

August 2020



# Great Lakes Offshore Wind: Frequently Asked Questions



## Overview

AS NEW YORK STATE CONSIDERS THE POTENTIAL FOR OFFSHORE WIND IN THE GREAT LAKES, IT IS IMPORTANT TO KNOW THE FACTS ABOUT OFFSHORE WIND.

In 2019, the New York State Climate Leadership and Community Protection Act was signed into law, mandating 70% of NY's electricity to come from renewable sources by 2030 and carbon-free electricity by 2040. Offshore wind, in both the ocean and the Great Lakes, will need to play a significant role in meeting these ambitious mandates. A recent study found that to meet the 2040 goal, offshore wind capacity will need to grow to 25 gigawatts (GW); supplying 34% of New York load in 2040<sup>1</sup> (generating enough power for approximately 7.5 million homes). The Great Lakes contain about 20% of the nation's entire offshore wind potential;<sup>2</sup> however, there are currently no offshore wind farms in the Great Lakes.

As New York State considers the potential for offshore wind in the Great Lakes, it is important to know the facts about offshore wind. The United States has one small operational offshore wind farm off the coast of Rhode Island, but there is nearly three decades of global experience with offshore wind to learn from. Countries including Belgium, China, Denmark, Finland, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Sweden, and the United Kingdom have embraced offshore wind power. As of 2019, European offshore wind farms generate nearly 205,000 MW of renewable energy,<sup>3</sup> or approximately 14% of the EU's power.



Before any offshore wind project is constructed in the Great Lakes, it will be required to go through a site-specific environmental review process, with meaningful public participation opportunities, to ensure it is responsibly-sited and protective of the Great Lakes ecosystem. The following are general frequently asked questions about Great Lakes offshore wind, not related to any specific project.

**Why do we need to go offshore for wind energy?** New York State needs a wide range of renewable energy sources to reduce harmful pollution, mitigate the impacts of climate change, and meet renewable energy mandates. A recent study estimated roughly 80 gigawatts of new clean energy sources will be needed to meet New York’s goal of a zero-emissions electrical grid by 2040.<sup>4</sup>

Offshore wind brings unique benefits as part of a diverse renewable energy supply. Offshore winds tend to blow more consistently than those on land and wind speeds are often higher. Larger turbines, which can capture more energy, are feasible because there are no land-based transportation constraints, and because offshore turbines are placed at much greater distances from residences, so visual impacts are less. Because there are no landforms or built structures to create wind turbulence, offshore turbines generally operate more efficiently than onshore turbines. Additionally, offshore wind generates more electricity when energy demand is highest and it is needed the most—during the daytime (as opposed to onshore winds, which are usually more powerful at night). Land-based wind turbines tend to be located in remote and sparsely-populated areas, offshore wind turbines could be sited far offshore and yet be connected to coastal urban load centers.

**Can wind power help fight climate change?**

Yes. A study of wind energy impacts in the eastern USA, conducted by the National Renewable Energy Laboratory, concluded that “Wind generation displaces carbon-added to the supply picture.”<sup>5</sup>

Offshore wind will slash greenhouse gas emissions in New York State. The first 2,400 megawatts (MW) of offshore wind energy developed to meet New York’s target would reduce greenhouse gas emissions in the state by more than 5 million tons each year, the equivalent of removing nearly one million cars from the road by 2030.<sup>6</sup>

**Does offshore wind reduce other harmful air pollution?**

Yes, increasing the use of offshore wind energy improves public health by reducing harmful air pollutants that contribute to heart and lung disease. Air pollution reductions from the first 2,400 MW of offshore wind in New York would be valued at roughly \$1 billion and would avoid close to 100 premature deaths each year.<sup>7</sup> On the



contrary, fossil fuel power plants cause significant air pollution. Mercury pollution from fossil fuel-burning power plants can lead to brain and nervous system damage and can cause birth defects. Soot and particulate matter emitted from coal, oil, and gas-fired power plants cause heart attacks and premature death.

**Will offshore wind turbines leak oil into the lakes?** While recreational boats consistently leak oil, and petroleum-transporting freighters on the lakes can have potentially catastrophic spills, wind turbines are constructed to prevent leaks of their small quantities of gear-box lubricants. Offshore turbines are designed to prevent any fluids from being discharged into the water with three levels of containment to minimize risk of any fluid discharges. The primary systems are sealed with multiple sensors that monitor fluid performance and containment. The secondary system is in the nacelle where fluid containment reservoirs are designed to capture any leaks from a primary system failure. If both primary and secondary containment fails, the bottom of the tower has a reservoir to contain any fluids originating from the nacelle.<sup>8</sup> Furthermore, all the fluids used in the turbine can and should be biodegradable.

**Will potential environmental impacts of Great Lakes offshore wind be considered *before* a project can move forward?** Yes, a site-specific review process, with opportunities for meaningful public input, allows potential impacts to the Great Lakes to be avoided, minimized, or mitigated. It is critical that any offshore wind project that moves forward is responsibly sited and protects the Great Lakes ecosystem.



**How will ice impact offshore wind turbines?** Ice conditions can vary greatly in the Great Lakes and will require site-specific analysis. The technical challenges of winter lake ice are not insurmountable. Advances in turbine design, including use of ice cone structures to alleviate pressure from ice on foundations, can be considered to mitigate the potential impacts of ice. Developers pursuing an offshore wind project in an icy lake environment would need to perform

due diligence to ensure their investment would stand up to icy conditions.

Offshore wind farms are predominately located in saltwater; however, there are three offshore wind projects currently operational in lakes, with more under development. An existing freshwater wind farm in operation—a 10-turbine wind farm built in 2009, in Sweden’s Lake Vänern, provides lessons that could help inform offshore wind projects in the Great Lakes. Lake Vänern has a similar average

depth as Lake Erie, and like Erie, Lake Vänern freezes in winter, although it is still able to function. While a frozen lake makes maintenance challenging, the community has not been dissuaded—a second offshore wind farm in Lake Vänern is being planned.<sup>9</sup> In fact, the project developers report three advantages of its freshwater lake location compared to saltwater settings in the region: less corrosion in freshwater; lower wave heights and maximum wind speeds reduce loads; and lower installation costs.<sup>10</sup>

### **Does offshore wind impact public access to the lakes, including recreational boating?**

The Block Island Wind Farm, the first and only operational U.S. wind farm, shows recreational boaters are safely navigating and fishing in and around wind turbines. A Great Lakes offshore wind project would only cause a short-term effect on public access, with temporary displacement of boating and fishing in the immediate area of the project during construction. However, once constructed, recreational boaters, fishermen, commercial charters, and tourists all return to the area. Turbines are spaced far enough apart to allow vessels to access the area both through and around each turbine while also maintaining safe distance from other vessels and commercial shipping lanes. Furthermore, the “reef effect,” in which the offshore turbines create an artificial reef that attract fish and other wildlife, will potentially improve and benefit the recreational fishing industry in the Great Lakes.



**Block Island Wind Farm:** The underwater base of the turbines function as artificial reefs and are encrusted with sea life. Mussels and crustaceans have attracted recreationally popular fish species such as scup, mahi-mahi, and striped bass.

**Will wind turbines impact radar, including military facilities?** Wind turbines can interfere with different types of radar; however, improvements in technology has provided solutions. Research has demonstrated that radar can be recalibrated, replaced or supplemented by a different radar system. That approach is used at Travis Air Force Base in California. The base, whose radar was being thrown off by nearby wind turbines, in 2015 installed a light-wave radar system designed to operate at a different frequency range than its previous surveillance radar system. The airfield now peacefully co-exists with a wind farm that is less than five nautical miles away.<sup>11</sup>

Wind farms can and do co-exist with military facilities across the country. Thirty-five percent of the nation’s wind fleet operates within 50 miles of a military facility, and yet these projects are not harming national security or changing base missions.<sup>12</sup> The Department of Defense (DOD) has a

robust review process to ensure proposed wind farms won't harm military readiness or operations, including radars, flight operations, research, development, testing, evaluation and training activities.<sup>13</sup>



**Do offshore wind farms impact property values?** The Lawrence Berkeley National Laboratory analyzed more than 50,000 home sales near 67 wind projects across nine U.S. states, and did not uncover any impacts from wind farms to nearby home property values.<sup>14</sup> Some studies have shown that property values can be temporarily affected after a wind farm is proposed for an area, before it becomes operational, but that once the wind farm is built and uncertainty and fear are resolved, property values return to pre-application levels, or higher.<sup>15</sup>

**Will offshore wind create jobs?** Building an offshore wind farm requires 74 different occupations, including electricians, welders, ironworkers, millwrights, carpenters, engineers, concrete finishers, scientists, and vessel operators, according to the New York-based Workforce Development Institute.<sup>16</sup> Jobs supported by offshore wind are well compensated, with average annual earnings (including benefits) of \$140,000 annually.<sup>17</sup> Offshore wind operations and maintenance jobs are long-term and would strengthen the region's economy over the decades-long life of a wind farm and beyond. According to NYSERDA, New York's existing Atlantic offshore wind program will create 10,000 jobs.<sup>18</sup> A recent study by the research group Wood McKenzie found that continued growth of offshore wind could bring 38,000 jobs to New York State.<sup>19</sup> Great Lakes wind projects would help bring many of those jobs to Western New York.

**Is offshore wind power reliable?** The NYISO has indicated that NY can take on additional wind power while providing reliable service to customers. NYS has implemented a number of system and operating practices that make wind power a reliable part of the state's electricity mix, including one of the nation's first centralized wind forecasting systems. The electric grid is designed to quickly compensate for fluctuations in both electricity generation and in demand. Grid operators keep "operating reserves" (backup generators, and increasingly batteries) ready in case demand should spike or a generator (fossil fuel, nuclear or renewable) should go off-line suddenly. Gradual wind speed changes and improved forecasting means wind energy is less costly to accommodate than traditional energy sources, enabling the use of less expensive reserves. Furthermore, when wind turbines are spread over large areas, their output becomes far more constant and even easier to accommodate.



**Will offshore wind be cost effective?** Wind power uses no fuel and has no associated fuel costs, and wind energy prices can be locked in for 20 years or more, acting as a hedge against volatile fossil fuel prices. While offshore wind is typically more costly than land-based projects, offshore wind costs will likely come down as the U.S. industry reaches economies of scale; just as the cost of land-based wind energy dropped by 69% over the last decade.<sup>20</sup> The cost of offshore wind in Europe, (now a mature industry) is now at similar levels. Additionally, offshore wind power helps to mitigate the impacts of climate change—scientists estimate that the impacts of climate change (e.g. flooding) will potentially cost New York State \$50 billion over the next decade.<sup>21</sup> The cost of offshore wind pales in comparison to the costs of inaction on fighting climate change.

**What happens at the end of a turbine's useful life? How is it decommissioned?** Wind turbines typically operate for 20 to 30 years before they would be decommissioned or, more likely, upgraded with new technology. Responsibilities for decommissioning wind turbines are addressed before the wind farm is built. Typically, the developer will post a bond for the cost of decommissioning; if turbines are decommissioned, the developer will remove the structures and return the area to its previous condition. Unlike traditional fossil and nuclear energy sources, wind farms do not leave behind harmful waste. Since the wind never runs out, most developers prefer to “repower” rather than decommission wind farms. In repowering, old turbines at the end of their lifespan are replaced with new ones in the same locations.



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- <sup>8</sup> Lake Erie Energy Development Corporation. “Icebreaker Wind FAQ”. [http://www.leedco.org/files/Icebreaker\\_Wind\\_FAQs.pdf](http://www.leedco.org/files/Icebreaker_Wind_FAQs.pdf)
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- <sup>13</sup> Military Aviation and Installation Assurance Siting Clearinghouse Office of the Assistant Secretary of Defense for Sustainment. <https://www.acq.osd.mil/dodsc/contact/dod-review-process.html>
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- <sup>18</sup> <https://www.nyserda.ny.gov/All-Programs/Programs/Offshore-Wind/Economic-Opportunities/Workforce>
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