



Blueprint

for the New York State
Offshore Wind Master Plan



NEW YORK
STATE OF
OPPORTUNITY

NYSERDA



Message from President and CEO John B. Rhodes

Under Governor Andrew M. Cuomo's leadership, New York State is leading on clean energy and climate change. Most recently, the State created a mandate to meet 50 percent of its electricity needs from renewable sources by 2030.

Offshore wind will play a critical role in turning this aggressive goal into a reality.

To develop this valuable resource responsibly and thoughtfully, New York State is crafting an Offshore Wind Master Plan (Master Plan), first outlined by Governor Cuomo in his 2016 State of the State address. While the Master Plan is not expected to be released until 2017, this initial Blueprint serves to outline New York State's comprehensive offshore wind strategy and advance the State's Reforming the Energy Vision (REV) strategy to build a cleaner, more resilient, and affordable energy system for all New Yorkers.

This Blueprint describes the benefits of developing New York State's offshore wind potential, while documenting and strategizing our approach to address the concerns of a wide range of stakeholders, including energy consumers, utilities, environmental groups, coastal communities, commercial and recreational fisherman, and the maritime industry. It also includes details on our existing and future collaboration across a diverse group of State partners and agencies.

As part of the process, we are encouraging stakeholders in offshore wind development to participate in public meetings and share feedback during development of the Master Plan.

Offshore wind has the potential to create new clean energy jobs, grow the State's businesses, and reduce harmful greenhouse gas emissions. Although New York State's offshore wind journey has just begun, we are committed, along with our government partners, potential project developers, and all who share an interest in the State's coastal resources, in bringing this critical clean energy resource to fruition for the benefit of our great State.

John B. Rhodes

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**New York State has
39 gigawatts (GW) of
clean, wind-driven
energy potential off
its Atlantic coast –
enough to power
approximately
15 million homes.**

**Blueprint for the New York State
Offshore Wind Master Plan prepared by:**

**New York State Energy Research
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With contributions from:

Department of Environmental Conservation

Department of Labor

Department of State

Department of Public Service

Empire State Development

Long Island Power Authority

New York Power Authority

Office of Parks, Recreation and

Historic Preservation



Introduction

In December 2015, Governor Cuomo directed the Department of Public Service (DPS) to develop a Clean Energy Standard mandating that 50 percent of New York State’s electricity needs be provided by renewable energy by 2030.

DPS’ Public Service Commission (PSC) established the Clean Energy Standard on August 1, 2016, charting a course that mandates the procurement of renewable energy by energy suppliers who are providing energy services to New York State households and businesses.¹ Achieving these commitments will require a significant increase in the amount of renewable energy resources in the State, as well as require innovative approaches to the energy market to ensure these energy resources provide reliable and affordable service to energy consumers.

Done correctly, offshore wind in the Atlantic Ocean could serve as a significant, clean source of power for the State. New York has 39 gigawatts of clean, wind-driven energy potential off its Atlantic coast—enough to power approximately 15 million homes.² It also has the potential to serve as a new, local source of affordable power for the New York City metropolitan area and Long Island, where energy demand and prices are high and there are significant opportunities to increase renewable energy generation, particularly through the use of offshore wind. Like all energy resources, offshore wind must be developed thoughtfully and responsibly.

NYSERDA is the lead entity coordinating the Master Plan, which will be a comprehensive strategy for developing offshore wind resources in New York State and will include recommendations on the best solutions and practices for maximizing the development and utilization of offshore wind for the State.

Elements of the Master Plan will include:

- Site identification and leasing strategies.
- Site assessment and site characterization pre-development activities.
- Cost, benefit, and interconnection studies.
- Analysis and recommended mechanisms for energy offtake agreements.
- Local economic impacts and job creation.
- Stakeholder and community engagement, and educational efforts.
- Viewshed, fishing, and other mitigation efforts.

NYSERDA, in partnership with the New York State Department of State (DOS), DPS, the New York State Department of Environmental Conservation (DEC), the New York Power Authority (NYPA), the Long Island Power Authority (LIPA), and other State entities, will engage community members, environmental advocates, the maritime community, industry, tribal nations, and government partners at all levels to develop the Master Plan. The State will also work closely with project developers to ensure that our efforts provide considerable value to those that will ultimately develop and operate offshore wind projects.

¹ Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard, Case 15-E-0302, “Order Adopting a Clean Energy Standard”, issued and effective August 1, 2016. <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={44C5D5B8-14C3-4F32-8399-F5487D6D8FE8}>

² NREL. Assessment of Offshore Wind Energy Resources for the United States. Golden, Colorado: National Renewable Energy Laboratory, 2010.



Credit: Deepwater Wind

The Blueprint for the New York State Offshore Wind Master Plan (Blueprint) outlines NYSERDA's process to develop the Master Plan for this important resource. The Blueprint also describes how stakeholder input and feedback will be pursued to inform the Master Plan. Blueprint activities will launch in the fall of 2016, and conclude with a completed Master Plan by the end of 2017. The Master Plan will be updated annually thereafter.

Early offshore wind projects may move forward in parallel with the Master Plan and should be the products of responsible site identification and assessment achieved through meaningful input from stakeholders, including the environmental, maritime and fishing communities, local economic stakeholders, and coastal communities.

Projects that do move forward should inform the Master Plan and identify challenges and opportunities to improve processes and drive down soft costs. Projects will also provide valuable guidance for how to scale offshore wind responsibly.

Growth of Offshore Wind

Wind turbines are commonly seen on land, but they can also be located in waters offshore with undersea cables that bring the electricity generated to shore. Land-based wind farms are currently used to generate electricity and power homes and businesses across New York State, the United States (U.S.), and around the world. Offshore wind turbines will supplement – and not replace – land-based wind farms and other renewable energy technologies such as solar. All of these technologies will be needed to meet the State's renewable energy commitment – the Clean Energy Standard.

Offshore wind is available to New York City and Long Island.

Its development will provide new, clean electricity generation and reduce congestion while reducing the need for new transmission from upstate regions.



Credit: Siemens

Offshore wind turbines are similar to land-based turbines except that they have been designed for the maritime environment and are typically larger in size and generating capacity. Denmark installed the first offshore wind turbines off its shores in 1991 and they are still operating today. Since then, Europe has installed over 11 GW of offshore wind turbines.³ In the United Kingdom, offshore wind currently provides approximately five percent of the country's annual electricity. This figure is expected to grow to 10 percent by 2020.⁴

While most of New York's renewable energy projects to date have been built upstate, offshore wind presents an opportunity for downstate development. New York City and Long Island account for over 45 percent of the State's annual electricity usage.⁵ Offshore wind has the ability to provide this high energy demand area with new, local, clean electricity generation and to reduce congestion without the need for new transmission from upstate. For offshore wind to be a viable solution at scale in New York State, market barriers, including costs, must be addressed and siting must account for the many uses of the ocean in the area, as well as potential environmental impacts.

Offshore wind suppliers, contractors, and developers overseas, as well as the U.S. Department of Energy's (DOE) offshore wind programs, are making excellent progress in reducing costs. Wind turbine manufacturers are developing larger, more efficient turbines and new foundation designs that allow wind power projects to be built in deeper water, farther offshore where there are stronger winds and little or no visual impacts to coastal residents. The Master Plan will fully evaluate project costs and detail actions that can reduce costs associated with development even further.

³ Wind Europe, <https://windeurope.org/wp-content/uploads/files/about-wind/statistics/EWEA-European-Offshore-Statistics-2015.pdf>

⁴ The Crown Estate, <http://www.thecrownestate.co.uk/energy-and-infrastructure/offshore-wind-energy/>

⁵ NYISO, 2015 Load & Capacity Data, "Gold Book"

Developing an Offshore Wind Project

Planning for, developing, and constructing an offshore wind farm is a multi-year process with multiple opportunities for public review and comment. The first step in the process of developing an offshore wind project is to secure a wind energy area lease from the U.S. Department of Interior's Bureau of Ocean Energy Management (BOEM). An environmental assessment must be conducted to study the effects of a measurement campaign to assess wind speeds, wave heights, seabed conditions, wildlife presence, and other characteristics of the site. Once approved, site assessment may take several years. After sufficient site data is collected, construction and operations plans for the wind project are developed. BOEM then carries out an environmental impact study that typically takes over a year and has multiple opportunities for stakeholder input. Only after approval of the construction and operations plan, as well as all State and other required approvals, may a project start construction. Before construction starts, an agreement for purchasing the electricity, financing, and plans for interconnecting to the grid must be secured. Finally, construction may take up to another two years before the offshore wind farm is operational and supplying power to the electric grid.

Unlike in Europe where a unified approach is employed, offshore wind development in the U.S. requires two distinct and de-coupled actions: acquiring a site lease that allows for project development on federal underwater lands, and securing an agreement for power purchase. This creates substantial risk for developers who pursue leasing at great financial risk and uncertainty without the stability of power purchase agreements. In turn, this risk reduces efficiency of development efforts and increases overall project cost. The Master Plan will join these two critical elements, reducing development risk, lowering costs, and enabling the greatest possible benefit to the State.

With the Master Plan, the State will adopt approaches that improve the speed, cost, and effectiveness of the development process in a manner that fully considers environmental, maritime, and societal issues, resulting in a fully balanced evaluation and identification of potential offshore wind sites. NYSERDA recently announced its plan to participate in a BOEM auction for a wind energy area south of Long Island, off the Rockaway Peninsula.⁶ If successful in securing the lease for this site, the State will then combine environmental, site assessment, and site characterization work with a power purchase mechanism and select a project developer through a competitive process. This strategy minimizes project risks and provides developers certainty to secure financing, maximizing competition to participate in development. The strategy ultimately lowers project costs for New Yorkers and can serve as an example in the Master Plan for how the State may ensure that certain future identified sites are developed thoughtfully and at the lowest possible costs to consumers.

In addition, each offshore wind project will be permitted individually. The permitting process for each project includes multiple opportunities for public input relating to the topics discussed in this Blueprint.

Offshore wind turbines are erected by ships.

The construction of offshore wind turbines requires large vessels with legs that reach down to the sea floor and jack the vessel up out of the water in order to provide a stable platform for cranes and workers to assemble foundations and wind turbines.



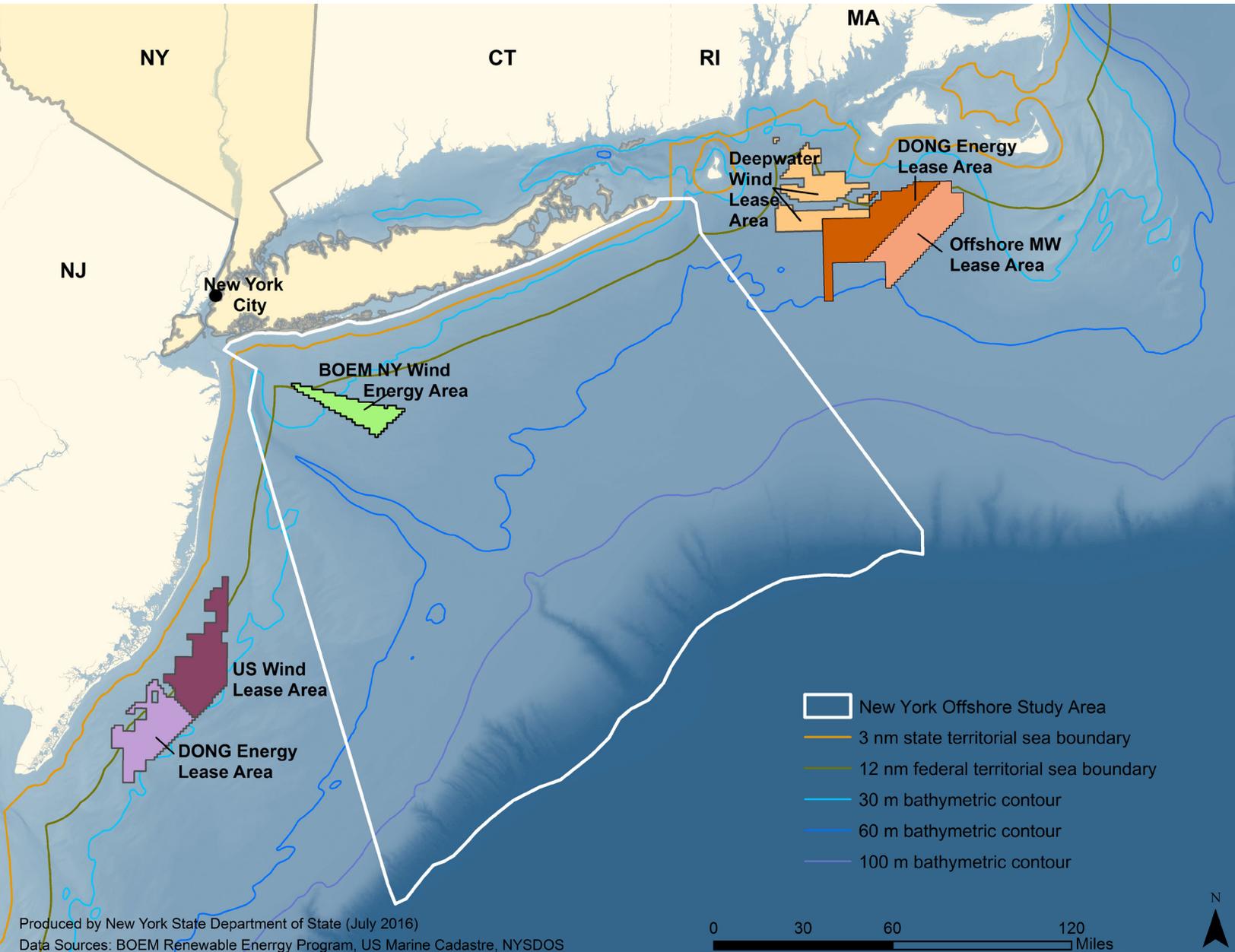
Credit: iStockphoto

⁶ <http://www.nysERDA.ny.gov/About/Newsroom/2016-Announcements/2016-06-02-New-York-State-to-Participate-in-Offshore-Wind-Lease-Auction>

Offshore Study Area

For the Master Plan, New York State is examining a 16,740-square-mile area of the ocean, from the south shore of Long Island and New York City to the continental shelf break, for potential future sites for offshore wind. Turbines will not be built in the entire area, but the Master Plan will help to identify locations within this area for development. Figure 1 shows a map of this area.⁷

Figure 1. Master Plan Offshore Study Area



⁷ The Study Area matches the NYS Department of State's "Offshore Planning Area" in the 2013 "New York Department of State Offshore Atlantic Study," http://docs.dos.ny.gov/communitieswaterfronts/ocean_docs/NYSDOS_Offshore_Atlantic_Ocean_Study.pdf

The Study Area contains both State and federal waters. Although wind turbines are not being proposed for construction close to shore or in State waters, transmission cables running back to land will pass through State waters.

Within the Study Area, BOEM has identified the first New York Wind Energy Area offshore of the Rockaways, which will be the subject of a lease auction later in 2016 (NYSERDA has announced its intention to bid in the lease auction), to be followed by further steps in the development process outlined above.

The Master Plan will also consider existing wind energy areas in federal waters outside of the Study Area that have been leased by BOEM and can connect to New York transmission systems. The “Lease Areas” identified in Figure 1, located outside of the Study Area, represent important opportunities for wind energy development and will also be considered in the plan. Projects in these areas will be studied with respect to interconnection and transmission, costs, and the benefits that they may bring to the State. The Master Plan will not look at the environmental, fishing, and maritime impacts of projects in these areas as BOEM already requires the lease holders of these sites to undertake that work.

Seeking Input from Stakeholders

Through the development and execution of the Master Plan, New York State will ensure that the views of key stakeholders are actively solicited and fully considered. The result will be a balanced evaluation of potential offshore wind sites and the responsible development of offshore wind projects. Specific needs and actions will be determined through consultation with State, federal, and local agencies and stakeholder groups. These needs and actions will be developed to inform project and turbine siting to minimize potential project impacts.

Although impacts from any new development are inevitable, the State is committed to understanding unique area sensitivities and how new offshore wind projects may be advanced with minimal impact. The following sections outline the anticipated approach associated with key stakeholders in New York State and beyond.

**Winds offshore
are stronger than
over land.**

**More wind means
more energy.**



Credit: Ecology and Environment, Inc.

One objective of the Master Plan is to reduce visual impacts by utilizing smart siting and technology choices.



Credit: London Array Limited

Coastal Communities

Modern offshore wind farms tend to have a limited impact to viewsheds because of their significant distance from the shoreline. One objective of the Master Plan is to further reduce visual impacts through siting and technology choices.

Both visual and cultural impacts can result from all types of development. Long Island has a rich history deeply shaped by the ocean and coastline that define the area. The maritime culture and economy of the region have dotted the coastline and ocean bottom with historical markers. Those cultural resources, including historic ship wrecks, historical sites, and buildings onshore, must be protected and preserved for generations to come. In 2016, BOEM conducted an environmental assessment of offshore wind development on the Atlantic Outer Continental Shelf Offshore New York.⁸ The assessment found that impacts to cultural resources within the limited area of the study would be minimal and can be mitigated through smart siting and responsible development. This study will be expanded, and community engagement with local residents and area tribal nations will further help to identify and minimize potential impacts to cultural resources.

Actions

Outreach – NYSERDA, DOS, and other agencies will actively engage local communities, tribal nations, and other interested stakeholders and demonstrate the potential visibility of wind turbines under different lighting and visibility scenarios in offshore areas considered for development.

Assessments and Surveys – NYSERDA, DOS, and Department of Parks, Recreation and Historic Preservation will conduct historic and cultural resource assessments and archaeological surveys of potential historic sites of cultural significance, including submerged and onshore resources, to determine impacts of potential offshore wind sites and, where appropriate, present mitigation strategies.

Lighting Impacts – NYSERDA will work with BOEM, the Federal Aviation Administration, and the U.S. Coast Guard to research and propose ways to reduce or eliminate adverse visual impacts from aviation and navigational lighting.

This work will commence during the third quarter of 2016.

⁸ Bureau of Ocean Energy Management (2016). Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore New York. <http://www.boem.gov/New-York/>



Credit: iStockphoto

Environmental Groups

Compared with conventional energy generation, offshore wind, like other renewable energy technologies, provides numerous environmental benefits that are good for both New Yorkers and wildlife. These benefits include significant reductions in carbon dioxide, air pollutants such as sulfur dioxide and nitrogen oxide, and water consumption. A further environmental benefit is that unlike conventional power plants located along shorelines that use water for cooling, offshore wind turbines do not entrain and impinge marine organisms.

At the same time, offshore wind, like all renewable energy technologies, has some impacts of concern on natural resources. Therefore, New York State must develop this resource responsibly and work with federal and State agencies, Fishery Management Councils, the Mid-Atlantic Regional Planning Body, environmental groups, and experts to minimize these impacts.

Offshore wind site assessment, construction, and operations off the shore of New York State will have varying degrees of direct and indirect effects on fish and wildlife species including birds, bats, fish, shellfish, and other marine invertebrates such as marine mammals and sea turtles, as well as the seabed. Noise from construction and operations may be disruptive and potentially harmful to marine species, particularly marine mammals, such as endangered whales. Once the turbines are in place, the greatest potential threats are to birds and bats that may collide with turbine blades. Other potential impacts are to the seabed during construction and changes in sediment transport and turbidity that may affect marine species and their habitats.

Actions

Outreach – NYSERDA, DOS, DEC, and other agencies will engage federal agencies, environmental groups, and experts with respect to environmental concerns and potential mitigation methods for all aspects of offshore wind development, construction, and operations.

Wildlife Surveys – NYSERDA, DOS, and DEC will undertake surveys of marine and avian species to measure and monitor the seasonal presence, distribution and abundance, and migration patterns to better understand the wildlife present offshore and to create a baseline to measure the impact of offshore wind projects.

Seabed Studies – NYSERDA, DOS, and DEC will undertake studies of the seabed to assess potential impacts on currents, sediment transport, turbidity, and the construction of subsea structures on marine species habitats.

Develop Guidelines – NYSERDA will work with DOS, DEC, federal agencies, environmental groups and experts to develop best practices for the development of offshore wind resources off the coast of New York State. These best practices will include siting, construction, and operating requirements to minimize the risks to fish and wildlife.

This work will commence during the third quarter of 2016.

Benefits of offshore wind include: significant reductions in carbon dioxide, air pollutants such as sulfur dioxide and nitrogen oxide, and water consumption.

(See Appendix for a listing of current and initially planned work)



Credit: iStockphoto

Maritime and Fishing Communities

New York State's ocean economy has long benefitted from robust maritime commerce and commercial and recreational fishing activities. Other maritime uses include sand mining for beach nourishment, offshore aquaculture, and non-consumptive recreational activities such as diving and whale watching, among others. Participants in these industries have an economic interest in any potential changes to the ocean from new development. The Port of New York and New Jersey is the nation's third-largest port, with large ocean-going vessels using three major traffic separation corridors in and out of New York Harbor. Additional vessel traffic follows less formal traditional coastwise trade routes. These nonregulated corridors are primarily closer to shore and used by tug and barge operators to bring goods from port to port. At the same time, fishing vessels operate in, near, and between these traffic lanes and corridors. Offshore wind development must allow for the continued efficient and safe operation of all vessels in the area.

The U.S. Coast Guard has stated that they will not restrict fishing access within offshore wind farms and between turbines. (Offshore wind turbines are expected to be spaced 0.75 nautical miles⁹ or more apart). It is essential to understand fishing operations and ensure that sufficient space to enable continued fishing activity is provided between turbines where possible. Underwater electric cables must be installed and buried in such a way that fishing activities may continue within an offshore wind farm with minimal impact.

⁹ One nautical mile is equivalent to about 1.15 miles

It is also important to understand the extent that offshore wind development may disrupt fish and marine mammal migration, spawning, or important habitats. Many such areas are dynamic by nature, changing seasonally or annually, and are susceptible to new patterns or trends induced by climate change. As important as it is to understand fisheries' behavior and habitats, offshore wind is also uniquely suited to address the root cause of climate changes as a new form of sustainable renewable energy, while potentially providing artificial reefs and new habitat opportunities.

Actions

Outreach – NYSERDA and DOS will engage the maritime and fishing communities, including out-of-state operators, that operate in the Study Area. The U.S. Coast Guard and vessel operators will be consulted to determine how they maneuver in the vicinity of other vessels and fixed objects. The fishing industry will be consulted regarding the location, timing, and frequency of their use of significant fishing grounds and the gear used in the offshore planning area; the levels of fishing effort and landings from the offshore planning area; habitat features and environmental conditions that may serve as proxies for favorable fishing conditions; and persistent or emerging trends. NYSERDA will engage an industry-respected fishing liaison to assist with outreach and engagement with to the fishing community.

Marine Navigation Study – NYSERDA, DOS, and DEC will work with the U.S. Coast Guard, the Port Authority of New York and New Jersey, and BOEM to conduct an in-depth analysis of ship traffic data and probabilistic risk analysis for vessels operating in the vicinity of potential offshore wind energy areas and determine mitigation actions such as turbine placement and lighting to reduce identified risks.

Fisheries Assessment – Using available and new data – including what is collected from fishermen – NYSERDA, DEC, and DOS will evaluate fishing areas, potential displacement and changes in fishing effort, and potential economic impacts resulting from offshore wind development.

Develop Guidelines – NYSERDA, working with DOS, DEC, DPS, the U.S. Coast Guard, and BOEM, will develop best practices for siting offshore wind farms, including turbine layouts and spacing, cable burial details, and construction operations, to minimize the impacts on the maritime and fishing industries from the development of offshore wind off the coast of New York State.

This work will commence during the third quarter of 2016.

The U.S. Coast Guard has stated that they will not restrict fishing access within offshore wind farms and between turbines.

(Offshore wind turbines are expected to be spaced 0.75 nautical miles or more apart).



Credit: Siemens

One study has shown that jobs directly supported by offshore wind are well-compensated.



Credit: Siemens

Local Economic Stakeholders

New York State is uniquely positioned to realize the significant economic benefits of offshore wind development. Specifically, the State has one of the largest ports on the East Coast of the U.S. and one of the most experienced and varied workforces in the nation. One of the major benefits of offshore wind development will be local job creation.

Developing an offshore wind industry will increase the State's competitiveness in the clean energy sector, revitalize industrial ports, boost the manufacturing sector, and create demand for skilled labor. This collective impact will result in good, high-paying jobs in the State for years to come. One study has shown that jobs directly supported by offshore wind are well-compensated, with average annual earnings (including benefits) of \$140,000 annually.¹⁰ Supply chain workers – such as manufacturing and assembly – are estimated to earn approximately \$70,000 annually.

To develop local, clean power resources, New York State will need a trained, local workforce and a developed supply chain to maximize local economic development potential. Companies involved in offshore wind include: those focused on engineering and design; turbine and component manufacturing and installation; and operations and maintenance (O&M).¹¹ New York State labor and trade organizations are well-suited to contribute to and benefit from the development of offshore wind at scale. But the State must take the lead to ensure that the skilled labor force is best positioned to serve this industry in every way to avoid job migration to candidates out of the State or country.

Actions

Outreach – NYSERDA, the New York State Department of Labor (DOL) and Empire State Development (ESD) will engage trade unions, ports, and manufacturing hubs throughout the State to gather information to inform workforce development initiatives. Port officials will be consulted regarding how to maximize the potential for offshore wind economic development opportunities related to maritime trades, particularly the need for skilled labor and for onshore facilities for assembling project components prior to installation.

Supply Chain Assessment – NYSERDA will analyze the supply chain and infrastructure needs of offshore wind to identify gaps in the current New York State supply chain that can be developed in a manner that will reduce costs for the industry and increase the value of economic development from offshore wind, including port facility improvements.

Workforce Development Study – NYSERDA will, in consultation with DOL and ESD, assess the current regional workforce to identify potential gaps in skilled labor and provide recommendations for workforce training or advanced degree programs to fill those gaps.

This work will commence during the third quarter of 2016.

¹⁰ Great Lakes OSW study: <http://www1.eere.energy.gov/wind/pdfs/57511.pdf>

¹¹ International Economic Development Council (2013). Creating the Clean Energy Economy, Analysis of the Offshore Wind Energy Industry, p.9-13. Retrieved from: http://www.iedconline.org/clientuploads/Downloads/edrp/IEDC_Offshore_Wind.pdf



AXYS FLIDAR Buoy.
Credit: AXYS Technologies

Site, Grid, and Economic Studies

Measurement campaigns and analysis of the study area; interconnection studies analyzing grid requirements and optimal connection points for offshore wind projects; and cost and benefit analyses will be undertaken. The results of these measurements and studies, in addition to the input from stakeholders and environmental, maritime, and visualization assessments, will be used for sizing, timing, and identifying new sites for offshore wind development in New York State to be included in the Master Plan.

Defining a pipeline of offshore wind projects in the Master Plan will create a visible market that will help attract supply chain investments to the State and reduce the cost of offshore wind energy to consumers.

Site Assessment and Characterization

To date, cost has been a major impediment to offshore wind development in the U.S. Substantial costs are incurred in the early development and permitting processes – costs which are ultimately embedded in the power prices that New York State consumers would pay for the project's energy output. As an example, meteorological and oceanographic measurements in possible project areas are required to support the siting, design, and permitting of offshore wind projects. The State is committed to undertaking pre-development activities, including resource assessment, baseline environment studies, and site characterization, that will reduce offshore project risks and costs. All measurements and studies undertaken will have detail and quality that is acceptable to BOEM and other agencies for any required approvals, and to investors and lenders for financing.

The final deliverable of all surveys and analyses will be made available for public review and use, including downloadable data available on a website and/or other dissemination methods.

Actions

Partner Engagement – To ensure that this effort is aligned with the information needs of the industry, NYSERDA will form a market advisory group comprised of key industry experts who can actively inform and contribute to the site assessment and characterization. Through active engagement with this group, NYSERDA will ensure that any detailed analyses will be completed in a manner that is suitable for project financing and construction.

Site Assessment Data Campaign – NYSERDA will measure meteorological data such as the speed and direction of the wind and the height of waves in the ocean using technology deployed in one or more locations in the Study Area. (See Appendix for a listing of currently planned studies)

Site Characterization Data Campaign – NYSERDA will map seabed and sub-seabed conditions, sample seabed soil, detect geohazards, and locate existing cables and underwater structures. (See Appendix for a listing of currently planned studies)

This work will commence before the end of 2016.



Credit: London Array Limited

**Offshore winds
are typically
stronger during
the day,
producing more
electricity when
consumer demand
is at its peak.**

Grid and Interconnection

Interconnection in the context of offshore wind refers to linking a new offshore generating facility via an undersea cable to the New York State electric transmission system. Offshore wind interconnection challenges are diverse, but are generally related to the limitations and constraints of the existing grid. Many of these constraints, such as integrating large quantities of a variable resource into the grid while maintaining system reliability and power quality, can be managed by effective forecasting, power system operations and controls, and learning from the integration of onshore wind energy in the State and elsewhere. Other challenges, like physical capacity restraints within the existing grid, pose greater barriers for offshore wind development in the State.

As with many areas in the State, the electric grid in New York City and on Long Island is aging and constrained. Potential offshore wind projects in the Atlantic off the coast of New York State are located close to major load (electricity demand) centers, and are expected to produce power during the peak or highest periods of demand. As a result, offshore wind projects, along with their associated transmission and interconnection investments, can provide value to the electric system and enhance its reliability and resiliency.

Actions

Partner Engagement – Work with the New York Independent System Operator, DPS, NYPA, LIPA, Con Edison, other electricity providers and grid operators, and offshore electrical component suppliers to undertake interconnection studies and analysis.

Offshore Wind Interconnection Study – Conduct detailed analyses of options and costs of injecting offshore wind into various interconnection points in load zones J (New York City) and K (Long Island) of the New York grid, as well as any required transmission upgrades for distribution and reliability.

Cumulative/Regional Impact Analysis – Consider the interaction of New York State’s development activities with those of other Northeastern and Mid-Atlantic states and the cumulative impact of developing large amounts of offshore wind to determine the impact to the State’s grid and electric market.

Transmission Cost Study – Evaluate the cost of offshore wind transmission and required grid upgrades associated with offshore wind that benefit New York State ratepayers and align with the State’s market structures.

Transmission Siting Proceedings - NYSERDA and DPS will work closely to assess the need for transmission proceedings and to fully consider ratepayer costs and benefits.

This work will commence before the end of 2016.

Economics and Cost-Effectiveness

The PSC stated in the Clean Energy Standard Order, “New York State is fortunate to have substantial potential for offshore wind production and with appropriate time, careful planning, and deliberate action, the State has the opportunity to exploit its geographic advantage to develop offshore wind and promote the beneficial attendant economic activity associated with this burgeoning industry.”¹² Given its unique geography and substantially divergent power prices, the State is particularly well positioned to benefit from the development of offshore wind as a resource that can produce energy injected in areas with substantial locational value. The robust development of offshore wind in waters off of Europe demonstrates that such positive economic impacts are possible. To date over 11 GW of offshore wind projects are currently operating and supporting 75,000 jobs¹³ with industry expectations to grow to 40 GW by 2024.¹⁴



Credit: GE Renewable Energy

¹² Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard, Case 15-E-0302, “Order Adopting a Clean Energy Standard”, issued and effective August 1, 2016. <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={44C5D5B8-14C3-4F32-8399-F5487D6D8FE8}>

¹³ Ho, A., Mbistrova, A., & Corbetta, G. (2016). The European Offshore Wind Industry - Key Trends and Statistics 2015. Brussels, Belgium: European Wind Energy Association.

¹⁴ Karst, T. (2016, March 1). Comments on OSW Economics in Europe. 2016 U.S. Offshore Wind Leadership Conference. Boston, MA: MHI Vestas Offshore Wind.

Offshore wind projects can create value for the electric grid,

enhancing system performance and reliability, as well as offsetting otherwise necessary capital and operating expenditures.



Credit: Siemens

Recent studies show that the cost of energy from offshore wind in the Northeastern U.S. is expected to decline over time. Developments in Europe, including the summer 2016 auction results in the Netherlands, provide evidence that these cost reduction prospects are achievable.¹⁶ The rate of offshore wind cost reductions and the pace of such declines for New York State will depend on global cost reductions, the scale and duration of offshore wind development in the region, industry supply chain development, and operational experience.

A complete economic perspective will take into account both value and cost. Offshore wind projects tend to be large in size, have high capacity factors¹⁷, be located close to load pockets along the shore, and produce power during peak periods of demand. As a result, they can actually create value for the electric grid, enhancing system performance and reliability, as well as offsetting otherwise necessary capital and operating expenditures. Finally, environmental and other externalities, notably the cost of carbon, require proper accounting. The PSC's Benefit Cost Analysis Framework establishes the structure for these assessments.¹⁸

The cost of offshore wind can also be reduced by utilizing procurement models that minimize developer risk and consider the full value of offshore wind for New York State. The PSC's recent Order under the Clean Energy Standard Proceeding expressed a desire for the State to fully consider these issues.¹⁹

The most effective development of offshore wind requires industry and developer investment, which in turn depends on certainty of the size of the market. New York State recognizes the importance of market certainty and will determine the quantity and timing of planned offshore wind resources, principally as a function of: 1) required offshore wind contributions to the Clean Energy Standard renewable energy targets; and 2) anticipated cost-effectiveness of the offshore wind resource, as compared to alternative resources.

¹⁵ Beiter, P., Musial, W., Smith, A., Lantz, E., Kilcher, L., Damiani, R., Scott, G. (2016). Estimating the Economic Potential of Offshore Wind in the United States. 2016 AWEA Windpower. New Orleans, LA: National Renewable Energy Laboratory. <http://www.nrel.gov/docs/fy16osti/66288.pdf>

¹⁶ <https://www.government.nl/latest/news/2016/07/05/netherlands-offshore-wind-farm-borssele-cheapest-world-wide>

¹⁷ A measure of the productivity of a project, calculated as actual energy produced by a project over a given period divided by the amount of energy that the project would produce when generating at maximum capacity during that period.

¹⁸ Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Case 14-M-0101, "Order Establishing the Benefit Cost Analysis Framework", issued and effective January 21, 2016. <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b-F8C835E1-EDB5-47FF-BD78-73EB5B3B177A%7d>

¹⁹ Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard, Case 15-E-0302, "Order Adopting a Clean Energy Standard", issued and effective August 1, 2016. <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={44C5D5B8-14C3-4F32-8399-F5487D6D8FE8}>



Credit: GE Renewable Energy

The State’s approach to offshore wind economics will therefore be considered from two perspectives:

- Maximizing the potential economic gains that the State can realize from offshore wind deployment.
- Reducing the cost of offshore wind for State ratepayers to the maximum extent possible, while considering the locational and other values that it will bring.

Actions

Partner Engagement – NYSERDA and DPS will work closely with the market advisory group to design Clean Energy Standard procurement and contracting approaches to best support offshore wind for New York State at scale in a manner that fully considers ratepayer costs and benefits.

Offtake Mechanisms and Value Modeling – NYSERDA and DPS will analyze options for economic arrangements for the State to support energy offtake agreements for offshore wind projects that optimize the value to ratepayers.

Cost Reduction Pathways – NYSERDA will conduct an analysis of the impact on costs due to new and emerging technologies, new and improved installation methods, and potential State actions that can reduce costs.

Offshore Wind Quantities – NYSERDA and DPS will conduct analyses to quantify the quantity and timing of planned offshore wind resources solicited through the Clean Energy Standard.

Evaluation – NYSERDA, NYPA, and LIPA will evaluate existing and potential local load and congestion points where the value of offshore wind is such that it is competitive with other generation and transmission solutions.

Additional Wind Energy Area (WEA) Identification – NYSERDA and DOS will initiate a process with BOEM to identify further WEAs that are best suited for development in quantities to meet the State’s offshore wind demand.

Offshore Wind Vessel Assessment – NYSERDA will conduct an assessment of installation, operations, and maintenance vessels requirements (including the Jones Act) and costs.

This work will commence before the end of 2016.

Moving Forward

New York State is a committed leader in working with partners and other stakeholders to bring development of this critical resource to the State. NYSERDA will work to incorporate study results and public comments into the Master Plan.

The Master Plan is scheduled for completion by the end of 2017.



Appendix – Current and Initially Planned Environmental Site Characterization and Site Assessment Work

Current Work

- NYSERDA's digital aerial surveys will collect high-resolution imagery of bird, bat, marine mammal, sea turtle, and fish species (including sharks and rays).
- DEC's aerial surveys will focus primarily on marine mammals and sea turtles but also include opportunistic bird and fish sightings to the extent possible.
- DEC's passive acoustic whale monitoring survey in the vicinity of the shipping lanes.
- DEC's development of ocean indicators in conjunction with Stony Brook University.
- Stony Brook University's acoustic tagging study of Atlantic sturgeon and fish of opportunity.
- Federal aerial and shipboard surveys conducted as part of the Atlantic Marine Assessment Program for Protected Species (AMAPPS), which involves NOAA, BOEM, FWS, and the Navy.
- Multi-state Cooperation (NY, MA, ME, RI) of offshore wind development.

Planned Work (partial listing)

Study Area/Site Assessments

- Marine, aviation, and safety/security risk assessments – probabilistic risk analysis for vessels and aircraft operating in vicinity of potential offshore wind energy areas and determination of mitigation actions such as turbine placement and lighting to reduce identified risks.
- Commercial and recreational fisheries assessments – evaluate fishing areas, potential displacement and changes in fishing effort, and potential economic impacts.
- Essential fish habitat studies – identify essential fish habitats and habitat areas of particular concern for managed species, threats posed by development to habitats, and possible conservation efforts.
- Visual resource assessments – Demonstrate the visibility of wind turbines in offshore areas considered for development under a range of lighting and visibility scenarios.
- Historic and cultural resource assessments – study of potential submerged resources, mitigation actions, and impacts of potential offshore wind sites.
- Archeological surveys – historic site and cultural resource assessments of potential offshore and onshore sites.

Field Studies – Phase 1

- Metocean data measurements and analysis including, but not limited to, turbine hub-height wind speed and direction, wave and current measurements using met tower, and/or floating buoy-mounted Light Detection and Ranging (LIDAR) technology deployed in one or more locations in the New York Bight.
- Acoustic surveys and studies – Buoy mounted sensors will measure and record above and under water acoustics to define baseline noise levels and to listen for birds, bats, and marine mammals. Acoustic data will be used to determine effects of construction operations.
- Oceanographic surveys and analysis – Data in the New York Bight will be collected regarding depth, currents, sediment transport, turbidity, and sea surface temperature, etc.
- Marine and terrestrial biological resource assessments – Ship and airborne visual and digital surveys to determine the distribution and abundance of fish, marine mammals, sea turtles, birds, and bats.



Credit: iStockphoto

Field Studies – Phase 2

- Geophysical and geotechnical surveys and analysis – Geophysical surveys will be undertaken by a survey vessel towing sonar equipment and other sensors to map seabed and sub-seabed conditions, detect geohazards, and locate existing cables and underwater structures. Geophysical surveys include seabed soil sampling, penetration testing, and coring using specialized vessels and offshore drill rigs. Geotechnical surveys will be completed once WEAs are established as this information is highly site-specific.
- Onshore surveys and land use studies for areas of potential cable shore landings, onshore transmission, and onshore substations – Surveys include utility surveys, soil measurements, and borings as required.
- Land use and existing infrastructure assessments.
- Avian, bat, and threatened and endangered species assessments.
- Socioeconomic resource, recreational resource, public health, and safety assessments.
- Wetland, waterbodies, and land-use assessments.
- Cumulative effects assessments.

Analytical Studies

- Cost-reduction pathways – Analysis of impact on costs due to new and emerging technologies, new and improved installation methods and potential State actions that can reduce costs.
- Supply chain assessments – Determine supply chain and infrastructure suitability along with possible actions that reduce costs and increase value, including port facility improvements and workforce training.
- Installation, operations, and maintenance vessels assessment and costs.
- Electric load, grid, and interconnection requirements – Detailed analysis to identify challenges, options, and costs of injecting a large amount of offshore wind into zones J and K of the New York State grid.
- Offtake mechanisms and value modeling – Analyze options for contractual mechanisms for the State to support energy offtake agreements for offshore wind projects and the value to ratepayers.
- Regional activity impacts – Consider the interaction of the State’s actions with those of other Northeastern and Mid-Atlantic states.

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

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