# Agency Coordination of Offshore Wind Projects in Washington State

University of Washington Environmental Management Certificate Program
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# Executive Summary

The purpose of this report is to clarify roles and responsibilities of various state agencies in anticipation of proposed offshore wind energy projects. This project was conducted by a team of interdisciplinary graduates at the University of Washington from September 2013 – March 2014. This document is designed to provide guidance for state agencies. It may also be useful for federal and local agencies, private offshore wind developers, and stakeholders interested in the process of siting and development of offshore wind facilities.

Washington's Energy Independence Act requires all utilities in Washington with more than 25,000 customers to obtain 15 percent of electricity from renewable sources by 2020. Offshore wind is an eligible form of renewable energy under the Act and provides an opportunity to meet this requirement. Washington has strong wind resources and recent improvements to floating wind platforms makes offshore wind possible in the state's deep coastal waters. Although no offshore wind projects have been proposed to date, **the State of Washington can take proactive steps to prepare for future development.**

Federal, local, and state government agencies have overlapping jurisdictions over the regulation of offshore wind energy development. The extent of their respective roles depends primarily on where a project is sited. To date, there has been no research conducted on the roles of different agencies within the state, how they would participate, coordinate their responsibilities, and potential gaps in coordination of a process to obtain a permit.

To address these roles and responsibilities, the research team interviewed staff from state agencies about their siting and permitting authorities, concerns about environmental impacts, and how they would coordinate with other agencies. Based on interviews and research, we identified several key findings and recommendations to prepare state agencies for offshore wind development.

## Findings

1. **Limited Internal State Agency Coordination**
    - Agency interviews revealed limited understanding among state agencies about how they relate to other agencies during the offshore wind development process. Interagency coordination is important because agencies have shared missions and authority for managing coastal resources.
    - Washington state agencies have coordinated on projects in the past, but have not worked together on this new form of technology. Inconsistencies between state agency knowledge and viewpoints about offshore wind energy could result in communicating mixed messages; Washington needs one unified voice.

**2. No Clear Path for Developers**

- Washington has no defined process that takes a developer from project proposal through construction and eventual operation of an offshore wind farm. The necessary permits to regulate an OSE project exist and the Governor's Office of Regulatory Innovation and Assistance (ORIA) plays a central role in coordinating some environmental and business regulatory systems among state agencies, stakeholders, and developers. However, there is currently no process to handle OSE specifically; particularly its federal aspects.

**3. There are Existing Organizations who Coordinate Ocean Activity**

- Currently there are two organizations created by the state of Washington that serve as forums for coordination of Washington's ocean-related policies and management of Washington's coastal resources. These groups coordinate interests and policies of the ocean and coastal water resources.
    - The State Ocean Caucus (SOC) is comprised of the Governor's Office and state agencies and primarily fosters collaboration and coordination of state ocean policy with tribes, local and regional government, federal agencies, academia, and the general public.
    - The Washington Coastal Marine Advisory Council (WCMAC) is open to private citizens, industry representatives, and community groups in an effort to collaborate on coastal water resource management.

**4. Lack of Federal, State, Local, and Tribal Coordination**

- No mechanism currently exists for Washington to coordinate with federal agencies about offshore wind, particularly with the Bureau of Ocean Energy Management (BOEM). The BOEM leasing process requires collaboration between state, local, and federal government to determine acceptable locations for offshore wind farms.
- Government coordination is critical to providing clear directions to developers and communication to stakeholders. Independent and inconsistent conversations between external parties and government agencies hinder development and pose a risk to protecting Washington's coastal resources.

**5. Offshore Wind Energy has Unknown Environmental Impacts**

- Offshore wind energy is an emerging technology in the United States and Washington. As a result, there are significant gaps in research about its potential long term impacts. State agency representatives frequently expressed concerns about fish and wildlife, aquatic habitat, and interaction with existing ocean uses.

## Recommendations

1. **Improve internal state coordination by establishing a written agreement between state agencies.**
    - Currently state agencies have an understanding of how they would likely participate in offshore wind development, but do not have a clear picture about the role of other agencies. Relevant agencies must have a clear comprehension about where they fit within the overall process.
    - A formalized agreement should designate a person or persons at each agency who is familiar with the agency's regulatory authority and concerns about offshore wind. State agencies have coinciding jurisdictions over coastal areas and a collaborative approach will enable them to communicate with one voice to developers and other levels of government.

2. **Improve coordination at all levels of government by establishing a Bureau of Ocean Energy (BOEM) Task Force.**
    - Federal, state, local, and tribal governments have overlapping jurisdiction over the ocean, and currently there is no existing mechanism to bring these entities together to coordinate offshore wind development.
    - BOEM is a federal agency within the Department of the Interior that manages the development of ocean energy projects. A BOEM Task Force is a mechanism to bring together interested and affected state, local, and tribal governments to manage development. In several other states, the creation of a BOEM Task Forces has eased the development process and improved organization.
    - Establishing a Task Force gives state agencies the opportunity to comment on the ocean leasing process, allows for timely and consistent dissemination of information, and improves communication between relevant governmental parties. Rather than federal, state, tribal, and local governments communicating separately about ocean energy policies, a centralized BOEM task force enables them to work together.

3. **Prioritize research on the environmental impacts of offshore wind by creating a research prioritization and coordination task force made up of state agencies, scientists, and experts**
    - Offshore wind is a new technology and the environmental impacts have not been fully researched. Environmental studies are needed to understand the potential effects on issues such as water quality. The state needs access to current research in order to effectively protect Washington's natural resources.
    - Collaboration through a focus group would allow agencies to share information and prioritize key areas for further research. State agencies must be prepared to communicate key areas of concerns to about proposed wind projects in their interaction with BOEM during the leasing process.

This report provides background information on the opportunity for offshore wind in Washington, summarizes interview findings, and suggests actions to improve the state agency coordination.

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## Abbreviations

BOEM – Bureau of Ocean Energy Management

BPA – Bonneville Power Administration

DFW – Washington Department of Fish and Wildlife

DNR – Washington Department of Natural Resources

DOE – Washington Department of Ecology

EFSEC – Energy Facility Site Evaluation Council

JARPA – Joint Aquatic Resources Permit Application

kW -Kilowatt

MSP – Marine Spatial Planning

MW – Megawatt

NEPA – National Environmental Protection Act

nm – nautical miles

OIRA – Governor's Office of Innovation and Regulatory Assistance

OSE – Offshore Energy

RCW – Revised Code of Washington

SEPA - State Environmental Protection Act

SMA – Shoreline Management Act

WCMAC – Washington Coastal Marine Advisory Council

## Purpose and Overview

This report was developed by an interdisciplinary team of graduate students through the University of Washington's Program on the Environment. It was initiated on behalf of the Washington State Department of Commerce and in partnership with Washington Sea Grant. The purpose of the report is to provide preliminary research about offshore wind energy, describe the roles and responsibilities of Washington state agencies, and recommend actions to prepare the state for future offshore wind development.

The team conducted interviews with representatives from the following five agencies: Department of Ecology, Department of Natural Resources, Department of Commerce, Department of Fish & Wildlife, and EFSEC. The information contained in this report is also the result of meetings with the Governor's Office of Regulatory Assistance and Innovation (ORIA), State Ocean Caucus, a private renewable energy corporation, and experts guest lecturers and advisors.

The primary audience for this document is employees of state agencies with responsibilities for permitting and siting of offshore wind energy projects. In addition, federal and local agencies may use this guidance to enhance coordination between all levels of government. Other groups who can benefit from this information include private offshore wind developers and stakeholders interested in the process of siting and development of offshore wind facilities.

## Section 1: Background

The passage of new energy goals for power utilities in Washington has brought renewable energy into the spotlight. In 2006 Washington became the second state in the nation to pass a renewable energy standard by voter initiative, leading to the creation of the 2007 Energy Independence Act (RCW 19.285). This legislation tasks utilities serving greater than 25,000 Washington customers with obtaining 15% of electricity from renewable energy resources by 2020. The law also requires utilities to acquire all cost effective energy conservation practices. . Utilities that qualify for this standard represent 84% of Washington's electric load.[1] In 2010, Washington generated 6.4% of its electricity from renewable energy sources.[2]

Wind energy is one of the eligible technologies listed under the Energy Independence Act. While Washington is already a leader in land based wind generation, to date an offshore wind farm has not been proposed or built off the coast of Washington. **Offshore wind energy presents a promising source of clean renewable energy to meet Washington's new standards.**

OSE is an emerging technology, but it has been successfully implemented in other parts of the world. Europe has been the leader in offshore wind energy generation since the installation of the first offshore wind project in Denmark in 1991. Fifty-three wind farm projects, totaling nearly 3,800 megawatts (MW) of capacity, are producing renewable energy off the coasts of 10 European countries, with nine additional offshore wind projects under construction.[3]

**The availability of wind resources, supportive government policies, and well established supply chains from existing land-based wind industry makes Washington an attractive place for offshore wind development.** Many coastal areas in the United States, including Washington, have high wind resource potential. Projects are already underway on the Atlantic coast, mostly notably in Massachusetts and Rhode Island. On the Pacific coast, a Seattle-based wind company recently received approval to develop plans and negotiate a lease to build the West Coast's first offshore wind energy farm. The proposed project would consist of five floating turbines off the coast of Coos Bay, Oregon.[4]

Offshore wind development projects require the involvement of local, state, and federal governments. Because Washington has not received a proposal for an OSE project, the role of state agencies and the permits required have not yet been determined. In order to prepare state agencies for future OSE proposals, this report will provide the following information:

1. The motivation and potential for offshore wind development in Washington
2. Overview of the technology
3. Role of state agencies in OSE development
4. Recommendations for state agency coordination

## *Section 1.1: Motivation for Washington OSE Development*

Support for renewable energy by elected officials and the public and the availability of wind resources on the Pacific coast make Washington a viable candidate for offshore wind development. OSE has the potential to diversify the Washington's energy portfolio to meet increasing demand from a growing population, promoting economic growth in coastal areas by creating new jobs. With the right policies in place and effective coordination at the state level, Washington could potentially harness wind resources and develop a strong offshore wind industry.

### *Section 1.1.1: Population Growth*

A study from the Washington Climate Change Impacts Assessment examining the effects of climate change on energy supply and demand determined that in the absence of warming trends, population growth is projected to increase heating energy demand in Washington State by 38 percent in the 2020s and 68 percent by the 2040s. When effects of population growth and a warming climate are combined, demand continues to be projected to increase by 22-23 percent and 35-42 percent, respectively.[5]

With a limited supply of geographic opportunities for increased hydropower production and terrestrial wind, Washington faces challenges in meeting increased energy demands from population growth.[6] Currently an abundance of power is generated from hydroelectricity, the state's largest source of renewable energy. But with population projections in Washington expected to exceed eight million by 2040[7] (Figure 1), the state must consider a range of new energy sources, including offshore wind.

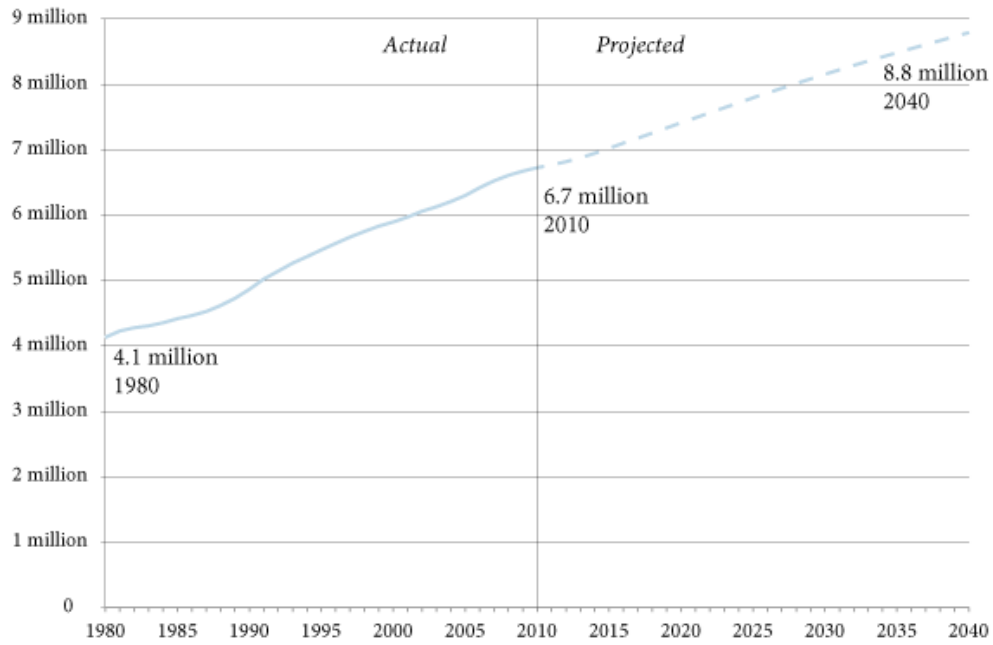


*Figure 1: Washington is expected to add over 2 million people in the next 25 years*

### *Section 1.1.2: Economic Development*

Washington has a long history of marine activity, including transportation and heavy construction. It is likely that goods and services as well as employees would be procured from existing state capabilities. The turbines would probably not be sourced from within the state, as there are existing turbine companies outside of Washington. However, turbine assembly and installation could be completed by firms.

Washington is a leader in land-based wind capacity, ranking seventh in the nation.[8] The state's existing wind industry has an established supply chain and existing suppliers. This allows offshore wind farm developers access to existing suppliers, low cost of conducting business, and access to an educated and skilled workforce.

Offshore wind energy development and maintenance represent a source of potential job growth for Washington, particularly in coastal communities. Construction and maintenance of offshore energy facilities requires a variety of short-term and permanent labor positions in the following areas:

- Construction
- Operations and Maintenance
- Purchasing of goods such as steel, cement, electrical cables
- Purchasing of services such as environmental studies, licensing, and legal fees
- Potential infrastructure investments into Washington's ports and electrical grid.

Actual cost projections of a project are largely dependent on the size (MW) of each project. The Cape Wind Energy Project located in Massachusetts and Rhode Island provides an example of potential economic impacts of a 468MW project. Cape Wind's Environmental Impact Statement includes estimated economic impact figures (Table 1).[9] It should be noted that Cape Wind proposes tower supported wind turbines, meaning that the wind turbine support structure extends down the ocean floor, where it is secured. Due to the extreme depths of Washington's coast, it is more likely that a floating platform design will be used, where the platform is secured to the ocean floor with moorings. Floating platforms were proposed for the WindFloat Pacific project in Coos Bay, Oregon due to water depths.[10]

**Cape Wind Economic Impacts**

| | |
|---|---|
| Wind Farm Size | 468 MegaWatts |
| Project Time | 27 months |
| Local Jobs Created | 391 |
| **Total Local Wages and Salaries During Construction** | **$59,603,000** |
| Capital Costs – Total | $700,000,000 |
| Capital Costs – Labor | $140,000,000 |
| Capital Costs - Non-Labor Goods and Services | $560,000,000 |
| **Annual Payment to Yarmouth, MA** | **$350,000 for 20 years or $7,000,000** |

*Table 1: Cape Wind Energy Project: Environmental Impact Statement Financial Estimates*

### *Section 1.1.3: OSE Potential in Washington State*

Data from the National Renewable Energy Lab shows strong wind resource potential in coastal areas of the United States (Figure 2).[11] Areas on the East Coast have been identified as prime candidates for OSE development including Delaware, Maryland, New Jersey, New York and Virginia. On the Pacific Coast, Northern California, Oregon, and southern Washington have some of the strongest offshore wind resource potential of all the coastal states, with some areas seeing annual average wind speeds of more than 23 miles per hour.[12] Wind power classes are representations of wind power densities at varying heights above sea level and range from 1 to 7, with 7 representing excellent wind potential.[13] In the Pacific Northwest region, wind resources are firmly categorized as Class 6.

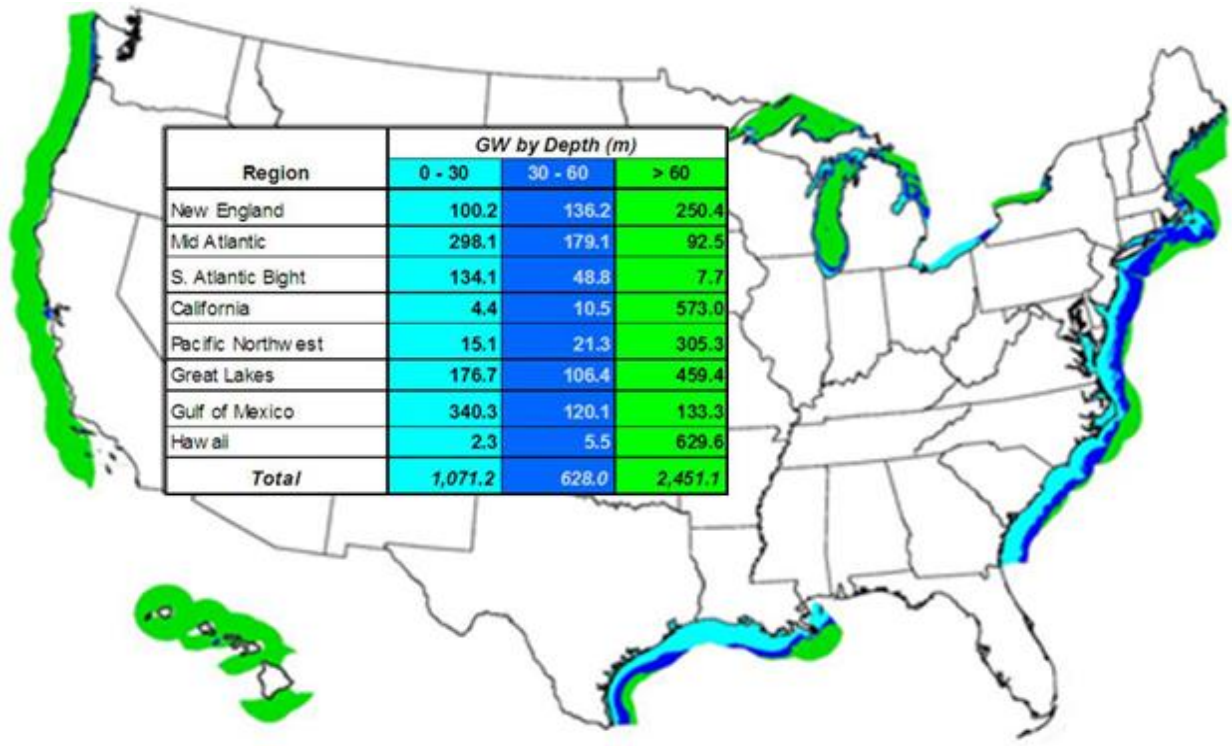


*Figure 2: United States Offshore Wind Resource (in Gigawatts) by Region and Depth for Annual Average Wind Speed Sites above 7.0 m/s, NREL*

According to mapped wind resource data from the National Renewable Energy Laboratory (Figure 3), Washington state holds significant resources off the coast out to 50nm (nautical miles).[14] In state waters, from the shoreline to 3nm, wind resources are relatively strong. However, as the map indicates wind resources become more consistently robust beyond 3 nautical miles (nm) out to 50nm. An important distinction to consider is the increasing depth further from the coast. The transition from 3nm to 12nm offshore shows seafloor depths quickly transitioning from 30m to 120m and greater. While the coastal waters hold a wealth of wind resources, the depths at which they are found are unique to the west coast of the United States. The technologies and infrastructure needed for energy production and transmission to shore could pose a significant challenge for interested developers and state and federal agencies concerned about the impacts.

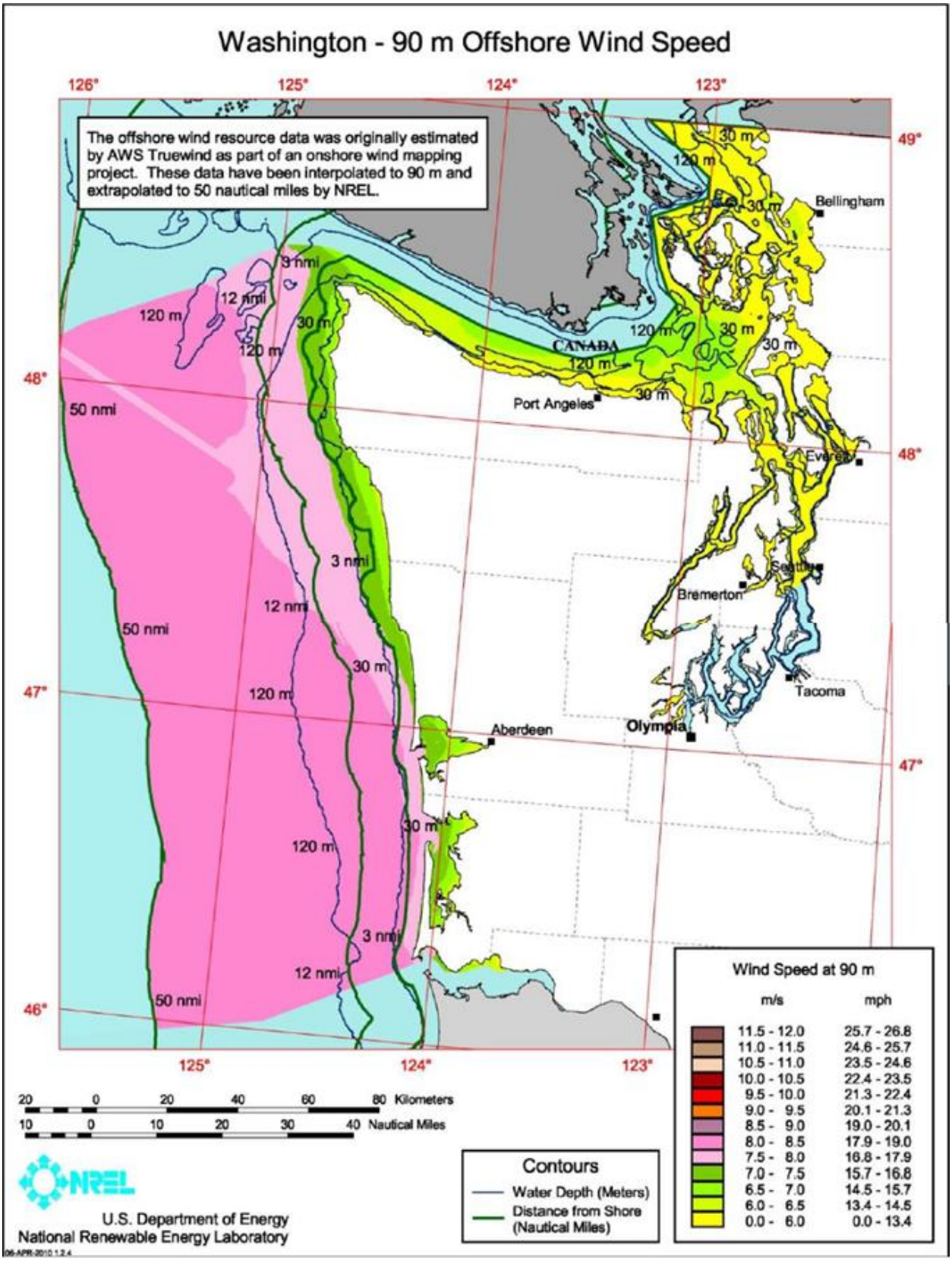


*Figure 3: Detailed Map of Washington's Offshore Wind Resources, NREL*

## *Section 1.2: Technology and the Washington State Energy Grid*

Technological improvements are increasing opportunities for OSE development and overcoming existing limitations such as seafloor depths. Traditionally, wind turbines are drilled into the ocean floor which limits development to water depths of 15 meters or less. However recent advances in floating platforms are making offshore wind economical in the deep waters, including the coastal waters of Washington. This section provides an overview of technology basics, integrating offshore wind power into Washington's electric grid, and the advantages and challenges of the technology.

### *Section 1.2.1: Technology Basics*

**Wind Turbines**

A wind turbine is any device that uses wind energy to create electricity. The first wind turbine in the US was built in 1888 by Charles F. Brush. Brush's 12kW wind turbine was used to power his mansion in Cleveland, OH.[15] Today's wind turbines have advanced to produce power in the megawatt (MW) range, the largest being the Vestas V164, an 8.0 MW 164 meter diameter turbine intended for offshore use.[16] On average, a 1.0 MW turbine can power approximately 300 U.S. homes.[56] Wind turbines are often classified by the maximum amount of power they can produce, the limiting factor of which tends to be the generator and not the rotor's ability to spin at high speeds. The three main components of a wind turbine are the tower, rotor and nacelle.

**Tower**

The tower is typically a steel tube that is erected in multiple sections. The inside is hollow, allowing access to the inside of the nacelle. The tower also houses electronic monitoring equipment and the power cable which carries electricity coming from the generator. For an OSE facility, the tower will likely be erected on a floating platform that is moored to the sea floor.

**Rotor**

A traditional rotor consists of three blades, although other blade configurations do exist. These three blades connect to the nacelle and face upwind relative to the rest of the tower. The blades are made of a composite to reduce weight while maintaining stiffness. Modern wind turbines have the ability to rotate, or "feather" each individual blade, allowing the turbine to maintain a constant speed or stop completely in extreme winds. The three blades connect to a central hub, which houses the pitch motors.

**Nacelle**

The rotor drives a shaft that connects to a gearbox and then to a generator. The nacelle houses all of these components in addition to any hydraulic or cooling systems. The nacelle also has the ability to rotate in order to face the rotor into the oncoming wind. Wind direction changes throughout the day so this capability helps increase the turbines annual energy production.

**Capacity Factor**

Developers are concerned with the rate of return of any potential wind farm. One of the dictators is the capacity factor. This is the ratio of the turbine's average power output to its rated power output. Every turbine has a rated power and speed. For example, the Vestas V80-2.0 MW has rated, or max, power of 2.0 MW, which occurs at a wind speed of about 31 mph. Since wind speeds change throughout the year the turbines power output is by no means constant. Over the course of the year, the average power output might come out to be only 600 kW, or 0.6 MW. This means that the turbine has a capacity factor of 30% (0.6/2.0).

Capacity factor is extremely site dependent; a wind turbine in Kentucky might not produce as much power if it were placed in west Texas. Developers choose areas that have high and consistent wind speeds, and then pick their turbines accordingly. The median capacity factors for onshore and offshore wind farms are 35.5% and 43%, respectively. The maximums have been 48.8% and 54%.[17] Figure 4 shows the capacity factors of various other energy sources in the U.S.

More information about capacity factor can be found on the EIA website.[18]

**Average Capacity Factors by Energy Source, 1998 through 2009**
(Percent)

| Year | Coal | Petroleum | Natural Gas CC[1] | Natural Gas Other | Nuclear | Hydroelectric Conventional | Other Renewables |
|---|---|---|---|---|---|---|---|
| 1998 | 67.7 | 22.2 | -- | 34.2 | 79.2 | 46.6 | 57.0 |
| 1999 | 68.1 | 22.4 | -- | 33.2 | 85.3 | 45.9 | 56.9 |
| 2000 | 71.0 | 20.5 | -- | 37.1 | 87.7 | 39.5 | 59.1 |
| 2001 | 69.2 | 21.5 | -- | 35.7 | 89.4 | 31.4 | 50.2 |
| 2002 | 70.0 | 18.1 | -- | 38.2 | 90.3 | 38.0 | 54.0 |
| 2003 | 72.0 | 22.4 | 33.5 | 12.1 | 87.9 | 40.0 | 50.0 |
| 2004 | 71.9 | 23.3 | 35.5 | 10.7 | 90.1 | 39.4 | 50.5 |
| 2005 | 73.3 | 23.8 | 36.8 | 10.6 | 89.3 | 39.8 | 47.0 |
| 2006 | 72.6 | 12.6 | 38.8 | 10.7 | 89.6 | 42.4 | 45.7 |
| 2007 | 73.6 | 13.4 | 42.0 | 11.4 | 91.8 | 36.3 | 40.0 |
| 2008 | 72.2 | 9.2 | 40.6 | 10.6 | 91.1 | 37.2 | 37.3 |
| 2009 | 63.8 | 7.8 | 42.2 | 10.1 | 90.3 | 39.8 | 33.9 |

*Figure 4: Coal and Nuclear have some of the highest capacity factors. Natural gas capacity factors have increased as it has become more of a base load resource.19*

## Deep Offshore Wind versus Shallow Offshore Wind

Offshore wind turbines have the same operating principles as onshore turbines; the critical differences being the support structure. Offshore turbines must be secured to the ocean floor while still being elevated to as high as 90 m above the water's surface. On the East Coast and in Europe, towers can extend down to the ocean floor because of shallow continental shelves. The West Coast, however, has a deep continental shelf, placing existing designs out of their depth capacity. Figures 5 and 6 display proven shallow water designs, unproven deep water (> 60 m) designs, and floating turbine concepts.

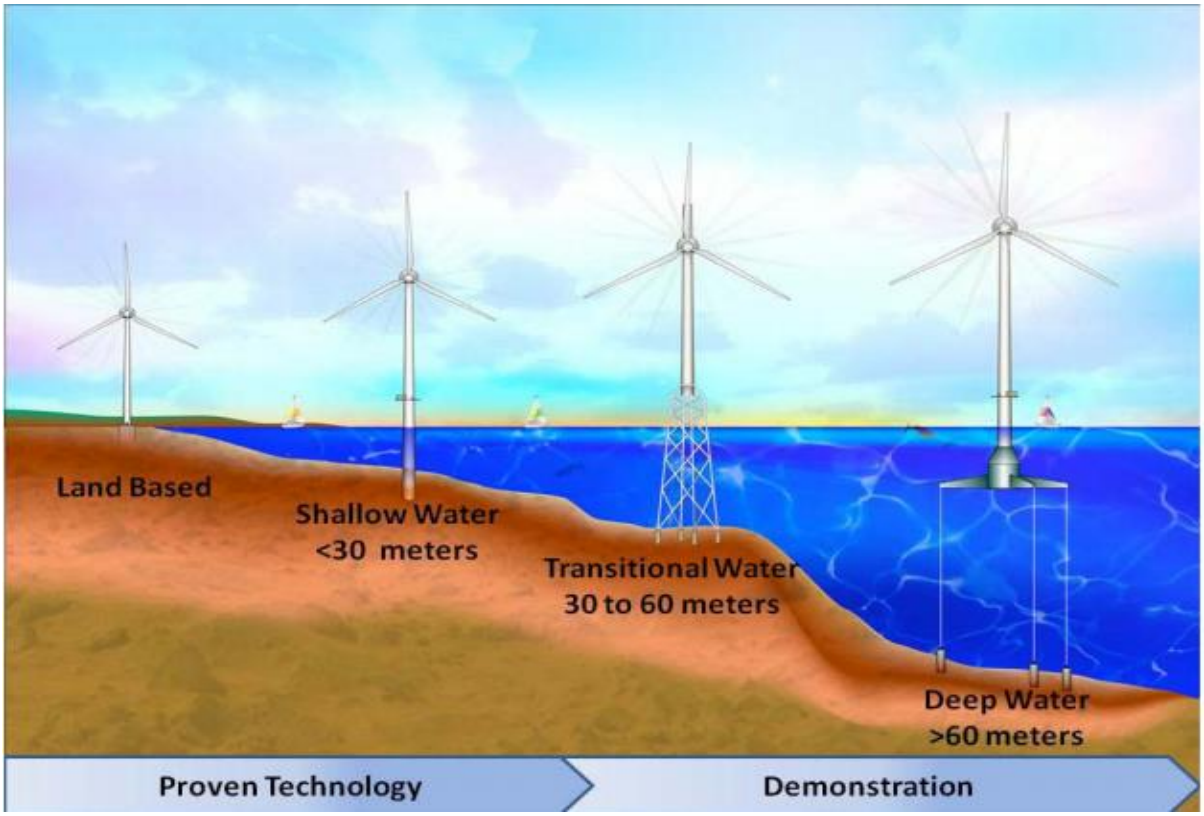


*Figure 5: Towers extending more than 30 meters deep are still unproven.*

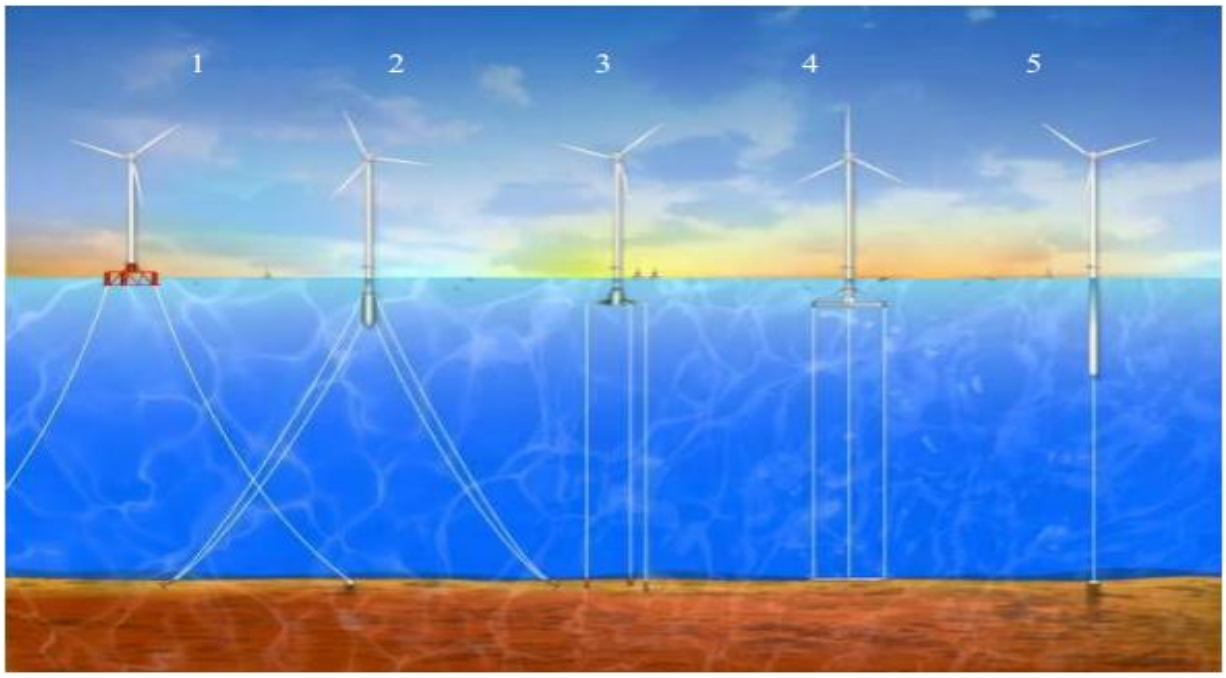


*Figure 6: Floating options include sunk counterweights and moored platforms.*

Companies such as Glosten Associates and Principle Power have proposed floating platform designs for use in deep waters (see Figure 7). In October of 2011, Principle Power successfully deployed a Vestas V80-2.0MW turbine 5 km off the coast of Portugal and are currently in the application stages for a 30MW pilot project 15 miles off the coast of Coos Bay, Oregon.

*Figure 7: Principle Power's vision of wind farm full of WindFloast.*[20]

**Construction of a Floating OSE Facility**

Floating offshore wind turbines are an emerging technology and best practices are still being developed. Typically, the turbines would be assembled at a dry dock or shipyard. After turbine and platform assembly is completed, a tug boat would pull the platform out to sea. Next it would be anchored to existing moors. A shielded/armored power cable would exit out of the bottom of the platform down to the ocean floor, buried, and taken to land. As it approached shore, horizontal drilling would be used to keep the cable underground until it connected to a newly built substation and then the grid.

## *Section 1.2.2: Integration into the Grid*

Wind energy is a "non-dispatchable" energy source. Unlike coal, nuclear, or natural gas, the output of a wind farm is not determined by the operators but is subject to weather patterns and wind speeds. In order to meet demand, utilities must balance the supply of wind-generated power with existing controllable energy sources.

In the Pacific Northwest, the Bonneville Power Administration (BPA) supplements land-based wind energy with existing hydroelectric resources. Depending on wind output, BPA can restrict or increase flow of dams (see Figure 8). The availability to supplement with hydroelectric power provides a unique advantage to Washington and makes integration easier. Other regions of the country that rely on fixed-output power supplies such as coal struggle with integrating wind because of its variability.

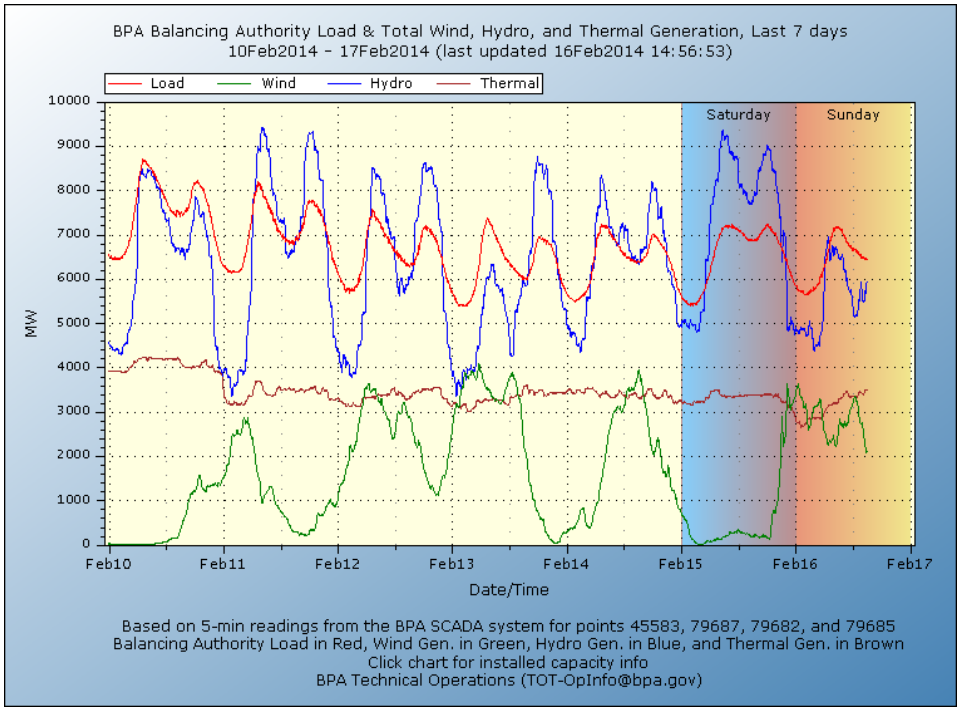


*Figure 8: BPA moderates the output of hydro to balance the output of existing onshore wind along with other energy facilities.*[21]

OSE growth is also hindered by the current physical grid and its limitations. The population of Washington's coast is relatively small; meaning a majority of the power produced offshore must be transported to high population density areas, like the Puget Sound region. Coastal grids are of concern to developers, as connecting a high output wind farm may overload the system. Growth in OSE will likely require additional investments into the grid's infrastructure, which could act as a disincentive to developers, as infrastructure costs can make a project uneconomical. Developers will look to areas that either have a high population or have robust electrical infrastructure.

In the Pacific Northwest, BPA operates and maintains the region's major high voltage electric transmission lines.[22] BPA transmission lines and substations along the coast can be seen in Figure 9.[23] The most developed electrical transmission lines along Washington's Coast lie west of Olympia ending at a natural gas power plant substation in Satsop, although substations exist as far west as Aberdeen. The current state of energy infrastructure development at any of these coastal locations or planned future infrastructure will potentially impact offshore wind energy development. For example, the demonstration WindFloat Pacific Project off the coast of Oregon initiated by Principle Power benefited from existing energy infrastructure development.

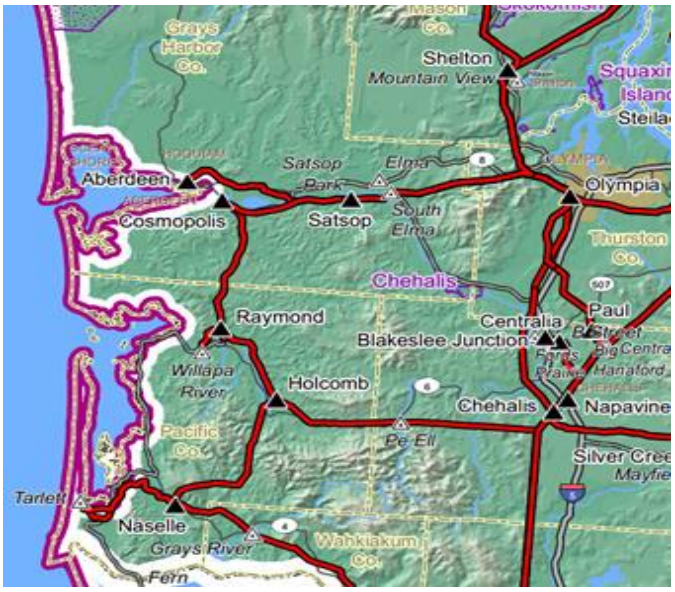


*Figure 9: BPA Managed Transmission Lines and Facilities*

The International Port of Coos Bay is currently developing energy infrastructure to support the Jordan Cove Energy Project (JCE), which includes facilities that liquefy and store natural gas and generate power via natural gas technology. Principle Power was able to negotiate a power purchase agreement with JCE at prices sufficient to meet the economic demands of the offshore wind project, leveraging a market opportunity.[24] As a newer technology using a commercial demonstration project, the energy offshore Principle Power produces is sold at higher prices than those found on the current energy market. In addition, the union between the simultaneous developments of these projects provided for an immediate load center for Principle Power. The electricity produced from the WindFloat Pacific Project will be transmitted through a subsea cable directly to the JCE.

Opportunities like the above are beneficial to developers because they reduce losses via long distance transmission, save costs on potential infrastructure investments, and simplify the permitting process by avoiding the national grid. More information about the agreements between the WindFloat Pacific Project and the Jordan Cove Energy Project can be found in the Unsolicited Lease Request[25] made to BOEM.

## *Section 1.2.3: Advantages and Challenges*

Offshore wind energy has advantages over traditional fossil fuels and other types of renewable energy, but it is not without challenges. Offshore wind farms have the potential to increase capacity factors, reduce carbon emissions, and lessen impacts to humans and wildlife associated with terrestrial wind. On the other hand, offshore wind is potentially difficult to construct and maintain. Gaps in research present uncertainty, as potential economic impacts to local communities or effects to fish and wildlife have not been extensively studied.

**Advantage – Capacity Factor**
Offshore wind resources tend to be stronger than onshore winds and more consistent, meaning that the range of potential wind speeds is smaller. This is in large part due to a lack of impeding geography such as mountains, trees, and hills as well as lower friction between wind and water. The result is a steadier supply of power, simplifying the operational strategies of utilities, and higher capacity factors. Higher capacity factors allow for larger capacity turbines to be economically viable. Offshore wind farms are known to reach capacity factors as high as 47 percent, a significant increase from the 30 percent of onshore winds.

**Advantage – Human Impacts**
The Cape Wind project in the Nantucket Sound has faced controversy from residents who were concerned about its visibility from the shore. Terrestrial wind farms have also received complaints from local residents due to the effects on existing view sheds, low frequency noises from spinning blades, and bright lights at the top of the turbines which are required by FAA. Floating turbines address many of these issues because they can be built in deep water several miles of the coast and therefore are not visible over the horizon.

**Challenge – Cost of Electricity**
Offshore wind is currently one of the most expensive ways to generate electricity. Figure 10 shows how offshore wind energy compares to other forms of energy generation. The column of focus in the figure is "Total system levelized cost." This column represents the cost per megawatt-hour per each technology. With the cost of typical electricity energy consumption measured in kilowatt-hours, how technologies in their current state of development affect utility bills can be compared. According to the figure, if a developer were to construct an offshore wind farm in 2018, the projected cost of electricity would be $0.22 per kilowatt-hour. Hydro powered generation is projected to be $0.09 per kilowatt-hour, conventional coal at nearly $0.10 per kilowatt-hour, and land-based wind at nearly $0.09 per kilowatt-hour.

| | | U.S. average levelized costs (2011 $/megawatthour) for plants entering service in 2018 | | | | |
|---|---|---|---|---|---|---|
| Plant type | Capacity factor (%) | Levelized capital cost | Fixed O&M | Variable O&M (including fuel) | Transmission investment | Total system levelized cost |
| **Dispatchable Technologies** | | | | | | |
| Conventional Coal | 85 | 65.7 | 4.1 | 29.2 | 1.2 | 100.1 |
| Advanced Coal | 85 | 84.4 | 6.8 | 30.7 | 1.2 | 123.0 |
| Advanced Coal with CCS | 85 | 88.4 | 8.8 | 37.2 | 1.2 | 135.5 |
| Natural Gas-fired | | | | | | |
| Conventional Combined Cycle | 87 | 15.8 | 1.7 | 48.4 | 1.2 | 67.1 |
| Advanced Combined Cycle | 87 | 17.4 | 2.0 | 45.0 | 1.2 | 65.6 |
| Advanced CC with CCS | 87 | 34.0 | 4.1 | 54.1 | 1.2 | 93.4 |
| Conventional Combustion Turbine | 30 | 44.2 | 2.7 | 80.0 | 3.4 | 130.3 |
| Advanced Combustion Turbine | 30 | 30.4 | 2.6 | 68.2 | 3.4 | 104.6 |
| Advanced Nuclear | 90 | 83.4 | 11.6 | 12.3 | 1.1 | 108.4 |
| Geothermal | 92 | 76.2 | 12.0 | 0.0 | 1.4 | 89.6 |
| Biomass | 83 | 53.2 | 14.3 | 42.3 | 1.2 | 111.0 |
| **Non-Dispatchable Technologies** | | | | | | |
| Wind | 34 | 70.3 | 13.1 | 0.0 | 3.2 | 86.6 |
| Wind-Offshore | 37 | 193.4 | 22.4 | 0.0 | 5.7 | 221.5 |
| Solar PV[1] | 25 | 130.4 | 9.9 | 0.0 | 4.0 | 144.3 |
| Solar Thermal | 20 | 214.2 | 41.4 | 0.0 | 5.9 | 261.5 |
| Hydro[2] | 52 | 78.1 | 4.1 | 6.1 | 2.0 | 90.3 |

*Figure 10: Levelized Cost of New Generation Sources, U.S. EIA*[26]

It is important to note that no offshore wind farms have been built yet in the United States; novel technologies like this are subject to the development of economies of scale before the cost of their operations decrease. As more offshore wind farms emerge, it is likely that their cost per kilowatt-hour will drop significantly to more competitive levels as capital costs decrease with mass production and standardization.

As of 2011, over 340 gigawatts of generating capacity from coal have been installed in the United States, with terrestrial wind energy reaching 45 gigawatts (see Figure 11). Despite land-based wind operating with less than a seventh the installed capacity of coal, it is projected to be less costly by 2018 (Figure 10 above). This is the culmination of years of investment in a new and expensive technology; a phase OSE must undergo before realizing potential advantages of economies of scale.

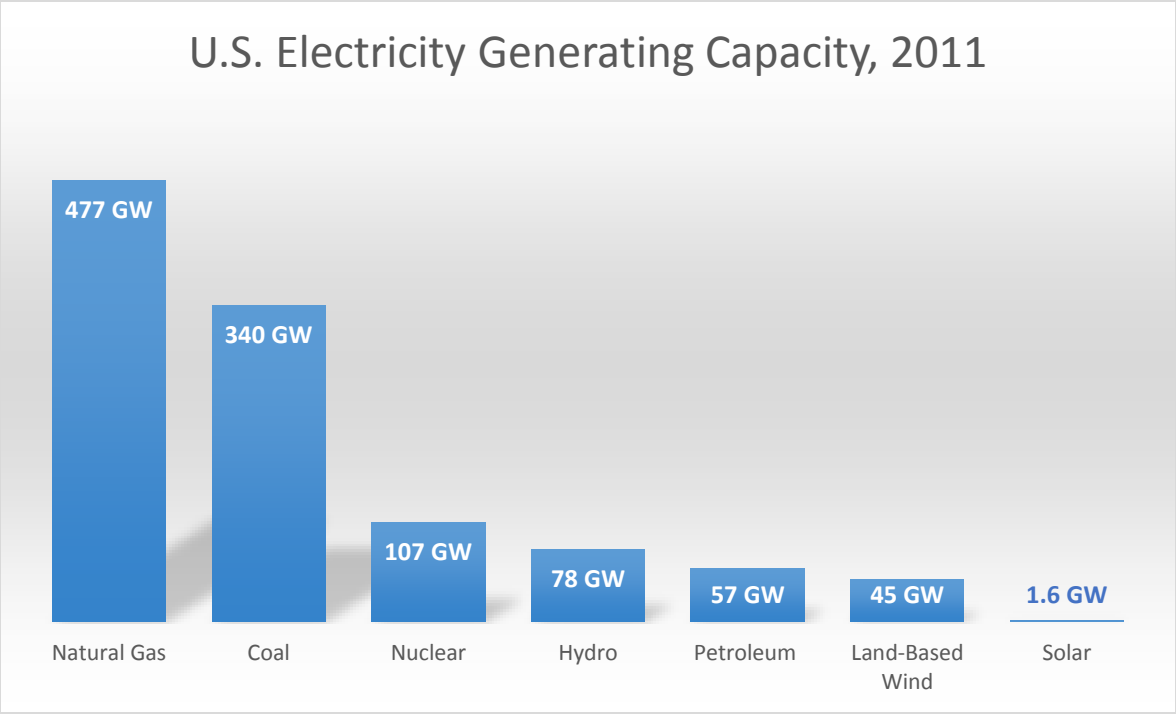


*Figure 11: United States Electricity Generating Capacity, U.S. EIA*[27]

**Challenge – Construction and Maintenance**

Constructing a wind farm on water is more difficult than on land because of the rough saltwater and unpredictability of the ocean. Construction equipment and vehicles are more expensive and deployment of the turbines is limited to specific sites and days when the weather is cooperative. Additionally maintenance is more expensive since it is more difficult for to reach the turbine. The turbines are also more prone to failure due to the spray of salt entering the nacelle, which can drive up maintenance costs. However, onshore construction such as roads are usually necessity for land-based wind but are not necessary for offshore projects.

**Challenge – Environmental Impacts**

OSE development has the potential to create new unknown environmental impacts or exacerbate existing impacts. Currently there is limited research about the long term impacts of offshore wind structures on fish and wildlife habitat, marine ecosystems, and threatened or endangered species. Noise, vibrations, light pollution from turbines, and underwater structures including platforms and mooring cables have potential impacts that have not been studied to an extensive degree, particularly in the Pacific Northwest. A preliminary study showed that the underwater noise created by offshore wind is low relative to other ocean activities (Figure 12).[28] Similar studies will be needed to accurately measure the impacts to wildlife.

More information about the key challenges that offshore wind development faces can be found in the U.S. Department of Energy report on A National Offshore Wind Strategy.[29]

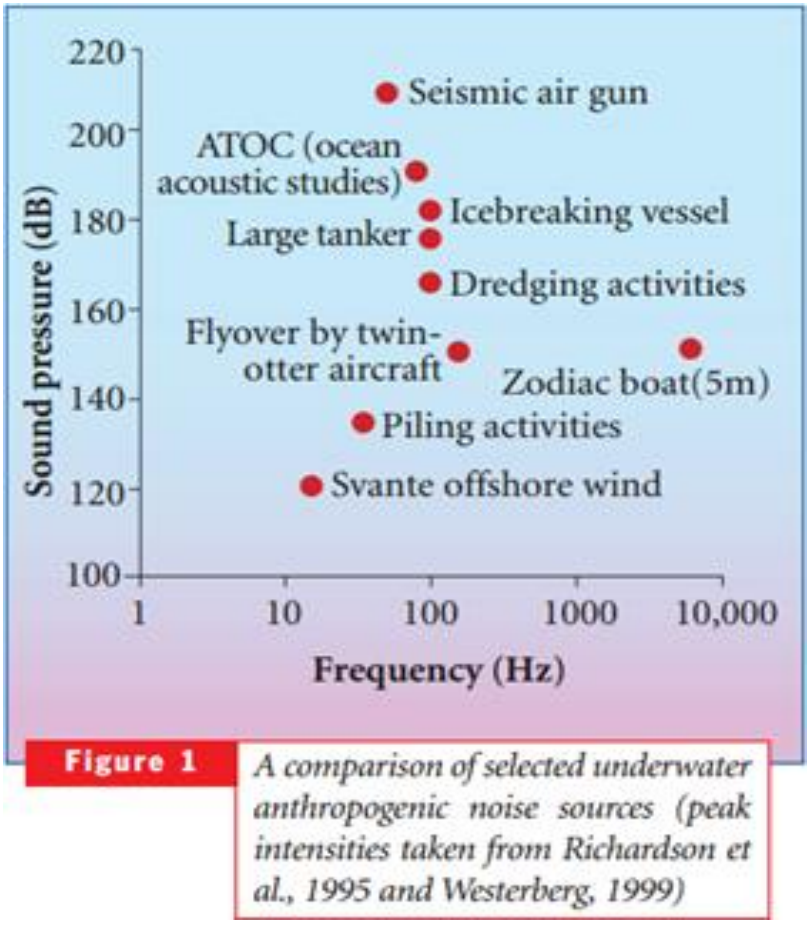


*Figure 12: Offshore wind turbines are among the quietest ocean activities*

## *Section 1.3: Role of Marine Spatial Planning*

Two primary considerations when siting an offshore wind project are the location of the offshore facility and the location of energy transmission lines onshore. Siting of both locations must consider:

1. Existing coastal activities in the area (e.g. commercial fishing, industrial shipping, naval operations, flight paths, and recreational use).
2. The state of nearby sensitive marine environments (e.g. marine sanctuaries, marine mammal migration, fishery activity, and coastal environmental processes).

Marine spatial planning (MSP) is a comprehensive and integrated approach to managing human uses and activities in the marine environment. MSP allows for coordination between all ocean and coastal users, draws upon the best available science, and creates an inclusive decision-making process that carefully considers economic, social, ecological, and cultural interests.[30]

Laws surrounding Marine Waters Planning and Management were enacted in March 2010 by the Washington State Legislature found in Chapter 43.372 RCW.[31] They were initially driven by potential energy development which is a new use in the oceans that necessitated better coordination among existing users. The goal of MSP is to improve management coordination between local, state, federal, and tribal entities to prepare for future energy development.

### *Section 1.3.1: Locating Offshore Wind Development*

The Marine Spatial Planning process is currently underway in Washington and is expected to be complete in 2015. Coastal resources that are being considered and mapped through MSP include energy sites, human uses, existing infrastructure, and marine life and habitat.[32] An interactive map of the various uses is available on the MSP website.[33] The MSP Project[34] site illustrates current and past projects that capture coastal resource data.

Upon completion of the MSP mapping process, Washington will have a coherent source of information regarding the myriad overlapping uses of coastal resources. MSP as an informational tool could have strong implications for the siting of marine renewable energy. With current knowledge of coastal activities, Washington state agencies will have greater understanding of how to determine more or less viable sites for any activity in coastal waters. It will be important for interested developers of offshore wind energy to stay informed of MSP developments as there is the potential for sensitive and high-use areas to be off limits for siting a project.

The location of the Olympic Coast National Marine Sanctuary is an important factor for offshore wind siting. The Olympic Coast National Marine Sanctuary is one of fourteen marine sanctuaries administered and protected by the National Oceanic and Atmospheric Administration. The border extends from the northern tip of the Olympic Peninsula to north of Grays Harbor, WA and encompasses 2,408 square nautical miles. The sanctuary

protects a productive upwelling zone that is home to marine mammals, seabirds, thriving kelp and intertidal communities, deep sea coral and sponges that form habitats for fish, numerous fishes and other sea life.[35] Additionally, this sanctuary conserves rich cultural and historical traditions and legacies of native contemporary tribal communities. The Energy Policy Act of 2005 mandates that no leases for marine energy can be made in a national sanctuary.

## Section 2: Role of Government Agencies

Federal, local, and state government agencies have jurisdiction over the regulation of offshore wind energy development. The extent of their respective roles depends primarily on where a project is sited. If a proposed development is more than 3 nautical miles from shore, it is primarily subject to federal jurisdiction. However, near-shore infrastructure such as cables or roads also makes the project subject to state and local jurisdiction.

In order to examine the roles of government entities, we created a hypothetical scenario of an offshore wind project that could be developed in Washington. In this scenario, a project is sited in federal waters, with a utility transmission cable traveling through state waters, and connection to an onshore substation in a local jurisdiction. This section will first highlight the role of federal and local governments before primarily focusing on the relevant state agencies. We will summarize the regulatory authority and concerns of each agency and how the agencies will work together to coordinate the proposed project.

## *Section 2.1: Federal Agencies*

One of the advantages of OSE is that it can be placed far enough away from people to ensure the aesthetics of existing view sheds by maintaining a free horizon. However, this would require an offshore wind project to be placed further than 3 nautical miles from shore and into federal waters. This section identifies the agencies and regulations responsible for overseeing such activity.

### *Section 2.1.1: Bureau of Ocean Energy Management (BOEM)*

BOEM is a federal agency within the Department of the Interior, which manages the development of offshore energy and marine mineral resources on the U.S. Outer Continental Shelf (OCS). A provision in the Energy Policy Act of 2005 established legal authority for "the Secretary of the Interior…to grant leases, easements, or rights-of-way on the Outer Continental Shelf for certain activities – wind energy development among them."[36] The specified region of BOEM's jurisdiction is 3 to 200 nm from the shoreline.

**Leases, Easements, and Rights-of-way**
Leases, easements, or rights-of-way are granted through BOEM on a competitive basis unless it is determined after their public notice that no competing interests exist.[37] BOEM is expected to provide coordination and consultation with potential state and local governments that may be affected by granting a lease, easement, or right-of-way and does not have the authority to alter, limit, or modify any claims or jurisdictions over that which States have in any submerged lands.[38] The ability to grant leases, easements, or rights-of-way does not apply to any areas on the outer Continental Shelf that are within the boundaries of a National Wildlife Refuge System or National Marine Sanctuary System.[39] BOEM also acts as the NEPA lead for any offshore proposal, including offshore wind. The full BOEM process is shown below in the BOEM Intergovernmental Task Forces section.

**BOEM Intergovernmental Task Force**
The BOEM Task Force is a mechanism for BOEM to coordinate OCS energy activities with interested and affected State, local, and tribal governments. BOEM establishes Task Forces to aid in decision making as elected officers of State, local, and tribal governments can provide meaningful input that is strongly considered in regards to the implementation of any BOEM renewable energy programs. The benefits of the Task Force include an opportunity for States to provide input on the ocean leasing process (i.e. identifying conflict areas, designating Wind Energy Areas), timely and consistent dissemination of information, and efficient and effective communication between all affected governmental parties as early as possible.[40]

The Task Force consists of the following:

- Federal agencies with explicit responsibilities
- State government officials designated by the Governor
- Local elected government officials
- Tribal elected government officials

BOEM has established Intergovernmental Task Forces in several states that are interested in developing offshore renewable energy. To date, 12 states have established a BOEM task force: Maine, Massachusetts, Rhode Island, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Oregon and Hawaii. These Task Forces are involved in every stage of the Wind Energy Commercial Leasing process (see Figure 13).

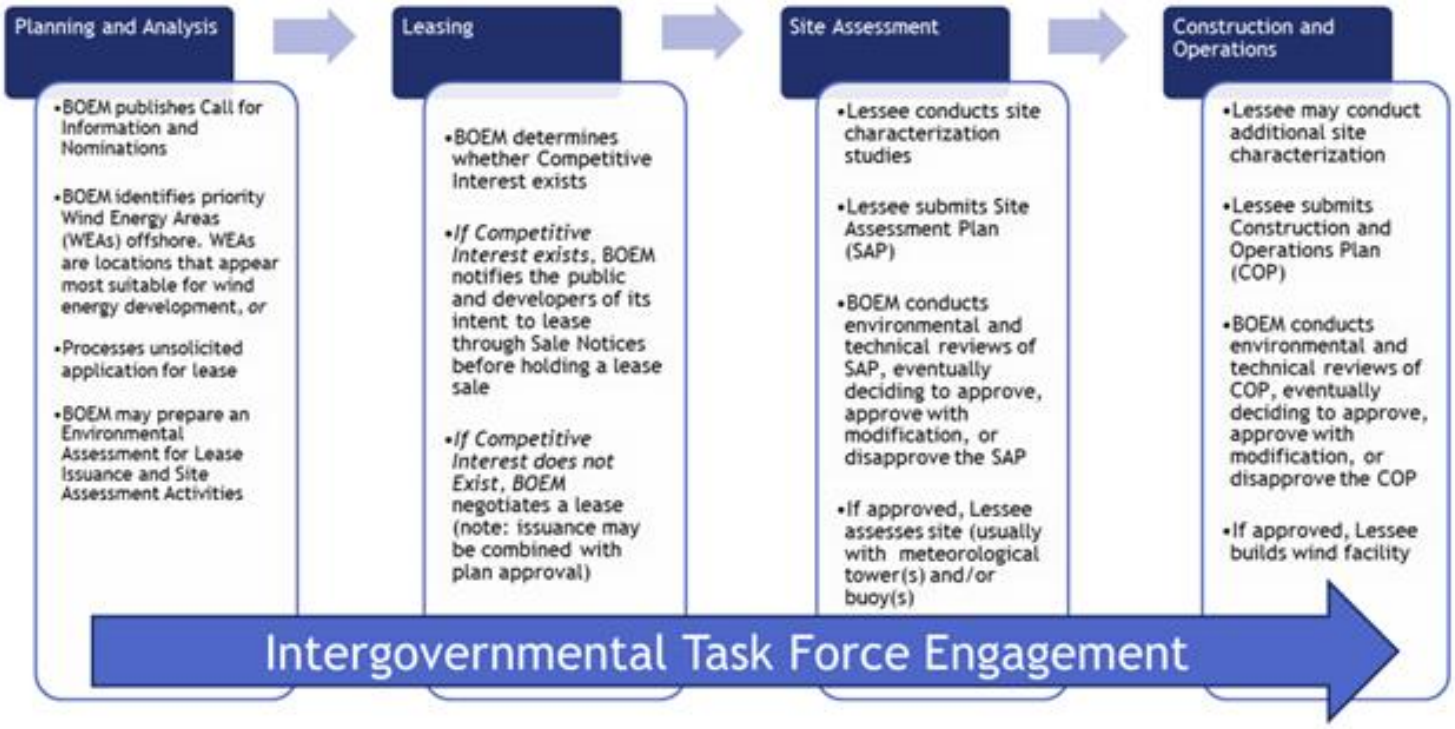


*Figure 13: The Task Force Engagement process take a project from initial proposal through construction and operations*

**Revenue Sharing**

Section 388 of the Energy Policy Act of 2005 also includes a method for allocating payments – including "royalties, fees, rentals, bonuses, or other payments"[41] – to states and the Federal Government to "ensure a fair return to the United States for any lease, easement, or right-of-way granted."[42] The Secretary of the Interior is responsible for allocating these payments based upon a formula that equitably distributes 27% of the revenues collected by the Federal Government. States who are eligible for revenue sharing include those who "have a coastline that is located within 15 miles of the geographic center of the project."[43]

### *Section 2.1.2: Other Federal Agencies*

While BOEM is the most involved Federal agency regarding offshore wind, other agencies must give their approval as well. Below is a federal regulatory matrix for offshore wind facilities created by the Georgia Coastal Research Council (Figure 14). The other agencies include the **US Army Corps of Engineers (USACE)**, **US Coast Guard (USCG)**, and the **Federal Aviation Administration (FAA)**. It should be noted that for offshore wind, the Federal Energy Regulatory Commission (FERC) issues no permits. However, any devices which convert the energy of water (e.g. wave energy converters) would require FERC approval. FERC's approval would be pertinent in the event of a co-developed wind/wave energy project.

| *Statute/Approval Type* | *Lead Agency* | *State Waters* | *Federal Waters* |
|---|---|---|---|
| **Coastal Zone Management Act** ***Consistency Review*** | State Coastal Management Agency | X | X |
| **Outer Continental Shelf Lands Act** ***BOEM Lease or ROW*** | BOEM | | X |
| **Federal Aviation Act** ***Guidance Conformity*** | FAA | X | X |
| **Federal Navigation laws** ***Permit*** | USCG | X | X |
| **National Environmental Policy Act** ***Assessment Review*** | BOEM/USACE | X | X |
| **River and Harbors Act §10** ***Permit*** | USACE | X | X |
| **Clean Water Act §404** ***Permit*** | USACE | X | X |

*Figure 14: A breakdown of the various federal permits required*

## *Section 2.2: Local Agencies*

Onshore construction activities would include the continued laying of the transmission cable and connection to a newly built or existing substation. These activities would require permission from local authorities. Local authority will primarily be regulated through a Shoreline Management Program.[44] The local government (county and/or town) has jurisdiction over marine waters (out to three miles) and shore lands bordering marine waters and lakes that extend 200 feet landward from the Ordinary High Water Mark (OHWM). Local governments may extend shoreline jurisdiction to include lands necessary for buffers for critical areas.

Under the Shoreline Management Act (SMA), each city and county with "shorelines of the state" must prepare and adopt a Shoreline Master Program that incorporates state laws and is customized to the specific needs of the community. The SMA establishes a balance of authority and partnership between local and state government in which towns, cities and counties are the primary regulators.[45] The Washington Department of Ecology acts primarily in a support and review capacity, but the local government would be responsible for issuing a shoreline permit for that aspect of an offshore wind development facility within shoreline jurisdiction.

## *Section 2.3: State Agencies*

The State of Washington will have two key roles concerning future OSE developments. The first is regulatory; the State of Washington has regulatory authority over the ocean and seabed up to 3 nm from its coast[46], therefore any undersea utility transmission cables as well as onshore substations will be subject to State regulation. The second is advisory; before any ocean leases are granted by BOEM, the Bureau will work with the State, (one method is via the above mentioned Task Force), to determine potential impacts and identify ideal locations for such projects.

Interviews were conducted with representatives of various Washington State agency officials to determine their regulatory authority and concerns. Concerns being issues the agency may bring up with BOEM during the leasing and NEPA evaluation. This section briefly introduces each agency, highlights the results, and then provides an analysis of how agencies can concurrently work with each other, local, and federal agencies on potential OSE projects. A hypothetical scenario was presented to each agency to frame the conversation and provide consistent results. The scenario presented below is based upon numerous examples of operating offshore wind farms in Europe and proposed projects in the United States. The scenario focuses on an offshore wind farm off the coast of Grays Harbor. Grays Harbor was chosen due to its proximity to existing electrical infrastructure and absence of marine sanctuaries.[47] (See visual representation of scenario in Appendix C.)

> *"The proposed project is for a 300 MW wind farm located 10-15 miles off the coast of Grays Harbor. This distance ensures a wind turbine free horizon for all people on the coast and places the turbines in Federal Waters. The turbines would be on floating platforms moored to the ocean floor and spaced far enough apart to avoid interfering with shipping and fishing vessels.*
>
> *An undersea, shielded cable would be used to bring power onshore to a substation. This would require horizontal drilling to place the cable underground as it approaches shore as well as the construction of a new substation. Additional electrical infrastructure would be required to connect the new substation to the grid at an existing BPA substation (e.g. Aberdeen or Satsop).*
>
> *Construction would involve heavy machinery moving across state highways and possibly rivers. There would also be significant port activity during construction as well."*

### *Section 2.3.1: Governor's Office of Regulatory Innovation and Assistance (ORIA)*

ORIA Website

**Mission:** *"The Governor's Office of Regulatory Innovation and Assistance (ORIA) helps people navigate Washington's environmental and business regulatory systems while working with our partners to improve those systems to produce better results and reflect our values."*

The services of ORIA include assistance in navigating the regulatory environment, interagency coordination, and regulatory improvement activities. ORIA offers online tools to help an applicant understand regulatory processes for both small businesses and environmental permitting.

Environmental Permit Handbook
Project Questionnaire

One of ORIA's greatest strengths is the ability to develop a unique timeline of project while facilitating agency coordination. A thorough list of existing relevant state permits before a project begins will aid timeline and process development. Regulatory authorities interact at the local, state and federal level; the legal permissions required at each level will vary according to applicable regulations and whether they trigger broader state or federal project processes such as State or National Environmental Policy Acts (SEPA or NEPA).

**Offshore Wind Regulations**
ORIA is not a regulatory agency, but works to coordinate environmental and business regulatory systems and works to improve those systems.

**Issues and Concerns Related to Offshore Wind**
ORIA could play an important role on the BOEM task force due to their experience as a point of contact for the general public and coordinator between all levels of government. Their primary concern will be how they can best fulfill this role regarding the new and unchartered waters of OSE.

### *Section 2.3.2: Washington's Ocean and Coastal Resources*

Washington has emphasized the importance of its ocean and coastal resources. Several organizations have been created to better manage their protection. In support of this project, the State Ocean Caucus (SOC) and Washington Coastal Marine Advisory Council (WCMAC) were researched to better understand what role they would play regarding potential OSE projects. An overview of the two organizations is provided below and a comparison of their personnel can be found in Appendix A. It should be noted that a representative of the SOC was interviewed, while no interviews was conducted with a WCMAC member.[48]

**State Ocean Caucus**

SOC Website

**Mission:** "*To manage Washington's ocean resources in a manner that serves to protect and improve the health and sustainability of coastal and ocean ecosystems while maintaining cultural and social well-being and ensuring the economic viability of coastal communities and the state.*"

The SOC includes the Governor's Office and a group of state agencies that are acting on the recommendations in Washington's Ocean Action Plan. The SOC provides a way for state agencies to prioritize activities and solve problems related to the ocean environment. (See Appendix A for listing of members).

The goals and purpose of the SOC include:

- "Manage the state's ocean and coastal areas to protect valuable marine resources and maintain ecosystem health while ensuring the vitality of coastal communities"
- "Coordinate state policy and consult and collaborate with tribes, local government, ports and interested citizens through the state ocean caucus"
- "Coordinate ocean activities among state agencies"
- "Foster collaboration and consultation with tribes, local and regional governments, federal agencies, academia, stakeholders and general public"[49]

## Washington Coastal Marine Advisory Council (WCMAC)

WCMAC Website

A key difference between WCMAC and the SOC is that WCMAC council members include private citizens and industry representatives. Additionally, the focus of WCMAC is the development of Marine Spatial Planning as an effective planning tool. (See Appendix A for listing of members.)

WCMAC's duties include:

- "Provide a forum to discuss coastal waters resource policy, planning, and management issues; provide either recommendations or modifications, or both, of principles, and, when appropriate, mediate disagreements."
- "Serve as an interagency resource to respond to issues facing coastal communities and coastal waters resources in a collaborative manner."
- "Provide recommendations to the governor, the legislature, and state and local agencies on specific coastal waters resource management issues, including:"
    - "Annual recommendations regarding coastal marine spatial planning expenditures and projects"
    - "Principles and standards required for emerging new coastal uses"
    - "Data gaps and opportunities for scientific research addressing coastal waters resource management issues; A coastal perspective regarding cross-boundary coastal issues"[50]

## *Section 2.3.4: Department of Ecology (ECY)*

ECY Website

**Mission:** *"Department of Ecology is to protect, preserve and enhance Washington's environment, and promote the wise management of our air, land and water for the benefit of current and future generations."*

Ecology's goals are primarily related to prevention and cleanup of pollution and to ensure the quality of air, water, and land. The agency may have a regulatory role in the development of offshore wind projects and may issue authorizations related to water quality and shoreline management.

### Section 2.3.4.1: Offshore Wind Regulations

Ecology's regulatory authority could include the offshore wind farm itself, subsea transmission cable traveling through state waters, and a substation built on land. The authorizations under Ecology's jurisdiction include:

- Section 401 Water Quality Certification under the federal Clean Water Act
- Coastal Zone Management Consistency Determination under the Coastal Zone Management Act
- Construction Stormwater General Permit

Ecology also reviews and approves local shoreline permits (conditional use permits and variances) to check for compliance with the policies and procedural requirements of the local Shoreline Master Program and the Shoreline Management Act.

### Issues and Concerns Related to Offshore Wind

For offshore wind farm, Ecology is primarily concerned with impacts to water quality and coastal resources. The agency would also be attentive to impacts to marine habitat, but would defer to Department of Fish and Wildlife, National Marine Fisheries Service, and US Fish and Wildlife service. Offshore wind is an emerging technology and each project will be reviewed for site-specific concerns. The agency could consider such elements as turbine design, installation and maintenance activities, anchoring/mooring, cable laying, cable landing, and more.

The location of the cable, cable landing, and upland infrastructure such as electrical substations are an important consideration for Ecology. The siting of infrastructure and landings needs to be reviewed in order to ensure that the construction, operation, and maintenance of these structures will not have negative impacts to water quality and/or coastal resources. Additionally, wetlands could be present at the site and would need to be avoided if possible, with impacts minimized and likely requiring mitigation.

## *Section 2.3.5: Department of Fish & Wildlife (DFW)*

DFW Website

**Mission:** *"To preserve, protect and perpetuate fish, wildlife and ecosystems while providing sustainable fish and wildlife recreational and commercial opportunities."*

DFW protects Washington's fisheries and marine wildlife through regulatory enforcement and advisement. Examples of their regulatory role include issuing individual and commercial fishing licenses, hunting permits, and construction permits. Additionally, state agencies may involve DFW to identify and mitigate potential fish and marine wildlife impacts, prior to issuing a permit.

The director of DFW is also an active voting council member on the Pacific Fishery Management Council; an organization emphasizing public participation and stakeholder involvement in the fisheries management process. The Council also has a Habitat Committee with a representative from DFW. The Habitat Committee tracks all permits and leases issued by federal agencies such as BOEM and FERC regarding wind, wave, and tidal energy projects on the west coast. The Committee provides regular reports to the Council on these federal activities. Most recently, the Council has been engaged in discussions surrounding the offshore wind pilot project in Coos Bay, Oregon.

There are four federal fishery management plans in the Pacific Ocean. Depending on the plan and the species involved, some cases are referred to as state managed and fall under state regulations for those fisheries. Examples of fisheries in federal waters that DFW regulates include:

- Coastal Commercial Dungeness Crab Fishery
- Coastal Pink Shrimp Fishery
- Coastal Spot Shrimp Fishery
- Hagfish Pot Fishery

There are also some fisheries in federal waters that fall under shared authority. Authority sharing includes either licensing or permitting to harvest, directed from the federal or state level. If DFW grants licenses or permits for fisheries in this case, they maintain control over enforcing regulations. In these cases and the cases noted above, DFW's authority uniquely extends beyond the three mile state jurisdiction.

### Offshore Wind Regulations

All projects that "use, divert, obstruct, or change the natural bed or flow of state fresh or salt waters" are required to obtain a Hydraulic Project Approval (HPA) permit from DFW.[51] The project introduced in the hypothetical scenario would require an HPA as the undersea cable would affect the natural bed of state waters. HPAs are authorized through Chapter 77.55 RCW and administered through rules in Chapter 220-110 WAC. Other agencies may reach out to DFW to determine fish and wildlife impacts before issuing a permit. For example, DNR may ask DFW to consult on a potential easement on an aquatic

land to ensure that there are no significant impacts to fish. Therefore, even though DNR has the authority, DFW can still play a role in the regulatory process.

DFW's authority over the federal aspects of an offshore wind farm may come into play if a federal fishery will be impacted.

**Issues and Concerns Related to Offshore Wind**

DFW is concerned with impacts to federal fisheries, marine mammals, seabirds, and recreational uses. Of particular importance to DFW are Marine Spatial Planning data layers currently under development including fishery independent surveys, surveys of seabird and marine mammal locations, and other recreational uses such as whale watching, bird watching, and intertidal activities. For more information about DFW's input on wind energy development, see the Washington Department of Fish and Wildlife Wind Power Guidelines.

## *Section 2.3.6: Department of Natural Resources (DNR)*

DNR Website

**Mission:** *"In partnership with citizens and governments, the Washington State DNR provides innovative leadership and expertise to ensure environmental protection, public safety, perpetual funding for schools and communities, and a rich quality of life."*

DNR manages forest, range, agricultural, aquatic, and commercial lands to provide fish and wildlife habitat, clean and abundant water, and public access for citizens. The agency has jurisdiction over all submerged lands within in the state including three miles offshore. DNR has three primary authorizations they administer: leases, easements, and rights-of-entry.

**Offshore Wind Regulations**
In the case of a transmission cable passing through state waters, an easement would likely be required to allow authorized "pass through" of a cable on or in aquatic lands. Easements are used for transportation and public utility uses. Request for an easement requires an applicant to go through a full authorization process with DNR in order to establish whether a project is fit for proceeding through a certain area. Additionally, for "in port" activities related to the building or maintenance of the offshore wind facility, any vessel or barge that would be anchored or stored outside of a marina or typical docking area would need to get a right of entry authorization from DNR. DNR has the authority to collect natural resources damages in the form of fines.

State definitions of "aquatic lands" and "public utility lines" can be found in RCW 79.105.060. Easements and management guidelines for aquatic lands can be found in Washington State Code RCW 79.110.200 – RCW 79.110.240 (easements for utility lines including specific charges based on the term of an easement) and RCW 79.105.030 (management guidelines for aquatic lands).

Below are some of the questions/concerns the agency would need addressed before issuing such an easement.

- How does the cable affect sediment or habitat?
- Does the cable affect threatened or endangered species?
- How will the cable be installed, operated, and maintained?
- Will there be any damages to natural resources?
    - If there is a possibility of substantial damages, DNR has the authority to collect natural resources damages in the form of fines.
- How does the project impact navigation?
- Does the project impede public access on aquatic lands?
- Does the project fit within DNR's environmental stewardship measures?
    - Construction, engineering, operations, and maintenance would all have to comply with these measures

### Issues and Concerns Related to Offshore Wind

Beyond their regulatory authority in State waters, DNR has several concerns regarding the impacts of an offshore wind project in Federal waters. Below are some of the concerns the agency might voice during the NEPA process.

- Effects to sediment and habitats
- Effects to threatened or endangered species
- Damages to natural resources
- Impacts to navigation

## *Section 2.3.7: Energy Facility Site Evaluation Council (EFSEC)*

EFSEC Website

EFSEC provides a "one-stop" licensing process for large energy projects and is the SEPA lead for any of the projects it reviews for certification. It has the authority to issue any state permit, but depending on the complexity may contract issuance to a sister agency, and has the authority to supersede local agencies. The U.S. EPA delegated authority to EFSEC to issue permits under the Federal Water Pollution Control Act and the Federal Clean Air Act.

The following energy projects (pending certain criteria are met) are required or can opt-in to receive certification from EFSEC:

- Petroleum Refineries – Required
- Petroleum Storage – Required
- Pipelines – Required
- Thermal Electrical Generation – Required
- Alternative Energy Electrical Generation – Optional
- Electrical Transmission Lines – Optional

**Offshore Wind Regulations**
It is unlikely EFSEC would have any regulatory authority as the State aspects of the project (transmission cable and substation) do not constitute an energy project eligible for certification.

**Issues and Concerns Related to Offshore Wind**
EFSEC has had to consider the environmental impacts of onshore wind projects and has noted that some may apply to offshore wind projects. Below are some of the concerns the agency might voice during the NEPA process.

- Impacts to birds from spinning blades
- Effects from noise pollution and light pollution (turbines are required to have aircraft lights)
- Impacts to radar
- Spill containment and natural disaster recovery plans

## *Section 2.3.8: State Parks and Recreation Commission*

State Parks Website

**Mission:** *"The Washington State Parks and Recreation Commission cares for Washington's most treasured lands, waters, and historic places. State parks connect all Washingtonians to their diverse natural and cultural heritage and provide memorable recreational and educational experiences that enhance their lives."*

The State Parks and Recreation Commission oversees the creation, protection, and upkeep of all of Washington's State Parks. Some of the Commission's daily responsibilities include issuing park passes, designating campgrounds, and managing moorage at state parks as well as issuing fees for boating, camping, winter recreation, and other activities.

The commission is also responsible for protecting Washington State Seashore Conservation Areas. These are primarily the state's ocean beaches and are defined under RCW 79A.05.605 as the area between the line of ordinary high tide and the line of extreme low tide.

### Offshore Wind Regulations

The undersea transmission cable would come ashore through the above mentioned Conservation Area. The use of these lands requires a "Right of Way Permit," which is issued by the Commission. Any transmission cables running through state parks would require an easement. Issuance of a permits and easements would be dependent on the effects during construction (e.g. equipment parked on beaches, effects of horizontal drilling, etc.). Restoration efforts by the developer may be mandatory as a condition of the approval.

### Issues and Concerns Related to Offshore Wind

The Commission's concerns regarding any potential offshore wind project would mainly be limited to habitat effects during construction and operation as well as alterations to existing views sheds.

# Section 3: Findings and Recommendations

## *Section 3.1: Findings*

**Limited Internal State Agency Coordination**
Agency interviews revealed a lack of clarity regarding how an agency fits into the offshore wind development process; representatives only understood the effects of their own agency's mission and authority. The importance of state agency coordination stems from their shared missions and authority for managing limited, common public resources. Washington state agencies have coordinated on projects in the past but not on this new form of technology. Inconsistencies between state agency knowledge and viewpoints about offshore wind energy results in communicating through many, inconsistent voices; Washington needs one unified voice.

A clear OSE point of contact at each agency also has great value. A knowledgeable representative can identify related regulations to enforce, the agency's primary concerns, and link the mission of the agency to the potential impacts of an OSE project. Most of the interviewed agencies play a role in Washington's MSP; the previously mentioned effort that will assist in locating ideal locations for ocean renewable energy projects. Despite this fact, finding an individual that met the above criteria required a lot of leg work, a potential pain point that will frustrate stakeholders, developers, and general inquirers.

**No Clear Path for Developers**
Washington has no defined process that takes a developer from project proposal through construction and eventual operation of an offshore wind farm. The necessary permits to regulate an OSE project exist and agency representatives were quick to point out which permits would be issued to allow the various activities of the hypothetical project the team proposed. For example, DNR knew that installing a transmission cable in the sea bed requires an aquatic lands easement. ORIA plays a central role in coordinating some environmental and business regulatory systems among state agencies, stakeholders, and developers. However, they have no process to handle OSE specifically; particularly its federal aspects.

The Joint Aquatic Resource Permits Application (JARPA) can help streamline part of the permitting process, but does not cover all OSE related authorizations.[52] While JARPA does combine applications for permits at all levels of government. Authorizations such as the right-of-way permit, issued by the Parks Commission, and building permits, issued by local agencies, will require individual applications. Some of the federal permits that BOEM, the USCG and FAA issue will also require their own approval process. Having one coordinated permitting process will enable agency coordination at all level of government so that OSE development occurs without sacrificing the protection of Washington's natural environment.

The National and State Environmental Policy Acts (NEPA and SEPA[53]) will be triggered as part of any OSE state or local permit application. Through these evaluations, an opportunity is provided for agencies, tribes, and stakeholders to express concerns

regarding an OSE project. NEPA and SEPA can work in conjunction with each other to identify the scopes of the respective evaluations, and appropriate state or federal lead and co-lead agencies. While NEPA and SEPA provide a mechanism for agencies to work together on one issue, the process is more efficient and effective if agencies familiarize themselves with their role and the roles of others prior to participating in the evaluation.

**Washington's Existing Ocean Organizations**

Currently there are two organizations created by the state of Washington that serve as forums for coordination or advisory bodies of Washington's ocean-related policies and management of Washington's coastal resources. The SOC is comprised of the Governor's Office and state agencies and primarily fosters collaboration and coordination of state ocean policy with tribes, local and regional government, federal agencies, academia, and the general public. The WCMAC is an advisory body open to private citizens, industry representatives, and community groups in an effort to collaborate on coastal water resource management. These two groups are exemplary models of existing organizations in Washington already coordinating interests and policies of the ocean and coastal water resources. Importantly, these efforts to coordinate all the relevant stakeholders affected by marine water activity are isolated from each other and other critical state actions that take place to facilitate OSE, such as siting and permitting.

**Lack of Federal, State, Local, and Tribal Coordination**

No mechanism currently exists for Washington to coordinate with federal agencies, particularly with BOEM. Developers and stakeholders benefit from a centralized point of intake; a place they can go to find all necessary information on OSE in Washington.

As noted earlier, regulation of OSE exists at all three levels of government, therefore, coordination between these levels is crucial to providing clear directions to developers and communication to stakeholders. Authorizations like the BOEM lease require state agency input to determine acceptable locations for offshore wind farms. A potential solution is the BOEM Intergovernmental Task Force. As noted in Section 2.1.1, such a task force does not exist for the State of Washington. Independent and inconsistent conversations between external parties and government agencies hinder development and pose a risk to protecting Washington's coastal resources.

**Unknown Long Term Environmental Impacts of OSE**

Offshore wind energy is an emerging technology and the long term environmental impacts of an OSE project have not been extensive studied. How would the transmission cable impact local fish and wildlife? What effects would the electromagnetic field have on the local ecosystem? Would significant heat be generated? What impacts would they potentially have? The answers to these questions, and many more like them, affect the issuance of the various government permits and authorizations. OSE is new to the United States and Washington and there is are significant gaps in research that must be addressed prior to development.

## *Section 3.2: Recommendations*

Based on state agency interview findings and research, the team identified several key recommendations to improve agency coordination of offshore wind energy projects in Washington State. Currently, offshore wind energy projects have not yet been proposed in Washington and state agencies lack the necessary processes to facilitate development. These actions are intended to pre-emptively prepare state agencies to facilitate future project proposals.

### *Section 3.2.1: Improve Internal State Coordination*

**Initiate a written agreement between the Governor and state agencies regarding OSE which:**

1. **Clearly defines a point of contact(s) at each agency; and**
2. **Authorizes the point of contact to communicate on behalf of their agency**

The state needs a way to bring state agencies together to discuss their roles and responsibilities in managing an offshore wind proposal. This could be accomplished through a memorandum of understanding between agencies indicating mutual agreement to appoint representatives who will be dedicated to acting on offshore wind siting and permitting. Representatives should have knowledge of the agency's authority and concerns regarding offshore wind energy. The state could also leverage OIRA to centralize the permitting and coordination process for offshore wind energy.

A formalized agreement will enable state agencies to proactively identify a person or persons within the agency who will be involved in the offshore wind permitting and siting process. State agencies have overlapping jurisdictions on the coast and need to work together to facilitate the process. Interrelated coastal issues require a collaborative approach, and an interagency agreement is a way to achieve this.

### *Section 3.2.1: Improve coordination at all levels of government.*

**Establish a Washington BOEM Task Force in order to bring state, local, and tribal governments together to collaborate about offshore wind energy.**

There is a need for coordination across all levels of government about offshore wind. Federal, state, local, and tribal governments have overlapping jurisdiction over the ocean, and currently there is no existing mechanism to bring these entities together to coordinate offshore wind development.

In several other states, the creation of a BOEM Task Force has eased the development process and improved organization. "Task Forces are initiated at the request of a State Governor, as they have been in Oregon, Hawaii, and other states along the Atlantic coast." With a BOEM Task Force in place, there is a central point of contact for the developer and an instrument to consistently distribute information. The Task Force is conducive for

siting projects and allows government to work together and provide input in order to determine an appropriate location. Rather than federal, state, tribal, and local governments communicating separately about ocean energy policies, a centralized BOEM task force enables them to be one unit.

In Washington, the SOC and WCMAC are existing state organizations with contributing members similar to those found on BOEM Task Forces in other states (See Appendix A). These advisory bodies can provide an example of the appropriate representatives for Washington State to engage with other levels of government as a unified voice.

BOEM task forces exist in states that do not currently have offshore wind development, including North Carolina, where a Task Force is working to proactively identify locations for offshore wind development. Washington can model this approach to prepare for future offshore wind proposals.

### *Section 3.2.3: Identify and prioritize areas for further research.*

**Hold a focus group with representatives from state agencies, scientists, and experts to identify gaps in research about the long-term environmental impacts of offshore wind development.**

Offshore wind is a new technology, and thus the environmental impacts have not been fully researched. Environmental studies are needed to understand the potential effects on issues such as water quality. This is important because the state needs access to current research in order to effectively protect Washington's natural resources.

Identifying common areas of concern through a collaborative focus group will benefit state agencies in two ways. First, it could provide a way to identify missing information that is needed to issue permits for offshore wind energy. State agencies with regulatory authority expect to need additional research about impacts to state waters in order to issue permits such as the 401 Water Quality Certification. Second, state agencies must be prepared to comment on the location of proposed wind projects in their interaction with BOEM during the leasing process. Collaboration through a focus group would allow agencies to share information and prioritize key areas for further research.

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Northwest Marine Renewable Energy Center, University of Washington – Brian Polagye
Pacific Northwest National Laboratory – Andrea Copping
School of Marine and Environmental Affairs, University of Washington – Kara Blake
Washington Sea Grant – Bridget Trosin
Governor's Office of Regulatory Assistance – Sheila Hosner and Jane Dewell
Department of Ecology – Jennifer Hennessey
Energy Facility Site Evaluation Council – Jim La Spina
Parks and Recreation – Randy Kline
Principle Power – Alla Weinstein

### Photo Credit

The cover photo of the report is the Lillgrund Offshore Wind Farm in Sweden. Photo is taken by Siemens Press in 2008. Reference Number: PN200826-04. All other sources for graphics and photos are cited in the References section.

# Appendix A – Membership of Ocean-related Activity Organizations

| Seat | SOC[54] | WCMAC[55] | Potential BOEM Task Force |
|---|---|---|---|
| Ecology | X | X | X |
| Commerce | X | X | X |
| Fish & Wildlife | X | X | X |
| Governor's Office of Innovation and Regulatory Assistance | X | X | X |
| Natural Resources | X | X | X |
| Washington Sea Grant | X | X | X |
| State Parks | X | X | X |
| Agriculture | X | | X |
| Health | X | | X |
| Emergency Management Division | X | | X |
| Puget Sound Partnership | X | | X |
| Citizens | | X | X |
| Commercial fishing | | X | X |
| Conservation | | X | X |
| Economic Development | | X | X |
| Educational Institution | | X | X |
| Coastal Energy | | X | X |
| Energy industry or organizations | | X | X |
| Recreation | | X | X |
| Recreational Fishing | | X | X |
| Shellfish Aquaculture | | X | X |
| Shipping | | X | X |
| Science | | X | X |
| Washington Coast Sustainable Salmon Partnership | | X | X |
| Ports | | X | X |
| Grays Harbor Marine Resources Committee | | X | X |
| N. Pacific Marine Resources Committee | | X | X |
| Pacific Marine Resource Council | | X | X |
| Wahkiakum Marine Resources Committee | | X | X |

# Appendix B – State Agency Interview Contact List

| State Agency | Agency Staff | Date | Position | Location |
|---|---|---|---|---|
| Governor's Office of Regulatory Innovation and Assistance | Sheila Hosner<br>Jane Dewell | 12/6/2013 | Regional Assistance Leads | Department of Ecology<br>Northwest Regional Office<br>3190 160th Ave. SE. Bellevue, WA 98008 |
| Department of Ecology | Jennifer Hennessey | 12/17/2013 | Ocean Policy Associate and State Ocean Caucus Coordinator | Center for Urban Water<br>326 East D St.<br>Tacoma, WA 98421 |
| Department of Ecology | Rebekah Padgett | 2/4/2014 | 401 Water Quality and CZM Coordinator | Department of Ecology<br>Northwest Regional Office<br>3190 160th Ave. SE. Bellevue, WA 98008 |
| Department of Natural Resources | Katrina Lassiter | 2/4/2014 | Aquatic Policy Analyst | Washington State Department of Natural Resources Office<br>1111 Washington St. SE,<br>Olympia WA. 98501 |
| Energy Facility Site Evaluation Council | Jim La Spina | 2/7/2014 | Energy Facility Siting Specialist | Washington Utilities and Transportation Commission<br>1300 S. Evergreen Park Dr. SW.<br>Olympia, WA.98504 |
| Department of Fish & Wildlife | Michele Culver | 2/12/2014 | Regional Director | Phone Interview |
| State Parks and Recreation Commission | Randy Kline | 2/12/2014 | Environmental Program Manager | Phone Interview |

Our team also interviewed a local developer of offshore wind technology

| | | | | |
|---|---|---|---|---|
| Principle Power | Alla Weinstein | 12/9/2013 | Chief Executive Officer | Interview on University of Washington Campus |

# Appendix C – Interview Methodology

Our team presented each state agency with a hypothetical offshore wind project scenario to frame the interview discussions and generate consistent results (See Section 2.3).

Below is visual representation of the hypothetical offshore wind project. The map shows a close-up view of Grays Harbor off Washington's coast.

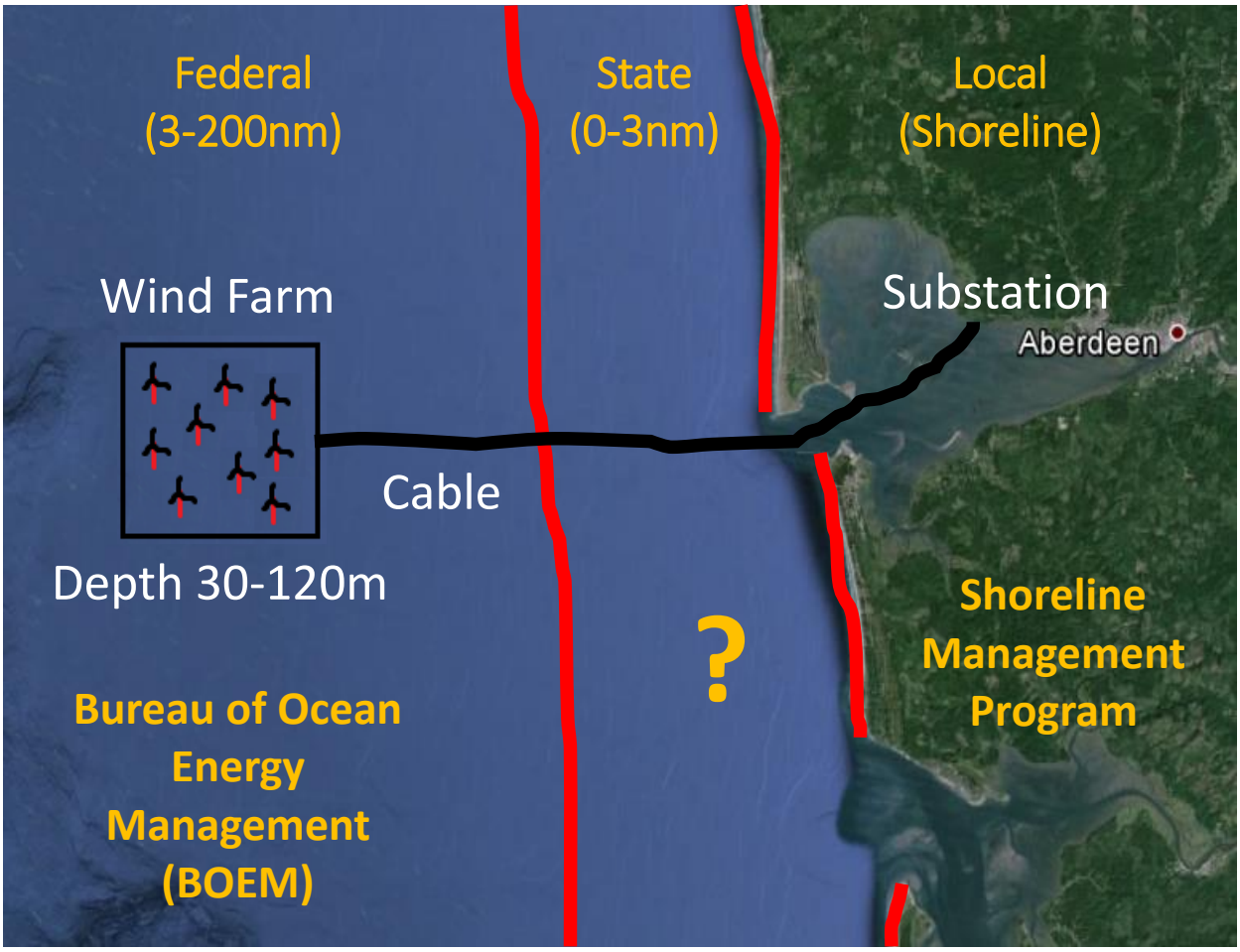


*Figure 15: Visual of the hypothetical scenario presented to state agencies*

The following general questions were included in each initial email to contact state agencies for interviews:

- What are the potential role and responsibilities of your agency regarding an offshore wind project proposal?
- What information and research would your agency be interested in or need to know to evaluate this project proposal?
- What regulatory requirements related to offshore wind development would be handled by your agency?
- What other agencies (i.e. federal or state) would you potentially work with on this issue?

# Appendix D – Team Biographies

**Kate Baker** is a second year graduate student at the University of Washington's Evans School of Public Affairs, with a concentration in environment and natural resource management. She is interested in the role of the private sector in environmental management and hopes to join and eventually lead projects that reduce the impact of business activities on the environment. Prior to graduate school, Kate was a senior consultant at IBM in Washington DC where she worked on financial management projects for public and private sector clients. She has worked in government as a legislative intern for the United States Senate and a Budget Intern at the Department of Defense. Kate earned a Bachelor of Science degree in Finance from the University of Maryland in 2009.

**Meihui Huang** is a second year graduate student at the University of Washington's School of Marine and Environmental Affairs. Mei's studies focus on stakeholder engagement in marine protected areas and policy process. Originally Mei is from Taiwan where she majored in geography. The significance of future renewable energy development drives her interest in this field.

**Alex Januzzi** is a second year graduate student at the University of Washington's Evans School of Public Affairs, with interests surrounding environmental policy, renewable energy, and regional economic development. Prior to relocating to Seattle, Alex worked in human health services for a nonprofit organization in San Diego as a resource counselor for people with developmental disabilities. Alex earned a Bachelor of Arts in Psychology from the University of California, Riverside in 2010.

**Anthony Mansoor** is a second year graduate student in the Department of Mechanical Engineering at the University of Washington, with a focus on renewable energy. He hopes to land a career in the offshore wind energy industry. Prior to moving to Seattle, Anthony worked in HealthCare IT in Philadelphia, where he focused on root cause analysis, application development, and project management. Anthony earned his Bachelors of Science in Mechanical Engineering from the University of Michigan in 2009.