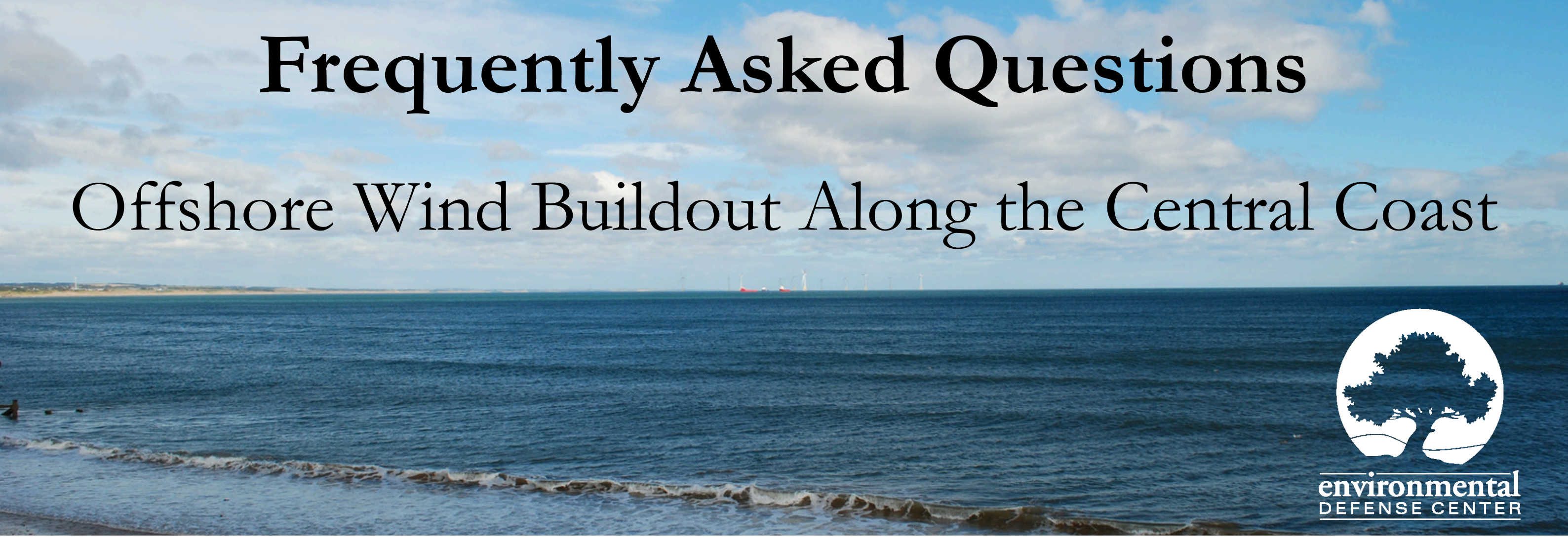
Frequently Asked Questions

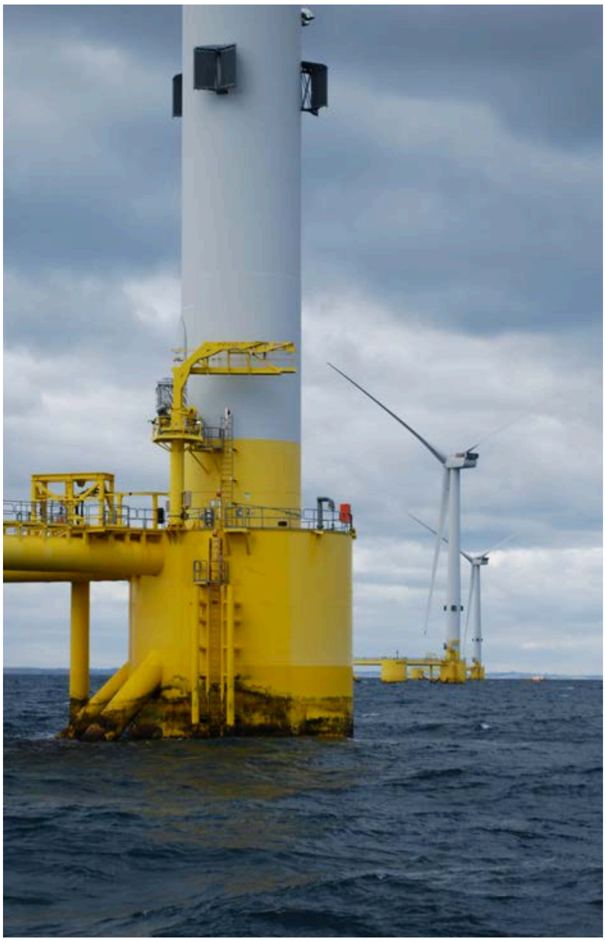
Offshore Wind Buildout Along the Central Coast



The Environmental Defense Center (EDC) has continued our role in regional and state leadership on offshore wind—an effort that began in 2016. Our advocacy efforts focus on responsible development that avoids and minimizes impacts to wildlife and the habitats they rely on, while helping us end the era of fossil fuels. Now we are working with partners to ensure that decisions made about offshore wind development off California remain informed by science, provide applicable information to decision-makers, and championing an inclusive planning process.

How large of an area is going to be used off the coast of California for Offshore wind off the Central Coast?

In November 2021, BOEM announced the designation of the Morro Bay WEA, which is about 20 miles off the Central California coastline and comprises roughly 376 square miles.



How many leases are off central CA? Which developers will be operating the central coast OSW farms?

There are 3 central coast wind energy areas available for leasing out of the 5 total, the 3 developers (pending lease buybacks) are Atlas Offshore Wind LLC now known as Equinor Wind US LLC, Golden State Wind LLC, and Invenergy California Offshore LLC.

- **Equinor Wind US LLC** (Atlas OffshoreWind LLC)
  - An international energy company based in Stavanger, Norway. Equinor has projects in oil and gas, renewables, and low carbon solutions. They currently operate in around 30 countries.
  - Equinor Lease
- **Golden State Wind LLC**
  - Golden State Wind is a joint venture between Ocean Winds and Reventus Power. Ocean Winds has 8 international projects where they participate in the development, finances, building, and operation of

offshore wind farms. Reventus Power is an international company based in Toronto, Canada.
  - GSW Lease
  - Lease Termination Agreement
  - CA Notice of Intent to Sue

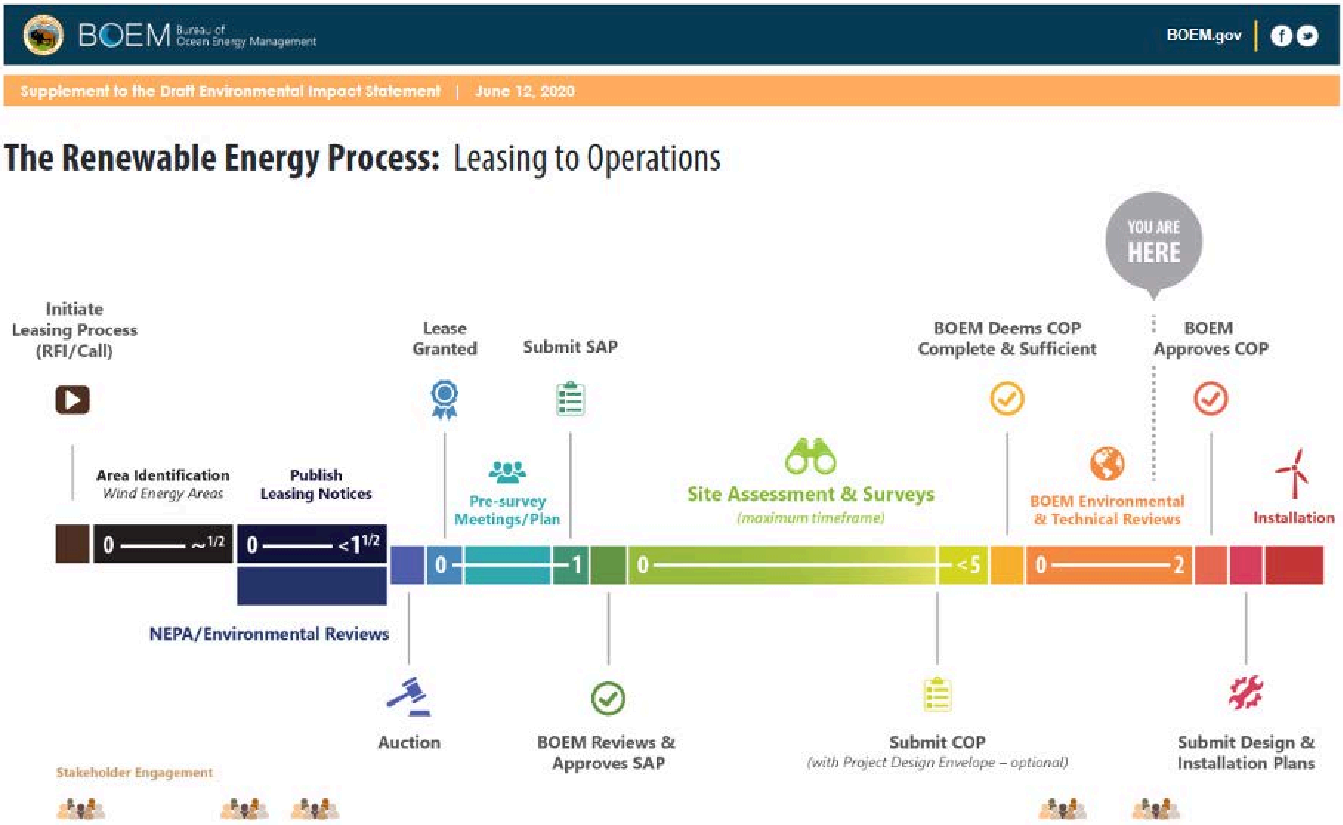
- **Invenergy California Offshore LLC**
  - A domestically owned company with international projects, encompassing over 200 sites.
  - Invenergy Lease
  - Lease Termination Agreement
  - CA Notice of Intent to Sue

Is California still working to advance OSW despite the federal uncertainty?

Yes! Multiple state agencies like the CA Energy Commission (CEC) and the Ocean Protection Council (OPC) are still funding and engaging in efforts meant to forward responsible OSW projects.

CA Energy Commission	Ocean Protection Council
Proposition 4 Offshore Wind Port Development Program can provide up to $475 million in grants to publicly owned ports for specified activities supporting the development of offshore wind generation • Recording of March virtual workshop for Proposition 4 Offshore Wind Port Development (POPD) Program	Final Draft Blueprint for the West Coast Science Collaborative voted on in June 2026. The WCSC will be foundational in developing the strong groundwork for the important research and monitoring needed for environmental protection in OSW development.
Assembly Bill 3 California Offshore Wind Advancement Act- Report 1 on seaport readiness is still under development at CEC. The report will develop a second-phase plan and strategy for seaport readiness that builds upon the recommendations and alternatives in the strategic plan for offshore wind energy developments	CA OSW Monitoring Framework developed by the California Marine Sanctuary Foundation, with input from over 200 scientific experts, in coordination with the OPC and the California Department of Fish and Wildlife to support the goals of California's AB 525 Strategic Plan.

What is the federal process and where are we in the process for full buildout?



The authorization process of wind energy leases via BOEM's Renewable Leasing Process.

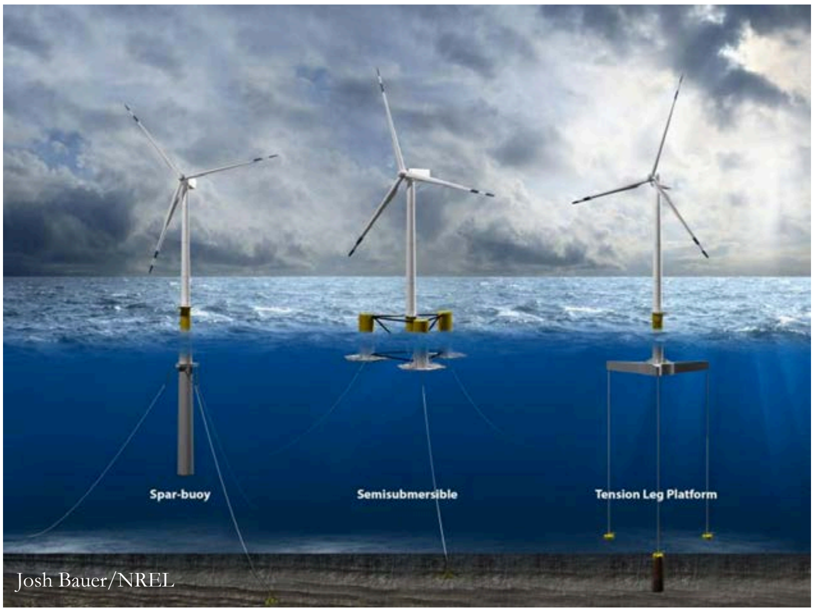
Until the federal government announced settlements to buyback leases from the previous three California offshore wind developers, the projects would have been in the site assessment phase of the BOEM process.[1] In the site assessment phase, experts gather data in their lease area to determine if the site is suitable. Potential surveys/data collected conducted are:[2]

- Meteorological and oceanographic measurements to determine wind speeds, wave heights, and currents.
- Geophysical and geotechnical surveys to gather information on seabed conditions.
- Environmental assessments to evaluate the impact on wildlife, habitats, and water quality.
- Navigation and shipping studies to assess the impact on shipping lanes.
- Grid connection studies to determine the feasibility of connecting to the electrical grid.
- Socio-economic assessments to gather information on the economic and social impact on the local community.

The site assessment phase could take up to 5 years, followed by submission of the Construction and operations plan (COP). Before a lessee can progress to the construction and operations phase, a COP must be submitted for the operation of an offshore wind energy project no later than six months before the completion of the five-year site assessment phase described above. The projects are required to go under environmental review (CEQA and NEPA) which will occur in the construction and operations phase of the process.[3] BOEM will be the lead agency.

What types of platforms will be used (floating vs. pile-driven)?

More than 20 different types of floating substructures have been demonstrated (Edwards et al. 2023), however, due to the unique underwater geography of California oceans certain technologies are infeasible like pile driven structures that were largely utilized on the east coast. Floating substructure types are ideal for California waters as the continental shelf drops more than 500m (1640ft) in depth. Floating wind technology generally falls into four categories: semisubmersible, spar, TLP, and barge.[4]



Examples of floating substructure types (left to right): spar, semisubmersible, TLP. Illustration by Joshua Bauer, NREL

- Barge: Achieves stability utilizing a flat-bottomed structure (barge) that has a large surface area in contact with the water
- Spar: Achieves stability through ballast (weight) installed below its main buoyancy tank
- Semi-Submersible: Achieves static stability by distributing buoyancy widely at the water plane
- Tension-Leg Platform: Achieves static stability through mooring line tension with a submerged buoyancy tank

How big will the turbines be?

The turbines will be as tall as the Eiffel Tower 330 m (1,083 ft) but when located 20 to 60 miles off the coast they are not expected to be highly visible from shore.[5]

Assuming that the specific power (rated capacity per rotor-swept area) remains similar to current offshore wind turbine models, rotor diameters for these turbines would be approximately 230–305 m (750–1,000 ft). With a tip clearance of approximately 30 m from the mean sea level, this results in a total turbine height of 260–335 m (850–1,100 ft) above the still water level.[6]

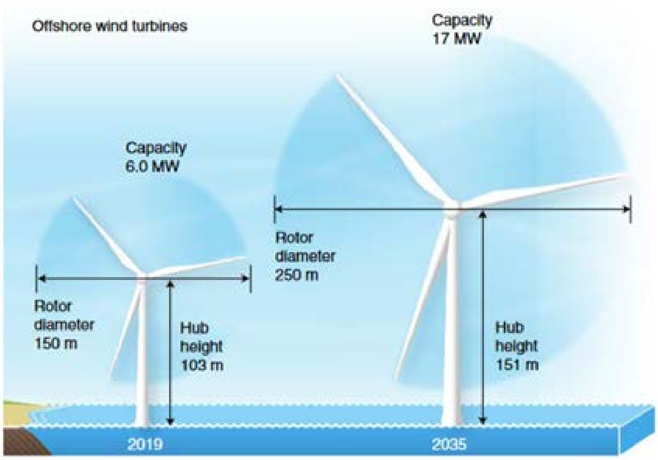
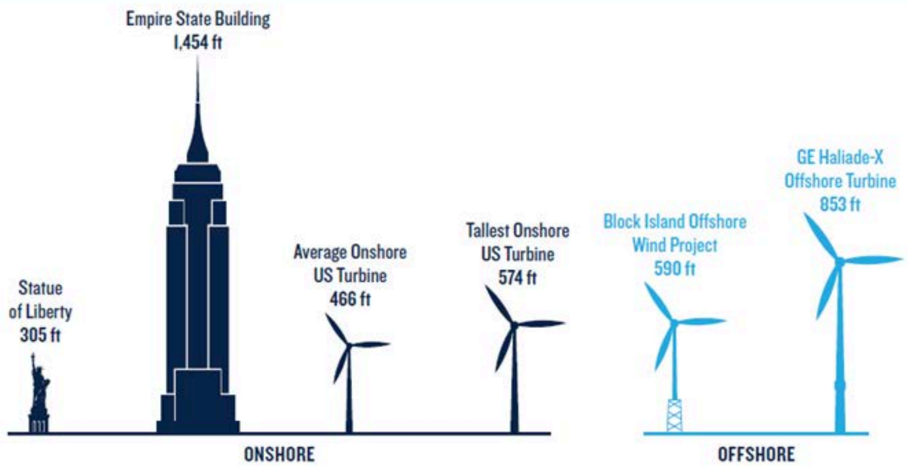


Figure 3. Evolution of wind turbine rating and size over time.
Source: Wiser et al. (2021)

[7]

The size and rating of offshore wind turbines have increased noticeably over the last two decades, and even larger models are under development (Figure below). Constraints in the supply chain, vessel capabilities, and port infrastructure are a current challenge and may limit continued upscaling.[8]

FIGURE 1: RELATIVE SIZES OF WIND TURBINES



Will the cables be laid on the sea floor or buried?

Array cables: Cables and mooring lines may be suspended in the water column, laid on the seabed, or buried; suspended configurations can include, but are not limited to, lazy wave, catenary, steep wave, or suspended U.[9]

The RPDE assumes a single WTG would require on average up to 2.7 nm (5 kilometers) of array cables, set at a target depth of at least 200 feet (60 meters) below water surface. Individual cable segments may be shorter or longer (up to 10.8–16.2 nm [20–30 kilometers]) than this average length, depending on site-specific layout.[10]

Export cables: Dynamic cable between a floating substation and the seabed, with a transition joint to static cable for remaining length; static cable between a subsea substation and cable landfall.[11]

Offshore export cables would have a target burial depth between 3 and 10 feet (1 and 3 meters). Burial may not be required along the full cable route depending on seabed conditions, vessel traffic and other factors considered in a cable burial risk assessment.[12]

Decommissioning of the WTGs and OSSs would typically follow a “reverse installation” process. Any buried offshore export cables and array cables would either be retired in place or removed from the seabed.[13]

Will the cables for the turbines emit an electromagnetic field? If yes, will electromagnetic fields from the cables harm marine life?

Electromagnetic fields (EMF) are naturally emitted from earth, producing environmental cues that land and water species detect and respond to.[14] Species like sockeye salmon, lobster, mole rats, eastern red spotted newt, and many species of birds use the polar compass and/or the inclination compass.[15] The polar compass distinguishes between northward and southward (i.e. along the prime meridian) while the inclination compass is more complex but generally distinguishes between poleward (north to south) and equatorward (east to west).[16]

Species that can pick up on EMFs are known as receptive species; they may be either electro-receptive, magneto-receptive, or both. Magneto-sensitive animals are able to detect and respond to very small changes in the intensity, angle, and direction of a magnetic field to then be used to aid in navigation.[17] These senses may facilitate homing (inherent ability of an animal to navigate towards an original location) for short/long-distance migrations, to find ecologically important resources such as shelter and feeding or reproductive grounds.[18] Electro-receptive species have the capacity to detect external underwater electric fields with special receptors, which is an important tool in predator-prey relationships, communication and in finding mates.[19]

Humans can cause changes or additions to the EMF environment which could alter behaviors of organisms that use it. A major source of EMFs are subsea cables which is predicted to increase across the world as we expand into more marine renewable energy (MRE) like wind, wave, and tidal.[20] Despite the uptick in MRE globally our understanding of what species use EMFs, how they use EMFs, how changes to EMFs from human activity (anthropogenetic) will impact species, and more is still largely unknown. More data collection to understand the initial conditions before construction of the project needs to occur to better inform mitigation measures for EMF emissions from cables and the impact on receptive animals.

Currently MRE industries are using alternating current (AC), or direct current (DC) cables that are either lower capacity inter-array, or higher capacity export cables.[21] High voltage AC (HVAC) cables are commonly used for distances 15-50 km from shore, and high voltage DC cables (HVDC) are preferable for longer distances.[22] HVAC cables are presently used the most in offshore wind projects globally however it is projected that HVDC will become more common.[23] As the industry grows and evolves there has been and will continue to be an increase in demand for higher capacity cables. Paired with the increased number of MRE projects there will also be an increase in higher intensity cables over a wider space in the marine environment potentially leading to behavioral impacts to species.

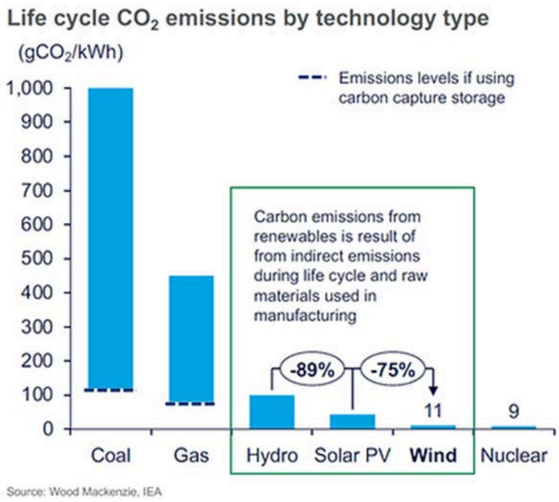
What is the carbon footprint of OSW? * Material from CoreHUB

Lifecycle emissions analysis[24] of wind turbines typically measure the climate impacts in terms of grams of carbon (i.e. carbon dioxide and methane) emitted per kilowatt hour of electricity generated. The kilowatt hour is commonly used by electrical energy providers for purposes of billing, therefore the greenhouse gas emissions from offshore wind projects are estimated using this metric. This allows comparison between the carbon emitted to manufacture a wind turbine with emissions that occur during fossil fuel-powered electricity generation.[25] Keep in mind that lifecycle emissions analysis produces an estimate, meaning different studies have concluded different total amounts of carbon released by offshore wind. Despite differing estimates, all research agrees that offshore wind power produces considerably less greenhouse gases (i.e. carbon) than almost all other forms of electricity generation. The below studies are a few examples of the range of values (please note carbon dioxide [CO2] or its equivalent [CO2eq] per kilowatt hour [kWh] of electricity generated [gCO2eq/kWh]):

- University of Santa Barbara 2019 study ~ 15.35 gCO2/kWh with an uncertainty range of 8.58–30.17 gCO2eq/kWh[26]
- Chinese 2023 study ~ 25.76 gCO2eq/kWh[27]
- Modeling for Italian OSW in 2023 ~ 31 g CO2eq/kWh[28]

The Intergovernmental Panel on Climate Change (IPCC) estimates[29] that offshore wind energy produces 8–35 grams of carbon dioxide (CO2) or its equivalent (CO2eq) per kilowatt hour (kWh) of electricity generated (gCO2eq/kWh). To put that in perspective, their estimates for other sources of energy are:

- Coal = 740–910 gCO2eq/kWh
- Natural gas = 410–650 gCO2eq/kWh
- Rooftop solar = 24–60 gCO2eq/kWh



How will species and habitats benefit from OSW?

One specific approach to achieving NPI in the offshore wind context could be a payments-based approach. Under this approach, developers would pay into a fund to develop better mitigation procedures.[30] Many federal, state, and local entities have created mitigation procedures called best management practices (BMPs) which include the incorporation of procedures or materials that may be used to reduce either direct or indirect negative impacts to habitats that result from project construction-related activities.[31] Additional research into best mitigation practices specific to offshore wind and the west coast will allow for more targeted mitigation designed for our region.

Another NPI that could enhance the beneficial impacts to species or a habitat is active restoration. Active restoration is direct action that seeks to restore a particular species or habitat, such as through nature-inclusive designs and habitat restoration.[32] Some of the critical habitats to focus on initially are salt marsh, seagrass, mangrove, giant kelp, and reef (both coral and shellfish). These are important habitats because of their structure, their productivity, and their ability to act as a carbon sink. A habitat that is also a carbon sink will take in large amounts of carbon by trapping it temporarily in plant stems and over longer periods of time in sediments that accumulate where they grow.[33] An example of a habitat enhancement option could be modeled to a n idea specific to the North Sea wind farms to create new man made oyster reefs. The limestone and granite that are normally used for scour protection (a rock pad is laid beneath the monopile structure, and then additional stone is placed around the base) are also ideal materials to provide oyster reef structure on the sea floor. The offshore wind industry is already constructing the most expensive part of the oyster reef and adding the biological component would be a smaller additional cost.[34]

How does OSW help fight climate change? (projected GHG impacts)

Offshore wind is an essential piece of the puzzle to reducing our greenhouse gas emissions. As a low carbon energy source offshore wind will have a lower impact on the environment than conventional fossil fuel power generation, which releases pollutants and greenhouse gas emissions that contribute to climate change.[35] Over the past few decades, the costs attributed with offshore wind energy projects has declined dramatically, introducing an important resource opportunity for generating clean energy on a large scale.[36]

There is also an indirect approach to increase benefits gained from offshore wind called net positive impacts (NPIs). Net positive impacts can address additional environmental mitigation or restoration projects after addressing the negative impacts caused by its construction and operation.[37] These additional measures can be activities that create and support habitat, attract and support species, or support and enhance important ecological functions and services, thereby helping to reverse biodiversity loss and indirectly help with climate change. For example one method called passive recovery is the removal of pressures that are causing environmental damage. It is not directed at the particular habitat but rather at external factors (examples include collection of marine debris and regulation of commercial fishing).[38]

What alternatives are there to developing OSW?

There are many alternatives to offshore wind however we should not look at any ONE alternative, we need multiple sources as different types. Low carbon energy alternatives like wind and solar have environmental conditions for operation that aren't always met (i.e. solar needs sun and wind turbines need sustained wind). Renewable energy sources—such as onshore and offshore wind, hydroelectric, wave/tidal, and solar—are important parts of a global strategy for tackling climate change.

Other avenues that could pair well with diversifying our energy portfolio includes reducing our energy usage across the board. When assessing the nation's demand for energy, federal and state agencies should fully evaluate opportunities to reduce the nation's energy demand through conservation and energy efficiency. Such measures can be incorporated in NPIs and BMPs or negotiated in community benefits agreements. Conservation and energy efficiency buildout can also provide great opportunities to create jobs and expand and fortify the economy.

What state and federal agencies will regulate OSW in CA?

- Federal
  - Department of Commerce- National Oceanic and Atmospheric Administration (NOAA)
  - US Coast Guard
  - Department of Defense
  - US Army Corps of Engineers
  - Bureau of Safety and Environmental Enforcement (BSEE)
  - U.S. Fish and Wildlife Service
  - Advisory Council on History Preservation
  - Environmental Protection Agency (EPA)
  - Federal Aviation Administration
- State
  - California Department of Fish and Wildlife (CDFW)
  - California Independent System Operator
  - California Office of Historic Preservation
  - California Public Utilities Commission
  - California State Lands Commission (CSLC)
  - Ocean Protection Council
  - State Water Resources Control Board

How can central coast residents get involved with OSW?

- Signing up for CEC notices
- Public testimony
- Written comments
- Webinars
- Engage in local groups engaging in Community Benefit Agreements conversations
- Sign up for e-news letter from NGOs in your region

For additional information please contact: Azsha Hudson, ahudson@environmentaldefensecenter.org
To learn more about EDC's work: https://www.environmentaldefensecenter.org/#
To learn about our team: https://www.environmentaldefensecenter.org/edc-staff/
Additional Resources: Frequently Asked Questions on Offshore Wind along the Central Coast
Monterey Bay Aquarium Frequently Asked Questions
Tethys Database on Wind Energy and the Environment
Synthesis of Environmental Effect Research (SEER)
Frequently Asked Questions for Offshore Wind along the North Coast
CMSF Environmental Monitoring Guidance Project
Special Initiative for Offshore Wind
Offshore Wind Impact to Whales

We recognize that EDC sits on occupied, unceded, stolen lands of the Chumash Peoples, on Shmuwich Territory, who have called this area home for time immemorial. We commit today to make space to elevate indigenous voices and support our local Chumash and indigenous communities in our work to protect our environment.

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