# Report of the
# Committee to Study Offshore Wind Energy and the Development of Other Ocean Power Technology

**HB 1312 (Chapter 180, Laws of 2014)**

Membership

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| Representative Robert Cushing, Chair | Senator Martha Fuller Clark |
| Representative Herbert Vadney | Senator Jeff Woodburn |
| Representative David Borden | Senator Russell Prescott |

## Summary

This Study Committee held seven meetings at which it heard numerous presentations from various experts in the field of offshore energy production.[1] The Committee wishes to thank these individuals for taking the time to come to Concord, oftentimes from out-of-state, to meet with us and share their knowledge. Many interested parties also attended these meetings, including those from state and federal agencies, businesses, academia, and environmental groups. One of the meetings was a public informational session and hearing held on the seacoast at the New Castle Public Library. About 20 members of the public attended.

After considering all of the information presented and the comments received from the public, the Committee has come to the following conclusions.

Key Findings

- The wind resource off of New Hampshire's coast has the potential to generate significant amounts of electricity, whereas tidal or wave energy do not.
- The best place to develop offshore wind power appears to be three or more miles beyond the Isles of Shoals due to the area's increased wind strength and consistency, reduced boat traffic congestion, and reduced onshore visual impact from the tall structures.
- However, this area has waters that are too deep for conventional foundation attachments to the seabed, and so it is probable that floating platforms would

[1] See Attachment 1 for list of presenters.

need to be used. Each tower, turbine, and blade assembly would sit atop its own platform and be tethered in place to the seabed.

- Floating platforms are used extensively for oil and gas extraction, but are not yet a proven, cost-effective technology for wind generation. However, demonstration projects have already been deployed in ocean waters and more are to come.
- Offshore wind development has the potential to generate significant economic activity within Portsmouth Harbor, other coastal communities, and even communities farther inland. Even if the large components of the generation units are not manufactured or assembled here, there are extensive supply chain and service needs that New Hampshire businesses and workers could provide, including cabling, support services and vessels, substation and shore grid connections, engineering, environmental services, and the operation and maintenance of the wind farms over the long-term.
- The area 3 or more miles beyond the Isles of Shoals is in federal waters which the Bureau of Ocean Energy Management (BOEM) is responsible for leasing to developers. BOEM has a process called “Smart from the Start” to identify suitable areas where wind development would be compatible with existing uses and not harm the fisheries resource or other wildlife. It is a process that engages multiple stakeholders and is transparent in nature.
- The wind resources off the coasts of our neighboring states are much greater than ours due to their longer coastlines. It makes sense for New Hampshire to work cooperatively with Maine and Massachusetts in developing offshore wind as a regional resource. Connecting future wind farms built off the coasts of Maine, New Hampshire, Massachusetts, Rhode Island and perhaps even farther south with a common undersea transmission line that parallels the coast may prove to be the most efficient means of moving the power to where it is needed onshore.

<u>Recommendations</u>

- The Committee sees its work as just the beginning of a necessary long-term discussion on the development of wind power off the coast of New Hampshire. Even though there are many outstanding technical, logistical and economic issues concerning the viability of offshore wind generation, especially using floating platforms, the state should prepare itself to take part in the industry’s development if the opportunity arises and it is in our best interest.
- The Committee encourages the Governor to reach out to the Governors of Maine and Massachusetts in an effort to identify ways in which the states can work cooperatively in the development of offshore wind. The Committee also hopes

that the Governors can agree on a joint request to BOEM to form a multi-state task force and stakeholder process to plan for regional offshore wind and transmission line development. It is the Committee's understanding that a state's participation in such a BOEM sponsored process does not obligate the state to contribute any money towards such effort.

**Background**

The technology used to generate electricity from wind has advanced significantly over the past couple of decades. The turbines and rotors are much larger now and more efficient at converting wind energy into electricity. Costs have also declined making wind much more competitive with other methods of generating electricity. Hundreds of commercial wind farms have been constructed across the United States in the past decade such that wind produced 4% of all the electricity in the nation in 2013.

A wind farm requires a relatively large tract of land for its construction because it is composed of multiple tower, turbine, and blade assemblies that are erected a significant distance apart from each other. This combined with the fact that each structure is very large makes a wind farm a very noticeable feature on the landscape, which can limit where one can be acceptably sited. Another limitation on siting is that wind farms do best, of course, where the winds are strong and consistent. This is less of a consideration in some areas of the nation that are flat and windy by nature, such as the plains of the Midwest. However, in New Hampshire the wind blows best across the top of ridgelines, and constructing a wind farm there tends to make it more prominent.

**Advantages and Challenges of Offshore Wind**

Both of these potential issues (visual impact and limited areas of sufficient wind strength) are nicely addressed by the siting of wind farms many miles offshore. The winds are very strong and consistent there and the structures are barely if at all visible from land. An added advantage is that since the visual impact is less of a concern, the turbine and blade assemblies can be sized even larger and placed on taller towers. This allows them to capture more wind per unit and to take advantage of the even stronger winds found at higher elevations. As a result, more electricity can be generated per structure which lowers overall costs due to economies of scale.

Unfortunately, constructing wind farms offshore is a challenging and, at this point, costly endeavor. Towers must be attached to the seabed in waters depths up to 50 meters in depth. A specialized and extremely expensive vessel is needed to erect each

tower, place the main turbine body on the tower, and finally to attach the blades, all in an oftentimes harsh marine environment. In additions, there is no existing transmission infrastructure out at sea for a wind farm to "plug into", so transmission lines must be laid and associated electrical components installed in order to bring the power from the offshore wind farm to land where it can be fed into the electrical grid.

**Development of Offshore Wind**

Despite these challenges, many countries in the world have moved forward in developing offshore wind farms. Presently, there are approximately 7 GW (7,000 MW) of offshore wind installed worldwide, with more projects in the pipeline. The majority of the installations are located in northwestern Europe. This has resulted in Europe becoming the world leader in this industry, with the necessary knowledge and experience, technologies, manufacturing and installation infrastructures, supply chains, and workforce skills to more efficiently plan and build offshore wind farms. China and Japan are poised to becoming major players in offshore development as well.

As of yet, no commercial-scale projects have been constructed in the United States, though there are two nearby New England projects that are considered to be in their initial phases of construction. The largest is the well publicized 468 MW Cape Wind project to be composed of 130 turbines and located within Nantucket Sound. First proposed in 2001, it has been controversial from the start and aggressively challenged in court and in the public arena by those opposed to where it is to be sited. The project owners have successfully persevered, though recently experienced a major and perhaps fatal setback when the two public utilities that were to purchase over three quarters of the project's electrical output terminated their contracts with Cape Wind. If constructed, the project would provide about three quarters of the electricity needs of Cape Cod. The other nearby but much smaller project is the 30 MW Block Island Offshore Wind Farm composed of just 5 turbines. It will provide power to the island as well as the mainland through a bi-directional, buried cable. This project is targeted for completion in 2016.

The winds that blow in the Gulf of Maine off of New England's coastline are very strong and have the potential to produce huge amounts of electricity (>150 GW). New Hampshire's share of that is quite small due to its limited coastline. Nonetheless, it is estimated that up to 2.8 GW of generation capacity exists 3 or more miles off of our coast, seaward of the Isles of Shoals. For comparison purposes, Seabrook Station is a 1.2 GW facility that generates at 87% of its capacity on a yearly average, whereas the percentage for an offshore wind farm generally would be less than 50%.

## Floating Platforms

Most of the area 3 or more miles off of our coast and seaward of the Isles of Shoals has waters too deep (>50m) for fixed seabed foundations. The alternative proposed for such deep waters is to affix the towers and turbines to floating platforms that would be held in place by tethers anchored to the seabed. Floating platforms are used extensively for oil and gas extraction, but are not yet a proven, cost-effective technology for wind generation. Demonstration projects consisting of single platform/turbine (2 MW) installations using different platform technologies have already been deployed off the coasts of Portugal, Japan and Norway, while groups of 2 to 6 floating platforms with larger turbines (5 to 7 MW) are planned in the next few years off the coasts of Oregon, Japan, and Scotland.

If these demonstration projects prove that floating platforms are a suitable technology for supporting wind turbines and a cost effective means of deploying them, then the deep water areas off the coast of New Hampshire and other parts of the Gulf of Maine can be utilized for power generation. One expected advantage that floating platforms will have over fixed seabed installations is that the platform, tower, turbine body, and blades can be assembled in the safe confines of a specialized port facility rather than at sea. Once assembled, the entire floating structure can simply be towed to the wind farm location and tethered in place, with little disturbance to the marine environment.

## BOEM Process

Locating a wind farm 3 or more miles from land requires a lease from the federal government because it would lie in federal waters. The Bureau of Ocean Energy Management (BOEM) oversees the development of wind energy in federal waters along with other energy sources. BOEM created the “Smart From the Start” process for identifying suitable areas for wind development in cooperation with states. BOEM’s stated philosophy is centered on engagement of stakeholders, transparency, and providing opportunities for public input through formal and informal processes.

The process is initiated by Governor request. Once that is received, BOEM establishes an intergovernmental task force composed of elected local and state officials as well as state and federal agency personnel. The task force works with BOEM to:

- Provide a regional perspective to the leasing process

- Engage federal, state, and other entities in long-term resource planning
- Facilitate site selection through stakeholder coordination
- Promote issue identification and mitigation of potential impacts
- Collaborate on the use of scientific research and information
- Enhance environmental monitoring and mitigation strategies

Twelve such task forces are in place along the Atlantic and Pacific coasts. Some have progressed to the point where BOEM has been able to identify suitable areas (7 in total) for wind development. One of these areas is off the southern coast of Massachusetts. It is 742,974 acres in size and capable of supporting up to 5 GW of generation. Competitive auctions have been held and leases awarded in some of the identified areas, with more auctions scheduled in the near future.

**Multi-state Cooperation**

BOEM can also form a multi-state task force when two or more states see an advantage in working together. Massachusetts and Rhode Island came to this conclusion back in 2010 resulting in BOEM establishing a joint task force of the two states. The process led to the designation of a wind energy area along their joint border and the subsequent auction and lease of a portion of it to a developer in 2013. The Deepwater One project has a capacity potential of 1 GW.

The multi-state approach provides the opportunity for integrated, regional planning. One place where this could prove especially valuable is when considering how power from multiple wind farms in a region can be most efficiently transmitted to the mainland. Rather than each wind farm having to lay its own cable to shore and interconnecting it to the grid, perhaps laying in a common transmission backbone that parallels the coast and comes ashore at a few key locations makes more economic sense. The wind farms could then just “plug into” that system. Such a system might also be useful as a valuable offshore transmission corridor that may alleviate some of the congestion and stress on New England’s transmission system by helping to move power to where it is needed within the region.

**Economic Activity**

The development of offshore wind has the potential of creating significant economic activity within Portsmouth Harbor, other coastal communities, and even communities farther inland. Even if the large components of the generation units are

not manufactured or assembled here, there are extensive supply chain and service needs that New Hampshire businesses and workers could provide, including cabling, support services and vessels, substation and shore grid connections, engineering, environmental services, and the operation and maintenance of the wind farms over the long-term.

This type of economic activity is not dependent on wind farms being built off of New Hampshire's coast. For example, Cianbro, a Maine company, is currently under contract to produce electric service platforms for the Cape Wind project in Massachusetts. The Maine Ocean and Wind Industry Initiative is an example of an industry-led effort to identify workforce and supply chain strengths in the Gulf of Maine. Several New Hampshire companies are included in the Initiative's regional supply chain database.

It is hard to know when offshore wind will truly take off in the region, but it is clear that our neighbors to the north and the south are making serious efforts to develop the industry. Massachusetts is one of the leaders in the country at the moment in this regard. It therefore behoves New Hampshire to become more involved in this potentially significant area of economic growth, even with the limited coastline that we have. There is no reason why the proverbial saying that "a rising tide lifts all boats" should not apply to New Hampshire when it comes to offshore wind development.

Information and documents supplied to the Committee can be found at:
http://www.gencourt.state.nh.us/statstudcomm/committees/2151/documents.aspx

## Attachment 1

### List of Presenters

| Name | Organization |
|---|---|
| Jeffrey Browning | Bureau of Ocean Energy Management |
| William O'Hara | Northeast Utilities |
| Val Stori | Clean Energy Group |
| Christian Williams | NH Dept. of Environmental Services - Coastal Program |
| Paul Williamson | Maine Ocean and Wind Energy Initiative |
| Bill White | Mass. Clean Energy Center |
| Joel Whitman | Whitman Consulting Group |
| Martin Wosnik & Ken Baldwin | UNH - Center for Ocean Renewable Energy |