Floating Offshore Wind Energy Study Tour

Lessons from Scotland

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Prepared for: Oregon floating offshore wind energy study tour participants
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I. Background

From August 18 to 24, 2024, an Oregon delegation visited the Northeast shore of Scotland to learn about their experiences with offshore wind development–both from large-scale wind developments fixed to the ocean floor and a demonstration of floating offshore wind technology (the Kincardine development of five, 9.5 MW floating turbines). The tour was organized by the Oceantic Network, a business group for offshore wind, and included Oregon representatives from the state Legislature, state agency, labor unions, renewable energy, fishermen, community and economic development groups from the Oregon south coast, intertribal group, conservation, and marine science.

The purpose of the study tour was to learn about the challenges and opportunities facing Scotland who has set ambitious goals of developing 8-10 GW of offshore wind energy by 2030 (or 25% of the world's floating offshore wind pipeline) in three phases:

- Demonstrations (well underway)
- Innovation and Targeted Oil and Gas (leasing complete)
- ScotWind (leasing complete for nearly 30 GW of wind generation)

The study tour included visits with the operators of the Kincardine floating offshore project (accounting, fisheries liaison, and environmental permitting); supply chain business, offshore to Kincardine itself, the Ports of Montrose and Aberdeen, the Scottish government's 'Catapult' (third-party testing new technologies and evaluating the relationship between offshore wind and the environment), the Scottish Fishing Federation (policy, haddock fisheries, and science), and a scientist affiliated with ECOWind (an association evaluating the impacts of offshore wind energy).

The pages below summarize some of the key themes heard by Oregon study tour participants. They are not intended to be the "answers" to Oregon's approach to floating offshore wind energy. This document is meant to be a summary of the group's collective lessons, differing perspectives, and remaining questions. It is for all of Oregon, Tribes, and Oregon residents to share in these lessons and engage in what makes the most sense for our collective place.

II. Areas of Learning and Discussion

The following themes were gleaned from the experiences and perspectives of individual study tour participants. Within each theme, Oregon Consensus tried to reflect key facts that resonated with the group, the differences in perspectives within each theme, and remaining questions participants held after each stop on the study tour.

There are some key differences between the Scottish and Oregon contexts:

- Scotland has extensive experience with deep sea oil and gas development since the middle 1970s that it has built on for offshore wind, and consequently also has years of experience with that industrial use at sea;
- The Scottish and UK governments have made significant financial investments in offshore wind;
- Aberdeen is a coastal city with a long history of trade and commerce (The Port established in 1124), starting with fishing, moving to oil and gas, and now looking for its future. The City's fortunes have risen and fallen with oil and gas in the last 50 years. The Aberdeenshire region remains one of the largest suppliers of oil and gas (North Sea fields) and fisheries landings in Europe (Peterhead).
- Scotland does not have sovereign Indigenous nations; and
- There are different laws and practices governing public engagement.

Those key differences aside, the learnings below are directly applicable to Oregon as it enters the early stages of considering offshore wind energy development.

2.1. Scotland has leased a large area for offshore wind energy- about 25 GW of floating and 17 GW of fixed through a strategy that started with A) demonstration projects, then B) electrifying the offshore oil and gas fields, then C) scaling floating offshore wind closer to shore. In the meantime, fixed offshore wind has been actively developing and the largest, and one of the last major, fixed offshore wind energy projects (4GW) is likely to be developed soon.

Scotland's leasing strategy was led by the Crown Estate in three phases. The strategy started with smaller demonstrations, electrifying power to the offshore oil and gas sector, and then full-scale development (ScotWind[1]). The strategy was designed to grow the supply chain and learn prior to full-scale development. The Scottish Fishing Federation noted that early leasing decisions did not involve fishermen, but that improved as ScotWind leasing areas were identified- but only slightly. The deeper offshore wind near the oil and gas rigs is mostly outside of fishing grounds, but the fixed wind, and the ScotWind floating sites are squeezing access to fishing grounds.

[1] The Crown Estate held a separate lease auction in 2022 for new floating and fixed bottom OSW known as Scotwind. This process resulted in a total of 20 leases. Thirteen of these are floating offshore wind and the remaining are fixed bottom projects.

This phased approach to leasing is giving ports and supply chain businesses the clear market signals needed to invest and grow their operations. Everything has taken longer than expected, but progress is occurring.

Kincardine is one of the demonstration sites. The five 9.5 MW turbines at Kincardine float in Principle Power steel floats, and are moored to the ocean bottom at 60-80 meters deep. Kincardine is connected to the United Kingdom's national grid via two cables buried approximately 1.5 meters under the seafloor, and generates enough power for 35,000 homes. The turbines ran quietly, just a swoosh as blades spun. The floats moved very little, and the turbines felt very big, even though these were much smaller than the next generation contemplated for floating offshore wind.

Kincardine is served by vessels going out and back in the same day. Already, the more distant fixed offshore wind developments (e.g., SeaGreen) are being serviced by much larger maintenance vessels where crew live on board for days at a time. New technology is in use making it safer to get from those larger service vessels onto the floating platforms via a gang plank that is laser controlled so it moves to match the rolling directions of the boat and the platform. The government's Catapult facility is currently refining and testing crew safety technology using real data from floating rigs.

2.2. Scotland has four to five decades of experience with deep offshore oil and gas that it is drawing from for offshore wind for engineering, supply chain, etc. That industrial ocean activity is different than Oregon's experience.

There is no oil and gas development off of Oregon's coast. The Scottish experience from the North Sea has definitely accelerated their ability to develop offshore wind energy. That experience includes:

- Port facilities and supply vessels;
- Fabrication for mooring; and
- Consulting and operations experience.

Pacific coast states have much less existing infrastructure and locally-grown supply chain businesses. At the Global Underwater Hub, one business noted how helpful the phased leasing approach was to building local business and local manufacturing.

And even for Scotland, the scale of offshore wind development in Scotland alone is difficult to keep pace with (e.g., current anchors for smaller turbines are 15 tons, but will need to be 35-40 tons for the larger turbines). The Kincardine turbines were manufactured and integrated/ assembled in mainland Europe, then towed to Scotland from the Netherlands. When a major component in the turbine failed, it had to be towed all the way to the Netherlands. The turbines have since been retrofitted with cranes to facilitate conducting more maintenance and major component replacements in situ.The economic viability of future offshore floating wind will be influenced by the ability to integrate and replace components as close to the projects as possible.

Expanding globally will require partnerships and collaboration. In May 2024 Ports in Scotland announced the Scottish Ports Alliance, which is a strategic partnership to attract businesses associated with the offshore wind industry, and recognition that no one port can serve all needs.

The Port of Aberdeen started planning in 2012 for a South Harbor expansion that could service floating offshore wind floats (instead of having to tow them to the Netherlands for repairs). That South Harbor also services oil rig decommissioning and cruise ship landings. The port facilities needed to service existing offshore wind floats (i.e., replacing components, final integration of monopiles and blades, and other service) needs deep water (e.g., the Port of Aberdeen is dredging to 14m), but not the same kind of land area is needed for fixed offshore wind where components lay along the quays. Construction began in 2017. The South Harbour is approximately 125,000 Sq meters in size and cost £420 million to build using a mix of the Port's revenues and grants from the UK and Scottish governments. The new harbor has 1.5km of quayside, can accommodate vessels up to 300 meters long, and should be able to service up to four floating offshore rigs at the same time (see Figure 2.2.2). The environmental impact assessment for the development of South Harbour (which was developed in a cove. See Figure 2.2.1) can be found here: https://marine.gov.scot/sites/default/files/00432567.pdf.

Figure 2.2.1. Pre construction photos

Figure 2.2.2. Post construction

The Port of Montrose is smaller than Aberdeen, lying in a town of 12,000 people.The port has $9.5M in annual revenue and 384 permanent jobs. The port is 59 acres in size. The trust ports like Aberdeen and Montrose are quasi-governmental and rely mostly on tonnage fees for boats coming and going. Montrose serves operations and maintenance for the fixed offshore wind projects currently, which means a lot of boats coming and going on a regular schedule. Montrose is one of the, if not the, largest chain and mooring anchor bases in the world.

2.3. The Scottish government has also sent clear market signals that it intends to transition from oil and gas to offshore wind, and has followed suit with investment in research and development, port upgrades, and supply chain supports

The UK regulator for the oil and gas industry, the North Sea Transition Authority (NSTA), requires the industry to reach a net zero target by 2050. Some oil and gas platforms are being recommissioned into offshore floating wind, others are co-locating offshore wind with oil and gas so the wind power can be used as a green energy source to power the oil and gas operations. To date, most of the early floating offshore wind developments are small-scale projects (less than 100MW), and are heavily subsidized by the UK government.

The UK and Scottish governments have invested significant amounts of money and have set strong goals to procure offshore wind energy. There is a government subsidy for this transition, and that has been intentional and transparent. The UK and Scottish governments have also directed a number of their agencies to scaling offshore wind including:

- An offshore wind research and development 'catapult'
- Scottish business promotion; and
- Consistently funded research into the environmental impacts of offshore wind energy.

Offshore Renewable Energy (ORE) Catapult conducts research on the offshore wind energy industry. With nearly 350 employees, the ORE Catapult helps companies and other stakeholders test new technologies, act as the third party engineer which tests turbine components, mooring and anchoring systems for DNV certification, and advances understanding of the interactions between offshore wind energy and the environment; They also manage the Floating Offshore Wind Center of Excellence to accelerate commercialization of floating OSW.

The United States has not made similarly clear commitments to achieving its offshore wind energy goals. The Biden administration has set ambitious goals, but there is not the same consistent efforts across every region in the United State. And there certainly is not the same level of investment occurring in Oregon. Those early-stage commitments from government were essential in Scotland. If Oregon wants to house some of the fabrication, support services, workforce development programs, portside operations and maintenance facilities, or other elements associated with offshore wind, the State of Oregon may need to consider which kinds of "market signals" it sends, to whom, and when. Some of these roles could be filled whether Oregon builds floating offshore wind energy off its coast or not. California is starting to make investment in Portside facilities (e.g., Humboldt Bay and Port of Long Beach) which may also include fabrication capacity. Washington is currently evaluating what an OSW process in the state should look like and how to ensure adequate stakeholder engagement. Washington ports are evaluating the role they may be able to play in the OSW supply chain, with a current emphasis on enhancing their vessel construction strengths.

2.4. None of this happened quickly. Planning started more than 10 years ago in the 2010s, and peak activity will likely materialize in the 2030s

Oregon has not made its decision about the future of floating offshore wind. The US Bureau of Offshore Energy Management (BOEM) will hold a lease auction for two areas for wind exploration off of Oregon's south coast in October 2024. That is the beginning of surveys, exploration, designs, etc. There is still 5-10 years before a construction plan, and likely at least 15 years before construction. Yet, a lot of the Scottish Ports and businesses started doing their plans and securing initial investments in the 2010s. The group heard loud and clear that it's never too early to start–but how to do that if there is still an open question of whether offshore wind will be developed off the coast of Oregon.

2.5. Support for floating offshore wind is not unanimous, and there is still a lot of learning occurring on long-term impacts.

From many speakers, the group heard some version of 'You have to try it to find out whether it works or doesn't and what the impacts are'. The Scottish Fishing Federation, formed in 1973 and represents eight fishing associations, representing 60% of UK fisheries by value and landings, worried clearly about this approach and not yet understanding where key thresholds, or tipping points, may be in the ecosystem where changes in ocean use or climate changes could fundamentally change how ecosystems function.

The technology (the floats, moorings, cables, blades, and components) are early enough that new things are being learned all the time–but those learning are less about viability, and more about getting to better efficiency and cost-effectiveness. In addition, the current technology is being deployed at a large enough scales, and in midwater depths (i.e., not the shallows that are prime grounds for shellfish or salmon, but also not the deeper water where the oil rigs don't interfere with fishing), that there are unknowns about:

- The combined effects of a warming ocean and wind turbines reducing the wind energy that drives currents, and what that might do to ocean productivity (a similar version of the presentation we saw from Dr. Beth Scott was presented to the Pacific Northwest National Lab- see minute 20:35);
- Early indications are that fish populations are using habitat near turbines and other components , but spawning and rearing may not be occuring near projects(i.e., artificial reef-like functions and excluding fishing are increasing the numbers of big fish, but there may be fewer young fish coming behind those);
- Shellfish populations seem to be doing less well (e.g., scallops), and one hypothesis from the larger fixed offshore wind developmentsis the density of cabling and/or the high levels of voltage. That hypothesis needs to be researched more.

Both renewables development and biodiversity conservation are putting dual pressures on the viability of fishing in Scotland, according to the Federation. As oil and gas developed, the Scottish Fishing Federation started SFF Services Limited in 1986 to provide vessel and personnel services to offshore industries. That business generates the revenue to hire their own policy and research staff, but the capacity demands on them from offshore wind development is intense. The Federation encouraged fishermen to engage early in the siting decisions. The

latest leasing round, ScotWind, could result in losing access to nearly 50% of the current fishing grounds. Yet, for the Federation, opposition during the leasing stages has not worked as well as working closely with the energy developers.

Scotland developed a Marine Plan in 2015 (https://www.gov.scot/publications/scotlands-national-marine-plan/) but the Federation seemed to indicate that the plan was not followed in the rounds of licensing. Scotland is embarking on a plan update now.

The Scottish ECOWind consortium is using government and industry funds to conduct independent science on ecosystem-wind energy interactions. This kind of research is happening globally, and Oregon could benefit greatly by staying close and coordinating with these global research efforts. The US Dept of Energy's Pacific Northwest National Laboratory (PNNL) is connected with this global network.

2.6. Clear labor standards help provide certainty for all workers, and buy local provisions help develop local business

The oil and gas industry developed safety and labor standards over time, and largely on its own. The OSW industry is also operating under a number of global standards for health and safety and labor standards are developed at the state or project level. In Scotland the safety and labor standards and certifications for oil and gas do not apply to OSW, and therefore oil and gas workers seeking to work in OSW will need to undergo retraining–which often requires workers to cover the costs of new certifications, and negotiate new labor contracts.This can lead to lower wages for offshore wind work relative to oil and gas for similar work, and different safety and labor standards depending on the national flag flown by the vessel providing workers to build or service the offshore wind rigs outside of Scottish waters. Several speakers also noted that "buy local" provisions help smaller businesses grow, and encourages partnerships between those local businesses and the larger global businesses.Oregon could benefit from being proactive in promoting labor provisions such as apprenticeship standards and project labor agreements to ensure a trained local workforce.

III. What Next?

The group is grateful for all they learned from Scottish colleagues and experts. As the group reflected on the lessons and insights offered from the time in Scotland, a number of questions came up as the group started thinking about how to transfer those lessons back to the conversations Oregon is and will continue to have around floating offshore wind energy. Some of those questions include:

- How might technology evolve and global innovations emerge that allow for siting offshore wind in more complex areas (e.g., lessons from deeper water in Brazil, or seismically active areas in Japan, or slopes in the Canary Islands)?

- What role, if any, does Oregon want to play in the floating offshore wind supply chain?

- If Oregon wants a role (e.g., siting offshore, research and development, labor supply, etc.) in floating offshore wind, what is that role, and what investments might it want to consider to realize those roles?

- How can the Oregon and Pacific states research community stay better connected with researchers at the Pacific Northwest National Labs and the global network of researchers?

- What are the key research questions, and which are being addressed and which are not (e.g., impacts of cable siting and depth, protecting cultural resources, impacts to ocean currents and climate change)?

IV. Study Tour Participants

Ashley	Audycki	Rogue Climate
Jena	Carter	The Nature Conservancy
Bobby	Cochran	Oregon Consensus
Nick	Edwards	Port Commissioner
Ranfis	Giannettino Villatoro	Blue Green Alliance
Rep.	Gomberg	OR legislature
Rep.	Grayber	OR legislature
Luke	Harkins	Rep Gomberg Staff
Sarah	Henkel	Oregon State University
Nicole	Hughes	Renewable Northwest
Andy	Lanier	OR Dept. of Land Conservation and Development
Casey	MacLean	Renewable Northwest
Reuben	Martinez	Affiliated Tribes of the NW Indians
Rick	Osborn	Blue Ridge Strategies
Brad	Pettinger	Fisherman
Graham	Trainor	AFL-CIO
Robert	Westerman	IBEW Local 932/OSAEW
Lexie	Woodward	South Coast Development Council