Offshore Wind, Fall 2022

By John Benson

October 2022

1. Introduction

The last post on this subject was almost six months ago, and it is described and linked below:

Offshore Wind Late Spring, 2022: *The last post on this subject was on the first day of March. This one is posted on the last day of May.*

There is no significant new news for any of the projects covered in the last post. The first new East Coast projects will not send their first power ashore until mid to late next year. However there is much new news for future projects. The Bureau of Ocean Energy Management (BOEM) has held two important East Coast auctions, and tentatively scheduled the first West Coast auction.

https://energycentral.com/c/cp/offshore-wind-late-spring-2022

I have collected a reasonable amount of new information on this subject, including a blockbuster, so I guess it's time to start and schedule my next windy post.

This post will cover a major disruption in the offshore turbine market, major east coast projects that are entering the construction phase, and west coast projects that are approaching lease sales.

2. Major Disruption in Offshore Turbine Market

There are really just three large international players in the offshore wind market: my former employer, Siemens; my other former employer, GE, and Vestas. The first two of these participants have major market-shares, and Vestas, not so much. GE and Siemens have now started a major donnybrook, with the latter suing the former for patent infringement.

A federal judge has ruled that GE may not sell its Haliade-X offshore wind turbine in the U.S. The ruling came months after a jury sided with Siemens Gamesa in a patent infringement lawsuit between the two manufacturing giants.[1]

In his September 7 decision, District Judge William Young said Siemens Gamesa had shown "irreparable harm" caused by the GE infringement, granting a permanent injunction. He also said that Siemens Gamesa proved the loss of significant market share to GE.

"Allowing GE to continue its infringing conduct would surely chill advancement of wind turbine and renewable energy technology and thus would defy the public interest," the judge wrote.

[1] John Engel, Renewable Energy World, "GE banned from selling offshore wind turbines in the US—What it means for projects already underway," Sep 9, 2022, https://www.renewableenergyworld.com/solar/ge-banned-from-selling-offshore-wind-turbines-in-the-us-what-it-means-for-projects-already-underway/

Judge Young factored in "other public interests" in his ruling, including the "rapidly developing climate crisis."

GE will be allowed to supply its Haliade-X offshore wind turbine to two offshore wind projects already underway in the U.S. The judge also said that GE could "design around" the patent in the future.

The 800-MW Vineyard Wind 1 project offshore Massachusetts and the 1.1 GW Ocean Wind 1 project offshore New Jersey had both selected the Haliade-X turbine.

As part of the jury's June decision, GE must pay a royalty of $30,000 per megawatt.

GE Renewable Energy said in a statement that it was exploring "all legal options," including an appeal of the judge's ruling.

The State of New Jersey said in a court brief that applying the injunction to the Ocean Wind 1 project would have "detrimental economic effects" to the state's emerging offshore wind construction and service industry, and threaten its greenhouse gas policy objectives.

Siemens Gamesa sued GE in Massachusetts in 2020, claiming the GE's Haliade-X turbines infringed its patents covering wind turbine technology. The judge's ruling said that Siemens Gamesa had shown that the patent GE infringed provided a key element for wind turbine functionality, allowing for larger, more reliable motors…

In other, probably unrelated news, GE recently announced it was laying off a large percentage of the workforce in its onshore wind business.

General Electric is laying off 20% of its U.S. onshore wind workforce, which equates to hundreds of jobs, according to a person familiar with the matter who declined to be named.[2]

A note was sent out to employees Wednesday.

"We are taking steps to streamline and size our onshore wind business for market realities to position us for future success. These are difficult decisions, which do not reflect on our employees' dedication and hard work but are needed to ensure the business can compete and improve profitability over time," a spokesperson for GE Renewable Energy told CNBC.

GE is said to be examining its onshore wind footprint in Europe and Asia as well.

GE's renewable energy business faces a trifecta of challenges: Rising input costs, supply chain issues and competition from the likes of Siemens.

While demand for clean energy options is rising as energy shortages continue to wreak havoc, analysts say it's been difficult to make wind energy a cost-effective option. The recently passed Inflation Reduction Act does restore a tax credit for onshore wind, but some experts worry it came too late…

Author's comment: One of the reasons that I stopped covering onshore wind was that its intermittency is much more severe than offshore wind or solar (mainly photovoltaic/PV) power. The instantons power generation of a wind turbine is proportional to the cube of the wind-speed. Thus if the wind is only a few miles per hour

[2] Seema Mody, CNBC, "GE is laying off 20% of its U.S. workforce devoted to onshore wind power, costing hundreds of jobs," Oct 6, 2022, https://www.cnbc.com/2022/10/06/ge-layoff-20percent-of-onshore-wind-workforce-hundreds-of-jobs.html

(mph), the amount of energy generated is minimal. If the wind-speed is over 8 mph the energy output is reasonable, and continues to be reasonable to maximum up until 20 to 30 mph. However at some point (well over 30 mph) there is too much energy, which can potentially damage the turbine. The turbine must then feather and brake its turbine, and shut down.

Off-shore wind is much stronger and more consistent than onshore winds. PV output tends to be much more predictable, especially in the Western U.S. and when supplemented with four hours of storage can cover the late-afternoon-to-evening peak demand.

3. East Coast & West Coast

East coast is taking the lead for offshore wind, as well they should. As pointed out above, the West Coast has more options for new renewable power projects, especially PV. They also have much more open land in areas with ideal weather for very large PV projects. But the west coast will still need significant offshore wind to reach net-zero, as described in subsections below.

Meanwhile the first major East Coast projects are entering the early construction phase of their implementation and promise to have first-power sometime next year. Eventually these will develop the project execution skills and equipment that will help lay the groundwork for the first West Coast projects' implementation several years from now.

3.1. East Coast Projects

The graphic on the next page is the best presentation of the current offshore wind projects (lease areas) and call areas on the East Coast. Note that these are in shallow waters (less than 60 meters).

The first two major projects to enter construction are Vineyard Wind and South Fork Wind. For additional details on these projects (and other upcoming East Coast projects) see the earlier post linked below.

https://energycentral.com/c/cp/offshore-wind-early-2022

Marcia Blount had just taken over her family's boat building business when she spied an opportunity. A project called Cape Wind was moving forward with plans to install 130 wind turbines in the shallow waters of Nantucket Sound south of Massachusetts.[3]

Someone, she thought, will need to build the boats to deliver workers to all those turbines.

So, in 2011, her company acquired the license to build a so-called crew transfer vessel, or CTV, from a British shipbuilder.

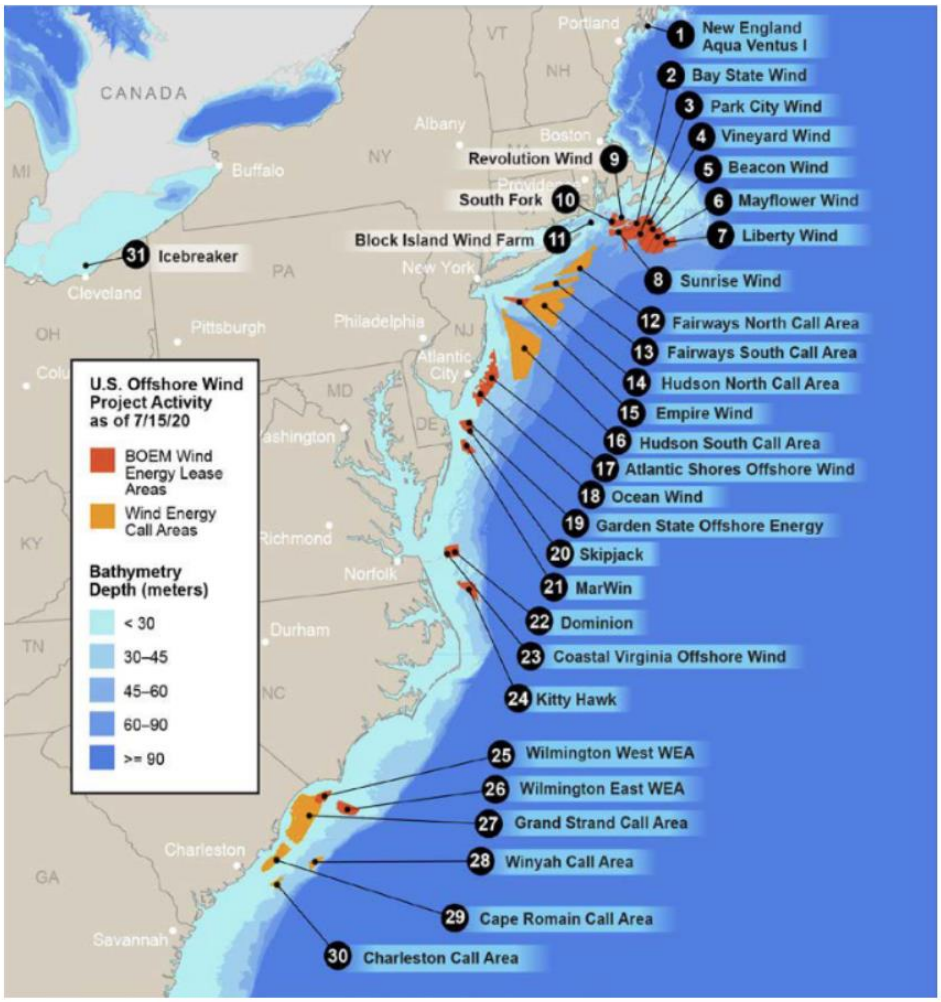
Then, nothing happened.

Cape Wind floundered amid a mountain of lawsuits. She noticed fewer and fewer people at the wind industry conferences she attended.

"It did get almost to the point where you started to wonder, 'Is this ever going to happen?'" Blount recalled.

[3] Benjamin Storrow, EE News, "Inside America's offshore wind hub: Boats, cables and elation," Sep 13, 2022. https://www.eenews.net/articles/inside-americas-offshore-wind-hub-boats-cables-and-elation/

Author's comment: I too was part of the above narrative. I worked for Siemens then, and played a small part of a team that was heavily involved in Cape Wind. I was also disappointed when this project crashed and burned.



Map of East Coast offshore wind projects, in various stages of development, from pre-leasing area identification to operational projects. Credit NREL.

Now, more than a decade after Blount set her eyes on the saltwater horizon, the offshore wind industry is finally poised to take off. The first two large-scale projects are slated to begin offshore construction early next year, taking the number of turbines installed in American waters from seven to 81. One could begin cable installation as soon as November, while the other is slated to start in early 2023.

The projects, both planned in federal waters south of New England, are part of an offshore wind boom along the East Coast. President Joe Biden wants to see the U.S. install 30 gigawatts of offshore wind by 2030, enough to power 10 million homes. The White House estimates the build-out would cut carbon dioxide by 78 million tons, more than the annual power plant emissions of New England, New Jersey and New York combined.

Onshore, companies like Blount's are racing to get ready. Blount Boats Inc. is building two 100-foot crew transfer vessels for a company contracted to work with Vineyard Wind, a 62-turbine project planned in federal waters 12 miles south of Martha's Vineyard, and Orsted A/S, a Danish developer with six projects along the East Coast.

"We see it as the future for us," she said on a recent tour of the company's boatyard. The aluminum skeleton of a 100-foot CTV was taking shape inside a massive hanger on the east bank of Narragansett Bay. If all goes to plan, the first will be launched sometime next spring…

Blount is hardly the only one. On the other side of Narragansett Bay, some 23 companies serving the offshore wind industry have set up shop at a sleek co-working space in Providence. They include shipping and logistics firms planning the trans-Atlantic voyage for turbine parts that can span the length of a football field, and consultants who spend hours poring over thousands of pages of permitting documents. Even a dredging company has taken up a place at the downtown office space.

The Atlantic Pioneer, a crew transfer vessel, docks at a turbine at the Block Island wind farm offshore from Rhode Island. Chris Bentley/Flickr

That activity coincides with some of America's first construction work on offshore wind.

In Wainscott, N.Y., a joint venture of Orsted and Eversource Energy has completed much of the onshore work needed to serve its 12-turbine South Fork Wind Farm, which will be built 35 miles east of Montauk. The company will begin drilling a tunnel for its high voltage cable under a local beach in October.

Similar work began in Barnstable, Mass., last year to connect Vineyard Wind to the New England grid before workers paused construction to accommodate the summer tourist season on Cape Cod. It is primed to begin again this fall, and this time, it will be accompanied by underwater work in the ocean…

The industry is now ready to move its work into the Atlantic Ocean. The Prysmian Group, a cable-maker, has finished manufacturing two high-voltage export cables at factories in Europe for Vineyard Wind. They are being loaded on ships, which are set to

embark in the coming weeks. One will make the journey mounted on a barge positioned atop a semi-submersible vessel to accelerate the trip across the ocean.

Vineyard Wind CEO Klaus Moeller has spent the past months busily planning for the cables' arrival. The cable corridor needed to be surveyed for potential obstacles, ranging from old lobster traps to unexploded bombs from World War II (one was actually found). A remote-controlled submersible was used to clear the path.

Finally, a certificate from federal regulators is needed to begin laying the cable. A decision is expected in September. The date of actual construction will depend on weather conditions…

3.2. Potential Issues with Other East Coast Projects

Although the East Coast offshore wind market have had a reasonably slow ramp up (see above) and currently have a supportive federal and states' governments, this is still a huge emerging market. It is understandable that they may have supply chain issues. The good news is that Europe is ahead of us, has developed a huge offshore wind industry, and are eager to sell us related products.

I looked for a good information source that could help my readers quantify this challenge, and found the source referenced here.[4]

Below I will excerpt some content from the Executive Summary of this document, and send my readers through the reference link for additional information.

In March of 2021, the Biden administration established a national offshore wind energy target to install 30 gigawatts (GW) by 2030. This ambitious goal was intended to not only help reduce dependency on fossil fuels, but also establish a new and sustainable renewable energy industry in the United States. The announcement referenced the potential benefits of establishing a domestic supply chain, including providing existing suppliers with the ability to produce thousands of components while creating tens of thousands of U.S. jobs over the course of the decade.

The administration's vision aligns with the perspective of the offshore wind energy industry. At a Leadership 100 event hosted by the Business Network for Offshore Wind in 2019, offshore wind energy developers and manufacturers identified the need for a road map outlining a pathway to a domestic supply chain as the top priority facing the industry. Building up domestic manufacturing capabilities will not only energize local industries but can possibly de-risk individual projects by reducing reliance on importing resources from European or Asian markets. Although establishing a domestic supply chain will require significant investment, it has the potential to benefit the entire industry and, by extension, help meet the country's decarbonization goals.

In this report, we characterize the challenges and opportunities facing the domestic supply chain industry and evaluate its potential benefits. This report is the first of a two-part series, describing the full supply chain road map and its associated benefits. The first report focuses on the high-level deployment, workforce, and component

[4] Matt Shields, Ruth Marsh, Jeremy Stefek, Frank Oteri, Ross Gould, Noé Rouxel, Katherine Diaz, Javier Molinero, Abigayle Moser, Courtney Malvik, and Sam Tirone, National Renewable Energy Laboratory, "The Demand for a Domestic Offshore Wind Energy Supply Chain," June 2022, https://www.nrel.gov/docs/fy22osti/81602.pdf

requirements that need to be met to achieve the national offshore wind energy target. We present:

- *A deployment pipeline that demonstrates the pathway to 30 GW and anticipated deployment rates after 2030, the associated demand for major fixed-bottom and floating offshore wind components (e.g., wind turbines, foundations, cables, substations), and the vessel and port requirements to support those installation activities.*
- *A series of sensitivity analyses showing how the demand for components, ports, and vessels changes for different technology pathways and availability of the global supply chain.*
- *An estimate of the total number of jobs that would be required to support the deployment scenarios under varying levels of assumed domestic content.*
- *A detailed list of the Tier 1, 2, and 3 components (e.g., finished components, subassemblies, and subcomponents, respectively) required to construct fixed-bottom and floating offshore wind energy projects.*
- *A discussion of critical path components that represent a significant challenge, bottleneck, or risk for a future domestic supply chain…*

In this report, we focus on the high-level demand for resources that will inform the next stage of analysis. We begin by establishing a deployment pipeline that conveys the scheduling of how existing offshore wind lease areas can be developed. This pipeline considers evolving technologies over the course of the decade, such as increasing wind turbine ratings and the types of vessels required to install projects, along with sensitivities to bottlenecks in the global supply chain and different market penetrations of fixed-bottom foundations. We use the deployment rates of the pipeline along with technology assumptions to consider the demand for ports and vessels and provide a high-level assessment of how effectively these resources can support the planned offshore wind energy buildout. The number of components manufactured annually feeds into an economic input/output model to evaluate the number of jobs and the magnitude of economic benefits that could be created under varying levels of domestic content. We break down these overall job numbers to identify the types of components that have the potential to provide the highest impact on a domestic workforce. Finally, we provide a detailed explanation of the types of Tier 1, 2, and 3 components that will be needed as part of offshore wind energy deployment and identify critical path items that may present a challenge for a domestic supply chain…

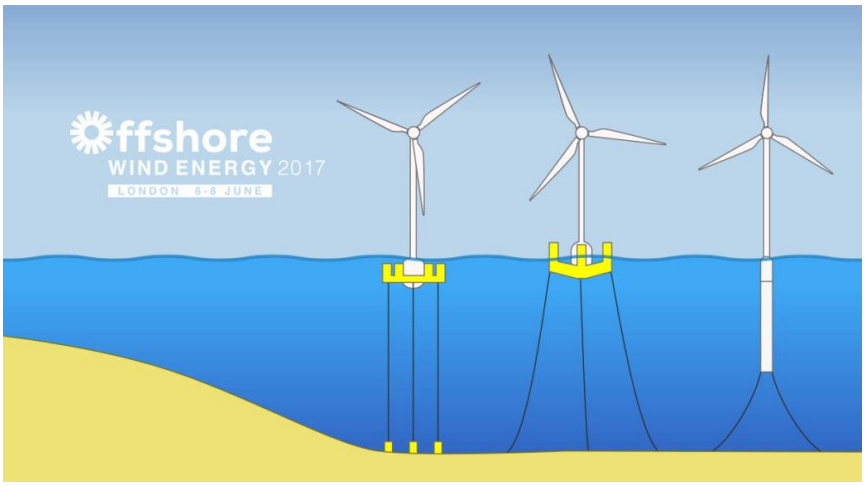
4. West Coast

As I've mentioned before, whereas the East Coast turbines are in relatively shallow water (see section 3.1 above), the ocean depth increases rapidly along the west coast, and the West Coast turbines will be in very deep water. This means that the East Coast turbines can be mounted to monopiles driven into the ocean-bottom. More than 80% of existing offshore turbines use this technology.

Because of the increase depth, the West Coast offshore turbines must float and use cables to tether the turbines to the sea-bottom (see graphic on the next page).

Floating offshore turbines are a newer technology, but there have been (and will be) early projects to where the technologies will be largely proven by the time the first U.S. floating turbines need to be deployed.

In August, the California Energy Commission set goals of installing offshore wind projects that could generate 2,000 to 5,000 megawatts by 2030 and 25,000 megawatts by 2045. That would be enough electricity to power 3.75 million homes over the next seven years and 25 million homes by mid-century.[5]



Then, in September, the Biden Administration announced it was expanding earlier offshore wind energy goals with incentives specifically aiming at bolstering deep-water projects…

On Sept. 15, the Biden Administration announced the Floating Offshore Wind Shot. The project aims to drive down the cost of floating offshore wind technology by at least 70%, to $45 per megawatt hour of power. That would make it just a bit more expensive than onshore wind and cheaper than hydroelectric power. To get there, federal regulators are doling out nearly $50 million for research and development, with a goal to incentivize 15,000 megawatts of floating offshore wind, or enough to power 5 million homes, in deep-ocean and lake waters by 2035.

That includes nearly $7 million in federal prize money for a contest (with applications open through Jan. 13) to optimize floating platform technologies and get them ready for wide-scale domestic manufacturing. Another $1 million will help get a network of West Coast ports ready to support offshore wind, while several million more is dedicated to studying impacts on bats, marine mammals and fishing activities.

Gov. Gavin Newsom in May 2021 announced he was opening the West Coast to offshore wind projects for the first time, with funding for upgraded ports, new staff, studies and public outreach. When Assembly Bill 525 was signed into law last fall, it required the California Energy Commission to set offshore wind goals by this summer. Next up, the commission must submit a strategic plan for offshore wind development by June 30, 2023.

Such moves have financial firms projecting that the United States will be second only to China in terms of deploying new wind power over the next decade, which could produce tens of thousands of jobs.

[5] Brooke Staggs, Southern California News Group via the East Bay Times, "Floating wind turbines off California coast soon could boost power grid," Oct 10, 2022, https://www.eastbaytimes.com/2022/10/10/floating-wind-turbines-off-california-coast-soon-could-boost-power-grid/

It also could generate or boost ancillary businesses. For example, building the offshore wind structures and blades is projected to add demand for more than 7 million tons of steel from U.S. factories. And for each major windfarm component, from turbine blades to subsea cables, the federal government expects one or two new U.S. factories to be built…

As for California, two areas off the coast of Humboldt and three areas near Morro Bay, totaling a combined 373,000 acres, have so far been identified as prime floating wind farm locations. If fully developed, the projects could generate 4,500 megawatts of electricity, or enough power for 1.5 million homes.

The Bureau of Ocean Energy Management expects to put leases for those five areas up to auction by the end of the year for companies that want to bid for the right to potentially develop wind farms there, according to agency spokesman John Romero.

4.1. Humboldt Bay

The first project on the U.S. West Coast will probably be in the Humboldt Bay in far Northern California (the Redwood Coast).

Within the next ten years, wind turbines could produce renewable energy for Humboldt County. The Bureau of Ocean Energy Management conducted an environmental assessment of the wind energy area within Humboldt Bay and found no significant impacts. Auctioning the area to developers is the next step and is said to be happening soon (see the next subsection).[6]

Humboldt Bay is said to be the perfect spot to house wind turbines and produce renewable energy, but many concerns come with bringing a new industry into our community, as well as the construction of those large steel structures that would sit in the bay. For more information on the project, we talked to Tom Wheeler, the Executive Director of the Environmental Protection Information Center (EPIC). Wheeler explained to us that Humboldt County's economic history has been rocky.

"Humboldt County has been one of resource extraction where outside developers, outside companies have come into our area and have extracted our wealth, whether it's gold, whether it's fish, whether it's timber, whether it's cannabis. And a lot of that wealth has left our communities."

Wheeler goes on to say that in pursuing the development of offshore wind energy, the community would like to see a different result and hopefully more longevity to the industry's initial economic burst. Along with the economic concern, the environmental effects of the project are another question on people's minds.

"We know that there are many marine mammals, whales that use the area. We know that birds also fly through the wind energy area. Frankly, we don't know how wind energy is going to impact a lot of these species," said Wheeler. "There is a cost to not doing a project as well. And I think that we need to keep that in mind because there are going to be impacts to wildlife from climate change if we don't take meaningful action to address the climate crisis, too."

[6] KIEM, "In the next 10 Years Wind Turbines could be Constructed in the Humboldt Bay," Sep 23, 2022, https://kiem-tv.com/2022/09/23/in-the-next-10-years-wind-turbines-could-be-constructed-in-the-humboldt-bay/

While the project's completion is still far in the future, progress and preparation are continually being made. The Humboldt Bay Harbor District is starting to plan for the construction of a port that will allow the installation of wind turbines.

Larry Oetker, the Executive Director of the Humboldt Bay Harbor District talked to us about the plans for construction and the jobs the project will provide.

"We're looking to build a new heavy-lift terminal so that the offshore wind towers can be constructed in Humboldt Bay," said Oetker. "What we've projected is that we won't just see the jobs for the very first offshore wind (project). What we're seeing is jobs continuing through at least 2045 for the deployment and construction of these offshore wind towers."

4.2. Initial California Offshore Wind Power Lease

This Final Sale Notice (FSN) contains information pertaining to the areas available for commercial wind energy leasing on the Outer Continental Shelf (OCS) offshore California. Specifically, this FSN details certain provisions and conditions of the leases, auction details, the lease form, criteria for evaluating competing bids, award procedures, appeal procedures, and lease execution. The Bureau of Ocean Energy Management (BOEM) will offer five leases for sale using a multiple-factor bidding auction format: Lease OCS-P 0561, Lease OCS-P 0562, Lease OCS-P 0563, Lease OCS-P 0564, and Lease OCS-P 0565 (Lease Areas). The issuance of any lease resulting from this sale would not constitute approval of project-specific plans to develop offshore wind energy. Such plans, if submitted by the Lessee, would be subject to subsequent environmental, technical, and public reviews prior to a BOEM decision on whether the proposed development should be authorized.[7]

BOEM will hold an online mock auction for potential bidders starting at 7:00 a.m. Pacific Standard Time (PST) / 10:00 a.m. Eastern Standard Time (EST) on December 5, 2022. The monetary auction will be held online and will begin at 7:00 a.m. PST / 10:00 a.m. EST on December 6, 2022.

BOEM considered the following factors in delineating the Lease Areas included in this FSN: reasonably comparable commercial viability and size; prevailing wind direction and minimal wake effects; maximized energy generating potential; mooring system anchor footprints; distance to shore, port infrastructure, and electrical grid interconnections; and fair return to the Federal Government pursuant to the OCS Lands Act through competition for commercially viable lease areas.

All five Lease Areas included in this FSN are the size and orientation that BOEM described in the Proposed Sale Notice. BOEM's designation of the five Lease Areas offered in the FSN was informed by its years-long coordination with BOEM's intergovernmental task force members, consultation and engagement with Tribes, stakeholder engagement, consideration of the 84 comments that BOEM received in response to the PSN, and the U.S. Coast Guard's Draft

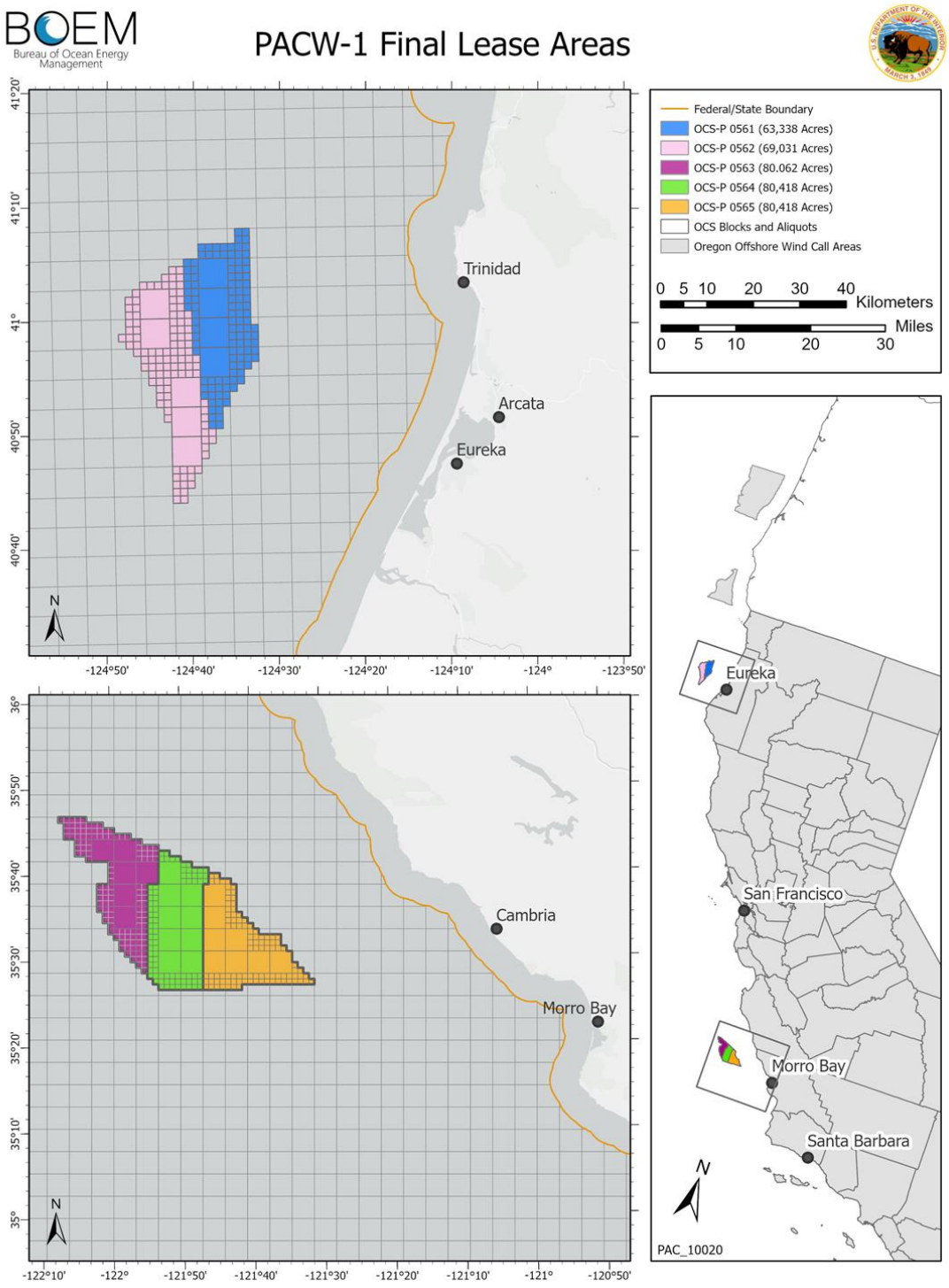
Lease	Total acres
OCS-P 0561	63,338
OCS-P 0562	69,031
OCS-P 0563	80,062
OCS-P 0564	80,418
OCS-P 0565	80,418

[7] Department of the Interior, Bureau of Ocean Energy Management, "Pacific Wind Lease Sale 1 for Commercial Leasing for Wind Power on the Outer Continental Shelf in California - Final Sale Notice," Oct 18, 2022, https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/PACW-1%20California%20Final%20Sale%20Notice.pdf

Pacific Coast Port Access Route Study. BOEM is offering five Lease Areas totaling 373,268 acres for sale through this notice.

Areas available for lease are listed in the table to the right.

The maps below describe the locations of the above areas.



The link below is to the main page for this lease auction, and contains links to the above sites and others.

https://www.boem.gov/renewable-energy/state-activities/california