Icebreaker Windpower Inc.
Lake Erie Energy Development Corporation (LEEDCo)

November 3rd, 2016
4:00 pm to 7:00 pm

PUBLIC INFORMATION MEETING
IN ACCORDANCE WITH
OHIO POWER SITING BOARD RULES
FOR
CERTIFICATE OF ENVIRONMENTAL COMPATABILITY AND PUBLIC NEED
Icebreaker Wind would be a demonstration-scale offshore wind facility located approximately 8 miles off the shore of Cleveland, Ohio

- One of the first offshore wind projects in the United States.
- Six 3.45 MW wind turbines.
- Buried and shielded submarine cables (inter-array cables) interconnecting the turbines (approximately 2.8 miles).
- Buried and shielded submarine cable (export cable) connecting the turbines to the Project Substation in Cleveland (approximately 9 miles).
- Generation capacity of approximately 21 MW of renewable electricity (enough to power approximately 7,000 homes).
Turbines and Foundations

Turbines (Tower, Nacelle and Rotors):
• Approximate Blade Length: 206 feet
• Approximate Turbine Hub Height: 272 feet
• Maximum Blade Height: 479 feet
• Approximate Tower Height: 233 feet above water line
• Tower Material: Multiple sections of conical steel structures
• Tower, nacelle, and rotors would be painted a light gray

Mono-Bucket Foundation:
• Suction Installed Caisson
• Foundation Material: Steel
• Approximate Bucket Diameter: 56 feet
• Approximate Shaft Diameter: 14 feet
• Approximate Overall Height: 121 feet
• Painted yellow above the water line up to the attachment point of the tower
Turbine and Foundation Installation

- Proposed quayside staging area at Port of Cleveland.
- Proposed construction period: Spring 2018 to Fall 2018.
- A crane would be utilized to lower the mono bucket (MB) foundation to approximately 1 meter above the lakebed. The MB foundation would be installed by applying suction causing the foundation to sink into the lakebed. This process would be monitored by divers and/or remote observation technology. No lakebed preparation or pile driving would be required.
- Using a crane mounted on a barge, tower sections would be installed at the first turbine site followed by assembly work inside the tower. Then the nacelle and blades would be installed. Following full installation of the first turbine site, installation of each of the following turbines would occur in the same sequence.

**Construction sequence:**
- Mobilize floating equipment
- Transport MB foundations from port to site
- Install MB foundations
- Install export cable
- Install inter-array cables
- Transport and install towers
- Transport/install nacelles and blades
- Commission turbines
Submarine Cable

- Inter-array and export cables would be rated at 34.5 kilovolt.

- Cables would be insulated and shielded with an approximate outer diameter of 4.5 inches.

- Cables would be installed in the lake bottom using either a cable plow or jetting tool. This burial technique would cut a trench, lay the cable, and bury the cable in a single operation.

- Cables would be installed under the breakwater using horizontal directional drilling. The cable would be pulled through the drill bore to the Cleveland Public Power Substation.
Icebreaker Wind

Project Purpose & Need

Air Quality

- Cleveland’s air quality among worst in nation despite improvements
- Cuyahoga County received an "F" grade for ozone and a "D" for particle pollution; failure.

Source: cleveland.com/American Lung Association

Mercury

Mercury emitted into the air from coal-fired power plants is by far the leading man-made source of mercury in the Great Lakes and the rivers and streams of the region. Cutting mercury pollution will improve the health of people, fish, birds, and other wildlife.

All of the Great Lakes and the majority of water bodies in the region are under fish consumption advisories, issued by state and provincial health agencies, due to mercury pollution. Mercury is the number one cause of fish consumption advisories in the region, and advisories have been increasing since 1993.

Anglers contribute to local economies with their fishing trips; in 2006, 1.4 million anglers spent $1.5 billion in the Great Lakes region on freshwater fishing. The total economic impact of sport fishing in the Great Lakes states totals more than $20 billion, supporting approximately 190,000 jobs. However, in virtually all of the Great Lakes states, the number of anglers has declined in recent years.

Source: MDCC

“Nearly half of our birds are at risk from climate change this century. That doesn’t have to happen.”

- David Yarnold, National Audubon Society President

Climate Change

Source: climate.nasa.gov

Jobs

JOBS IN OFFSHORE WIND INDUSTRY

<table>
<thead>
<tr>
<th>Year</th>
<th>US</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>11,008</td>
<td>?</td>
</tr>
<tr>
<td>2016</td>
<td>78,211</td>
<td>119,029</td>
</tr>
</tbody>
</table>
| 2020 | Source: AWEA/EWEA & Estimates from Block Island Wind Farm

Source: climate.nasa.gov
Avian and Bat Studies

Avian and bat risk from Icebreaker Wind is being assessed through a comprehensive synthesis of information from publicly available studies, as well as a series of original field and desktop studies conducted by the Icebreaker team over the past 8 years (listed in the table at right). Some of the most important evidence incorporated into the risk assessment is presented in this poster. In summary, these studies and data revealed that the abundances of birds and bats at the Project site 8-10 miles offshore are lower than what they are at typical land-based environments within the Great Lakes region, hence there is a low level of risk to birds and bats from Icebreaker Wind.

One of the most informative pieces of information on potential impacts to nocturnally migrating songbirds is weather radar (NEXRAD) data. The figure at left is an image from a paper published by Bob Diehl and colleagues (2003) showing nocturnal bird migration over the Great Lakes. The radar data shows 437 bird migrants flying at an altitude of 10,000 feet. The authors note that the data is indicative of the movement of birds during the spring migration season.

Another important group of birds in Lake Erie are waterfowl and other waterbirds, such as the Red-breasted Merganser shown in the photograph in the center. An important piece of information being used to study risk to this group of birds for the Icebreaker risk assessment is an aerial survey of birds in Lake Erie conducted by the Ohio Department of Natural Resources (Lott et al. 2011). The figure at left shows the radar pattern of the aerial survey transmits they flew, covering the first 25 miles from shore along most of the southern shore of the Lake. The graph at right, reproduced from their report, shows the very strong drop off of bird density with distance to shoreline that they documented during this survey effort. Note that Icebreaker Wind has been proposed for 8-10 miles from shore, a zone in which Lott et al. observed a very low density of birds.

Survey data to document the abundances of birds and bats in the vicinity of the Icebreaker Wind site provides an indication of how many birds and bats are exposed to potential collision risk, but that does not necessarily equate to the number of birds and bats that are actually injured or killed. A wide range of factors affect the number of birds and bats that collide with turbines, including the number of turbines, the size of the turbines, the number of years the turbines have been in operation, and the behavior of the birds and bats. The figure at left shows the results of a study conducted at Icebreaker Wind in which birds and bats were monitored using a combination of radar, acoustic monitoring, and carcass searching studies. The data summarized in the two tables at right show the overall level of bird and bat fatality rates at Icebreaker Wind. The studies span North America, and all of the rates shown in these graphs are based on intensive, systematic post-construction carcass searching studies. Summary of fatality rates reported by a large number of such studies are shown in the two tables above, reproduced from Simons et al. (2011). Each of the bars in these graphs represents a reported fatality rate from a single wind energy facility. The studies span North America, and all of the rates shown in these graphs have been corrected for searcher efficiency bias as well as carcass scavenging bias. These graphs give a sense of the level of variation that has been observed across land-based wind energy facilities in the US, as well as the overall national averages of roughly 4 birds and roughly 2 bats killed per year per megawatt (MW) of installed wind energy capacity. Thus, each 1 MW wind farm would be expected to have a fatality rate of roughly 0.5 birds and 0.5 bats per year. Icebreaker Wind is expected to have a fatality rate of roughly 1 bird and 1 bat per year, which is consistent with the national averages.
Lake Erie Aquatic Studies

Project Overview
Icebreaker is working closely with LimnoTech and Ohio State University’s Stone Lab to better understand physical and biological characteristics of Lake Erie. They are collecting a variety of measurements from the lake during pre-construction, construction, and post-construction phases of the project. A sampling plan was developed with guidance from Ohio Department of Natural Resources (ODNR), and other federal resource agencies such as the U.S. Fish and Wildlife Service (USFWS).

Overview Table of Sampling Methods, Locations, and Frequency

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Station</th>
<th>Frequency</th>
<th>Phases of project</th>
</tr>
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<tbody>
<tr>
<td>Fish Community</td>
<td>Hydro acoustic</td>
<td>3 transects</td>
<td>Monthly (May-Oct)</td>
</tr>
<tr>
<td>Noise</td>
<td>REF 1 and ICE4</td>
<td>May-Oct</td>
<td>All</td>
</tr>
<tr>
<td>Aerial Surveys</td>
<td>Throughout</td>
<td>2 days every 3wks</td>
<td>May-Oct</td>
</tr>
<tr>
<td>Larval Fish</td>
<td>N, W, S, D, May-Oct</td>
<td>May-Oct</td>
<td>All</td>
</tr>
<tr>
<td>Juvenile Fish</td>
<td>N, W, S, D, May-Oct</td>
<td>May-Oct</td>
<td>All</td>
</tr>
<tr>
<td>Benthos</td>
<td>N, W, S, D, May-Oct</td>
<td>May-Oct</td>
<td>All</td>
</tr>
<tr>
<td>Phytoplankton</td>
<td>N, W, S, D, May-Oct</td>
<td>May-Oct</td>
<td>All</td>
</tr>
<tr>
<td>Zooplankton</td>
<td>N, W, S, D, May-Oct</td>
<td>May-Oct</td>
<td>All</td>
</tr>
<tr>
<td>Chemistry (discrete)</td>
<td>N, W, S, D, May-Oct</td>
<td>May-Oct</td>
<td>All</td>
</tr>
<tr>
<td>Chemistry (continuous)</td>
<td>N, W, S, D, May-Oct</td>
<td>May-Oct</td>
<td>All</td>
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Food Web Monitoring
Monitoring the major food web components in Lake Erie including fish, zooplankton, phytoplankton, and benthos before, during and after construction will provide a better understanding of any potential impacts Icebreaker may have on the system. Sampling the food web includes trawling for larval and juvenile fishes, plankton net tows, and sediment grab sampling for lake sediment. Our scientists are sampling monthly using mobile and fixed hydroacoustics equipment to monitor the size, distribution and abundance of fishes in the study area. Hydroacoustics is a state-of-the-art technology which utilizes sonar technology for the detection, assessment and monitoring of underwater objects. All of the data collected by scientists at LimnoTech and Ohio State will help Icebreaker and other lake scientists make informed decisions.

Currents & Chemistry
To understand potential project impacts on water chemistry, water quality, and lake currents, LEEDCo has deployed several types of long monitoring equipment and has also implemented a routine monitoring program at the proposed project site. Sampling includes the analysis of water quality (i.e. DO, temperature) and chemistry (i.e. phosphorus, nitrogen, chlorophyll a) parameters. As part of the project, our team is deploying a sophisticated real-time weather buoy to collect wind speed, water temperature, and wave conditions at the study location. Not only will the new buoy help scientists gather data from the lake, but real-time buoy observations are made available freely to the public over the internet. Other long-term monitoring equipment deployed includes current meters, and continuous sensors measuring temperature, dissolved oxygen and underwater light levels.

Fish Behavior & Boating
To monitor fish behavior in the study area, our team is utilizing cutting-edge fish sensing technologies including acoustic telemetry and underwater noise level monitoring. Acoustic telemetry is being used to determine if offshore wind turbines and associated buried electrical transmission cables impact fish behavior in Lake Erie. Our receivers will join a lake-wide array of receivers deployed by the Ohio DNR. Fishes may also alter their behavior due to underwater noise and our team is deploying underwater microphones to evaluate the background noise in the study area. Additionally, multiple aerial flyovers are being completed in the surrounding Cleveland area to monitor recreational boating and fishing activity in the project site.
LEEDCo - Icebreaker Windpower Inc. Transition

- Successful development, construction, and operation of an offshore wind farm requires a company with ample financial resources, a strong balance sheet, and borrowing power.
- LEEDCo always planned to attract a for-profit company with the necessary resources to own, operate, and construct Icebreaker Wind, as LEEDCo is a small non-profit organization without the financial strength to construct the project.
- LEEDCo successfully attracted an experienced wind energy developer - Fred. Olsen Renewables – to Cleveland; they own and operate 500 MW of wind farms in the UK and Scandinavia and they have a pipeline of 2,200 MW in development.
- LEEDCo and Fred. Olsen Renewables entered into a relationship whereby Fred. Olsen Renewables would a) create a US company to finish the development activities and build Icebreaker Wind, b) invest their capital here in Cleveland to construct, own & operate the project, and c) secure the required debt.
- Fred. Olsen Renewables formed two new companies, based here in Cleveland, to finish the engineering and permitting; procure the turbines, foundations, electrical substation, and cable; install and commission Icebreaker Wind; and own and operate Icebreaker Wind.
  1) Icebreaker Windpower Inc.
  2) Fred. Olsen Renewables USA Inc.
- LEEDCo is currently in the process of transitioning the project to Icebreaker Windpower Inc.
- Fred. Olsen Renewables USA Inc., the parent company of Icebreaker Windpower Inc., will take on other renewable energy activities in the US not related to Icebreaker Wind.

<table>
<thead>
<tr>
<th>TODAY</th>
<th>AFTER THE TRANSITION</th>
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<tbody>
<tr>
<td><strong>LEEDCo</strong></td>
<td><strong>LEEDCo</strong></td>
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<tr>
<td>✓ Convene the LEEDCo counties</td>
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<td>✓ Promote offshore wind in NEO</td>
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<td>✓ Build the local supply chain</td>
<td>✓ Build the local supply chain</td>
</tr>
<tr>
<td>✓ Perform all of the planning, engineering, and permitting</td>
<td>✓ Complete all of the planning, engineering, and permitting</td>
</tr>
<tr>
<td>✓ Secure off-takers for the power</td>
<td>✓ Complete securing off-takers</td>
</tr>
<tr>
<td>✓ Manage the DOE awards</td>
<td>✓ Manage the DOE awards</td>
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<tr>
<th>ICEBREAKER WINDPOWER INC.</th>
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<tr>
<td>✓ Provide funding for LEEDCo’s development activities</td>
<td>✓ Invest the necessary capital to complete Icebreaker Wind</td>
</tr>
<tr>
<td>✓ Provide expertise to assist LEEDCo</td>
<td>✓ Build, own, and operate Icebreaker Wind</td>
</tr>
</tbody>
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Viewpoint and Wind Farm Technical Data

Camera Type: Nikon D810
Field of View: 39.5°
Viewer Location: Lat/Long: 41°29'49.69" N, 81°47'52.56" W
Photograph View Direction: North
Distance to Nearest Visible Turbine: 7.2 Miles
Time of Photograph: 15:58
Date Photograph Taken: August 3, 2016
Turbine Type: Vestas 126
Maximum Blade Tip Height from Ground: 479 Feet (146 Meters)
Turbine Hub Height: 272.3 Feet (83 Meters)
Turbine Rotor Diameter: 413.3 Feet (126 Meters)
Number of Turbines: 6 Total

VISIBILITY SUBJECT TO CHANGE BASED ON FINAL TURBINE LOCATIONS AND SPECIFICATIONS.
Visual Simulation of Proposed Turbines From Cleveland Mall, Cleveland
Cuyahoga County, Ohio

SIMULATION

Camera Type: Nikon D810
Field of View: 39.5°
Viewer Location: Lat/Long: 41° 30' 18.03" N, 81° 41' 43.64" W
Viewpoint View Direction: North Northwest
Distance to Nearest Visible Turbine: 8.6 Miles
Time of Photograph: 18:43
Date Photograph Taken: August 3, 2016
Turbine Type: Vestas 126
Maximum Blade Tip Height from Ground: 479 Feet (146 Meters)
Turbine Hub Height: 272.3 Feet (83 Meters)
Turbine Rotor Diameter: 413.3 Feet (126 Meters)
Number of Turbines: 6 Total

Visibility subject to change based on final turbine locations and specifications.

Visual Simulation of Proposed Turbines From Cleveland Mall, Cleveland
Cuyahoga County, Ohio

Prepared For:
Prepared By:
September 2016

Original Photograph

Prepared For:
Prepared By: