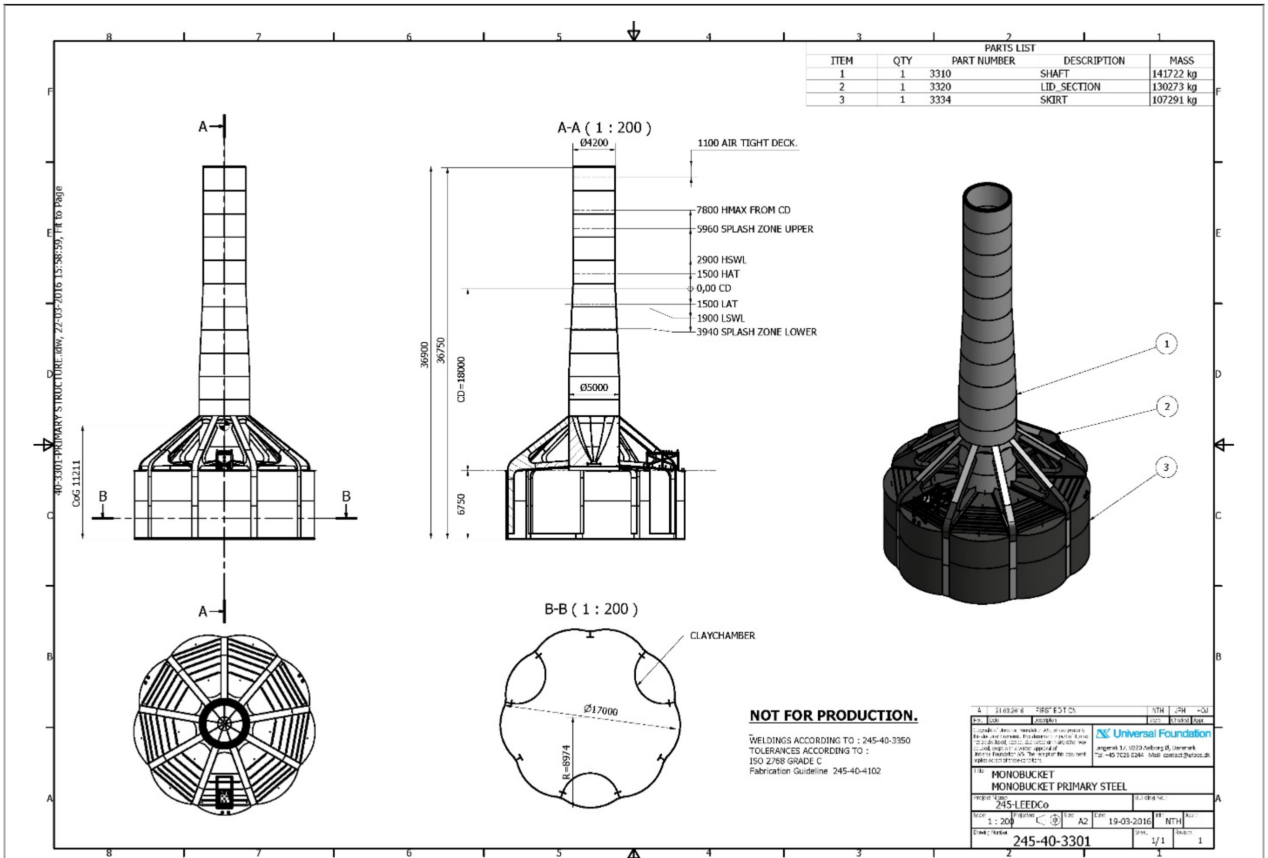

Figure 3: Preliminary Mono Bucket Design

<u>Cables</u>

The proposed inter-array cables and export cable would be three-conductor, single armored underwater power cables, with an approximate overall diameter of 4.5 inches and rated at 34.5 kV. The cables would be composed of a three-core copper conductor with cross-linked polyethylene (XLPE) or ethylene propylene rubber (EPR) insulation. Optical fibers for data transmission would be embedded between the cores. The cables would be buried in the lakebed to a depth determined during final project design.

4.0 Installation of Turbines and Foundations

The Port of Cleveland has been proposed as the quayside staging area for the Project. MB foundations would be transported to port by barge for pre-assembly at a dedicated quay area or would be transported directly to the site. Alternative installation methods will be evaluated during ongoing project design. The preliminary installation sequence is described below.

Construction Duration and Sequence

Construction is proposed to begin in the Spring of 2018 and be completed by the Fall of 2018. Construction activities are proposed to proceed in the following sequence, though multiple activities may be performed concurrently:

- Mobilize floating equipment
- Transport MB foundations from port to site
- Install MB foundations
- Install export cable
- Install inter-array cables
- Transport towers
- Install towers
- Transport nacelles and blades
- Install nacelles and blades
- Commission turbines

Foundation

Foundation components would be transported to the Port of Cleveland by barge for assembly and transport to the Project site. The assembled foundation would be loaded onto another barge at the port. The installation crane vessel would transit to the Project site where it would jack-up and wait for the barge carrying the MB foundation. Following the positioning and mooring of the barge, the foundation would be lifted off the barge by the installation crane vessel, and lowered to approximately 1 meter above the lakebed. At that position, the MB would be halted to allow the water column to stabilize. Once stabilized, the MB would be lowered onto the lakebed, and suction would be applied through a unit attached to the lid and water would be drawn from the MB causing the foundation to sink into the lakebed. Operations would be monitored by divers and/or remote observation technology. Since the foundation installation would use suction technology, there would be no lakebed preparation necessary (dredging or drilling) for installation. The foundation installation would not require any pile driving.

Turbines

It is anticipated that the turbine components, including nacelle, blades, and tower, would be transported to port by barge. The same installation crane vessel would be utilized for both foundation and turbine installation. The installation crane vessel would be positioned at the turbine site. A crane at the port would load turbine tower sections onto the feeder barge, which would then transit to the first turbine installation site. The installation of tower sections would be installed at the first turbine site from the feeder barge using the crane on the installation crane vessel. Assembly work inside the towers would begin as the feeder barge returns to port for the nacelle and blades. Once the feeder barge returns to the turbine site, the nacelle and blades would be installed using the crane. Once the turbine installation is complete, the installation crane vessel would reposition to the second turbine location while the feeder barge would return to port for the next tower.

The majority of each turbine would be painted a light gray.

5.0 Cable Components

Project Icebreaker would include two cable components: the inter-array cables, which would connect the wind turbines together electrically, and the export cable, which would transmit the Project's energy output to the shore. The export cable would traverse from Turbine 1 (the turbine closest to shore referred to as ICE1) in a southeasterly direction underneath the Cleveland Harbor Breakwater and under the remaining portion of the Harbor to the Project Substation located at the CPP Lake Road Substation in Cleveland, Ohio. One hundred and fifty feet of new pole-supported overhead transmission line to transmit electricity from the Project Substation to the CPP Lake Road Substation would be constructed.

The proposed export cable would be brought ashore entirely under the Harbor and the breakwater through a duct installed using horizontal directional drilling (HDD). The pit necessary for beginning the HDD would be located at the CPP Lake Road Substation. A drawback machine would be used to drill an approximately 30 cm (11.8 inch) diameter bore from the shore landing site to an exit point that would be located approximately 3,773 feet offshore. Drilling operations would use drilling fluids to stabilize the bore hole and to lubricate the drilling process. Drilling fluids would be used that are biocompatible with freshwater and pose no threat to the environment. Nonetheless, operations are proposed to minimize the possibility of drilling fluid discharging into the lake. The bore would be lined with High-Density Polyethylene (HDPE) conduit. The HDD bore would be capped off until the start of the cable installation operations.

The submarine cables would be installed using a deck barge with cable installation and burial equipment mobilized on board. The proposed approach for the export cable is to bury-the cable at the same time that it is laid onto the lake bottom (typically referred to as simultaneous lay burial) although another approach may be utilized if conditions warrant. The inter-array cables, which are the last of the cables to be installed, would likely be buried post-lay (after the cable has been lain between each turbine) due to the limited lengths between the turbines. The cable would be buried by using either a cable plow or a jetting tool. A plow is a tool which typically sits on skids (skis) and is pulled by a vessel. The plow's share cuts into the sediment forming a trench into which the cable is laid. A jetting tool equipped with high-pressure water jets would assist the burial process by fluidizing the sediments within a narrow trench into which the cable is lowered. The majority of sediments which are disturbed by the process would subsequently settle back onto the lakebed, providing a degree of back-fill.

6.0 Operation and Maintenance

Operation of Turbines

The rotor attaches to the drive train at the front of the nacelle (refer to Section 3.0 above). Hydraulic motors within the rotor hub would be able to modify the angle of each blade according to wind conditions, which would enable the turbine to operate efficiently at varying wind speeds. The rotor would be able to spin at varying speeds in order to operate more efficiently. The proposed wind turbines would begin generating energy at wind speeds as low as 3 meters per second (m/s) [6.7 miles per hour (mph)], and cease operating above a maximum wind speed of 25 m/s (55.9 mph).

Operation and Maintenance Center

The Great Lakes Towing (GLT) facility on the Cuyahoga River in Cleveland, Ohio, has been proposed as the best location for the O&M Center, due to the quality of the existing infrastructure and its close proximity to the Project Area. LEEDCo proposes to lease space from GLT, located on Division Road approximately one mile from the Cleveland outer harbor on Old River, to serve as the O&M Center for Project Icebreaker. The entire GLT site is approximately 6.3 acres. However, only a small portion of the GLT site would be leased by LEEDCo. The lease would include a small space for storage of spare parts and a condition for LEEDCo to share space with GLT for access to potable water and locker room/bathroom facilities. It is anticipated that the area to be leased would not exceed approximately 1/2 acre in size.

Maintenance of Submarine Cable

During operations, it is possible that the depth of cover for the cable may change over time. In such circumstances, rejetting or external protection may become necessary to maintain an appropriate level of protection for the cable. In the event that there are faults on the cable or external damage during operations, it may become necessary to repair the cable. Depending on the location of the cable repair, the cable may either be repaired or replaced, which in either case would require deburial and reburial using similar tools and methods as the original installation.

7.0 Decommissioning

Decommissioning would result in dis-assembling the turbines by reversing the installation process. An appropriate vessel with sufficient crane capacity would be mobilized to the site. The blades would be removed one at time. Then the turbine would be de-energized and disconnected from the transmission cable and the onshore Project Substation would be de-energized and disconnected/isolated from the grid interconnection. After that, the nacelles would be removed followed by the tower sections.

The turbines would be removed from the foundation and the submarine cable would be cut near the base of the MB at the lakebed. The MB foundations would then be removed by reversing the suction process utilized during installation. Pressure would be applied to the MB and water would be pumped into it. The pressure inside the MB would lift it out of the sediment. Once the MB becomes disengaged from the soil, it would be lifted with the crane onto a feeder barge.

All of the turbine and foundation components would be transported to quayside and proper disposition of the components would occur. The materials would be recycled where possible; those that could not be recycled would be disposed of properly.

The onshore Project Substation would be completely de-energized and the submarine cable would be cut at or slightly below the lakebed thereby separating the buried portion of the cable from the portion that runs up the turbine foundation.

The export cable and inter-array cables would remain buried.

Finally, the onshore Project Substation components would be de-installed and recycled where possible, those that cannot be recycled would be disposed of properly.