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California Energy Commission

FINAL COMMISSION REPORT

Assembly Bill 525 Offshore Wind Energy Strategic Plan

Volume I: Overview Report

Gavin Newsom, Governor

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California Energy Commission

Melissa Jones
Jim Bartridge
Lorelei Walker
Primary Authors

Elizabeth Huber
Director
SITING, TRANSMISSION, AND ENVIRONMENTAL PROTECTION DIVISION

Drew Bohan
Executive Director

ACKNOWLEDGEMENTS

California Energy Commission
Rachel MacDonald
Danielle Mullany
Scott Flint
Eli Harland
Elizabeth Barminski
Paul Deaver
Kristy Chew
Raechel Damiani
Paul Marshall
Sierra Graves
Katerina Robinson
Jessica Eckdish
Susan Fleming
Mona Badie
Carol Robinson
Stacey Shepard
Theresa Keates
Kari Anderson

California State Lands Commission
Jennifer Lucchesi
Jennifer Mattox
Katie Robinson-Flipp
Matt Koller
Amy Vierra
Reid Boggiano
Nicole Dobroski
Yessica Ramirez

California Coastal Commission
Kate Huckelbridge
Holly Wyer
Heather McNair
Javier Padilla Reyes

California Department of Fish and Wildlife
Chuck Bonham
Craig Shuman
Cyndi Dawson
Becky Ota
Eric Wilkins

Brian Owens
Christopher Potter
Crystal D'Souza
Victoria Lake
Margarita McInnis
Jay Staton

California Public Utilities Commission
Commissioner John Reynolds
Leuwam Tesfai
Jake McDermott
Trevor Pratt
David Withrow
Tommy Alexander

California Ocean Protection Council
Jenn Eckerle
Justine Kimball
Yi-Hui Wang
Maria Rodriguez

California Department of Water Resources
Delphine Hou
Thomas Gibson

California State Water Resources Control Board
Phillip Crader

California Labor and Workforce Development Agency
Derek Kirk
Rafael Aguilera

California Independent System Operator
Neil Millar
Jeff Billinton
Cristy Sanada

California Natural Resources Committee
Geneva Thompson
Noaki Schwartz
Maya Hsu

Bureau of Ocean Energy Management
Sara Guiltinan
Jennifer Miller
John Bain
Necy Sumait

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ABSTRACT

Assembly Bill 525 (Chiu, Chapter 231, Statutes of 2021) directs the California Energy Commission (CEC) to complete and submit a strategic plan for offshore wind development in federal waters off the California coast to the California Natural Resources Agency and the relevant fiscal and policy committees of the State Legislature.

This strategic plan is the last of four work products the CEC is directed to prepare by AB 525. The strategic plan consists of three volumes: **Volume I** is an overview report, **Volume II** is the main report, and **Volume III** contains the technical appendices. Over 500 pages of public comment on the Draft Strategic Plan, along with numerous comments throughout the AB 525 report development process, are available at the California Offshore Renewable Energy Docket, 17-MISC-01.

In preparing the strategic plan, the CEC coordinated with federal, state, and local agencies and a wide variety of interested parties. As required by AB 525, this strategic plan identifies suitable sea space to accommodate California's offshore wind planning goals, includes a discussion of economic and workforce development and port space and infrastructure, and assesses transmission investments, upgrades, and associated costs. In addition, this strategic plan presents the permitting processes for offshore wind facilities and identifies potential impacts on coastal resources, fisheries, Native American and Indigenous peoples, underserved communities, and national defense. The plan also outlines potential strategies that could address possible impacts such as avoidance, minimization, monitoring, mitigation, and adaptive management.

Keywords: Offshore wind energy; floating offshore wind; offshore energy; offshore development; offshore wind planning goals; decarbonization; coastal, cultural, and environmental resources; renewable energy; reliability; transmission; infrastructure planning; ports and waterfront facilities; workforce; economic benefits; sea space; fisheries; floating; Assembly Bill 525; Senate Bill 100

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Offshore Wind Introduction and Background

Offshore wind energy developed in federal ocean waters off California's coast is poised to play an important role in diversifying the state's portfolio of resources as it complements the generation attributes of other clean energy resources. Offshore wind can support grid reliability and help California achieve its 100 percent renewable and zero-carbon energy goals, as well as the electrification of other sectors, such as transportation.

In January 2022, Assembly Bill 525 (AB 525, Chiu, Chapter 231, Statutes of 2021) became effective, setting the analytical framework for offshore wind energy development off the California coast in federal waters and tasked the California Energy Commission (CEC) with developing a strategic plan for offshore wind development. The strategic plan must include, at a minimum, the following five chapters:

- Identification of sea space
- Economic and workforce development and identification of port space and infrastructure
- Transmission planning
- Permitting
- Potential impacts on coastal resources, fisheries, Native American and Indigenous peoples, and national defense, and strategies for addressing those potential impacts.

The strategic plan chapters are guided by three AB 525 interim reports. The first report, adopted in August 2022, evaluated and quantified the maximum feasible capacity of offshore wind to achieve reliability, ratepayer, employment, and decarbonization benefits and established planning goals of 2 to 5 gigawatts (GW) for 2030 and 25 GW for 2045.[1] The second report, adopted in February 2023, provided a preliminary assessment of the economic benefits of offshore wind as they relate to seaport investments and workforce development needs and standards.[2] The third and final

1 Flint, Scott, Rhetta de Mesa, Pamela Doughman, and Elizabeth Huber. August 2022. *Offshore Wind Energy Development in Federal Waters Offshore the California Coast: Maximum Feasible Capacity and Megawatt Planning Goals for 2030 and 2045*. CEC-800-2022-001-REV. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=244285.

2 Deaver, Paul and Jim Bartridge. December 2022. *Preliminary Assessment of Economic Benefits of Offshore Wind: Related to Seaport Investments and Workforce Development.* CEC-700-2022-007-CMD. Available at https://www.energy.ca.gov/publications/2022/preliminary-assessment-economic-benefits-offshore-wind-related-seaport.

interim report, adopted in May 2023, described permitting roadmap options for a coordinated, comprehensive, and efficient permitting process for offshore wind energy facilities and associated electricity and transmission infrastructure.[3]

Status of Offshore Wind Development

The offshore wind industry is growing rapidly with the total amount of global installed capacity exceeding 59 GW in 2022.[4] By early 2023, there were 18 countries with operating offshore wind projects. That number is expected to double by 2030. In addition, the United States has set several offshore wind goals at the federal and state levels. The Biden administration has set a goal of deploying 30 GW of offshore wind in U.S. waters by 2030 and an additional 15 GW of floating offshore wind by 2035.[5] Individual states have established goals to collectively procure 39 GW by 2040, with California's 2045 goal, that brings the total to 64 GW by 2045. With this trajectory, the United States is on a path to deploy 110 GW by 2050.

California Offshore Wind Leases

Offshore wind development off the California coast will occur primarily in federal waters under the exclusive jurisdiction of the Department of Interior's Bureau of Ocean Energy Management (BOEM). On December 6 and 7, 2022, BOEM conducted an auction for its first California lease sale, known as the Pacific Wind Lease Sale 1 (PACW-1), for commercial leasing for wind power on the Outer Continental Shelf in California. This auction resulted in awards to five lease holders off California's North and Central Coasts.

The winning bids for the five lease areas total more than $757 million from five companies: RWE Offshore Wind Holdings, California North Floating, Equinor Wind U.S., Golden State Wind, and Invenergy California Offshore.[6] On June 1, 2023, each of the five leases became effective. An important element of the leases is the inclusion of bidding credits for community benefits agreements (CBAs), which include a collective commitment by lessees of more than $50 million to support communities and ocean

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3 Jones, Melissa, Kristy Chew, Eli Harland, and Jim Bartridge. April 2023. *Assembly Bill 525 Offshore Wind Energy Permitting Roadmap.* CEC-700-2023-004. Available at https://www.energy.ca.gov/event/workshop/2023-06/workshop-assembly-bill-525-offshore-wind-energy-permitting-roadmap.

4 Musial, Walter, Paul Spitsen, Patrick Duffy, Philipp Beiter, Melinda Marquis, Daniel Mulas Hernando, Jennifer King et al. August 2023. *Offshore Wind Market Report: 2023 Edition*. Available at https://www.nrel.gov/wind/offshore-market-assessment.html.

5 The White House. September 2022. *Biden-Harris Administration Announces New Actions to Expand U.S. Offshore Wind Energy.* [Fact sheet]. Available at https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/15/fact-sheet-biden-harris-administration-announces-new-actions-to-expand-u-s-offshore-wind-energy/?utm_source=link.

6 BOEM California activities web page is available at https://www.boem.gov/renewable-energy/state-activities/california.

users. A breakdown of these CBA commitments and more information on CBAs can be found in **Volume II, Chapter 7**.

Advancing California's Climate and Clean Energy Policies

California has accelerated efforts to reduce the pace, magnitude, and costs of climate change impacts by improving resilience and reducing greenhouse gas emissions. Senate Bill 100, the 100 Percent Clean Energy Act of 2018 (De León, Chapter 312, Statutes of 2018), requires that eligible renewable and zero-carbon resources supply 100 percent of total retail sales of electricity to California's end-use customers by 2045. This will require a significant increase in new clean energy development in California, with solar, battery storage, and other clean resources making up the majority of future resource additions. Offshore wind can play an important role in diversifying the state's electricity system as it is projected to produce large amounts of generation overall and be available at times when the electricity system most needs resources, such as summer evenings when solar generation declines and air conditioning demand remains high. In addition, offshore wind can improve reliability and resilience of the electricity system while reducing environmental impacts from reliance on fossil fuels.

Further, if developed and deployed at scale, the advancement of offshore wind energy can provide local and statewide economic benefits and attract investment capital to California. Additionally, offshore wind presents the opportunity to develop and preserve a local, skilled, and trained workforce and establish a local supply chain and economy. It also presents the opportunity to potentially provide additional benefits to tribal and underserved communities throughout the offshore wind development process. This can be accomplished by ensuring that offshore wind projects, and related infrastructure, are developed in a responsible and timely manner while protecting coastal, marine, and tribal resources.

Offshore Wind Planning and Procurement

An outcome of planning for offshore wind is identifying pathways for utilities to procure offshore wind. The California Public Utilities Commission (CPUC) is authorized to order the procurement of resources by electrical corporations, electric service providers, and community choice aggregators as part of the Integrated Resource Planning (IRP) process.

Under AB 1373 (Garcia, Chapter 367, Statutes of 2023) the CPUC may identify additional need to procure long lead-time resources through a central procurement entity. The CPUC may request that the California Department of Water Resources (DWR), as a central procurement entity, procure these resources on behalf of electrical corporations, electric service providers, or community choice aggregators. In addition, local publicly owned electric utilities can voluntarily obtain eligible energy resources that DWR acquires on a contract-by-contract basis.

Recently, the CPUC released an initial assessment of needed long lead-time resources that could be acquired by DWR, including offshore wind, out-of-state wind, geothermal, generic long duration energy storage, and 8-hour batteries. The CPUC analysis showed that between 1 and 15.6 GW of offshore wind may be cost effective under multiple scenarios, noting that the net benefits of offshore wind are highly sensitive to cost assumptions. Cost reductions for offshore wind resources are anticipated as many emerging resources have achieved significant cost declines over time. Based on the analysis, the CPUC will likely revisit and revise need determinations at various points in the future.

Overview of Collaborative Efforts

As directed by AB 525, several California state agencies are collectively working to assess the potential role and opportunity offshore wind can provide for California. Led by the CEC, these coordinating agencies include the California Coastal Commission (CCC), the California Ocean Protection Council (OPC), the California State Lands Commission (CSLC), the Governor's Office of Planning and Research (OPR), the California Department of Fish and Wildlife (CDFW), the Governor's Office of Business and Economic Development (GO-Biz), CPUC, and DWR.

The CEC also consulted with the California Independent System Operator (California ISO) and other relevant federal, state, and local agencies, as needed, in the development of this report. The agencies have consulted with California Native American tribes, regularly met with an intertribal working group, and engaged with stakeholders identified in AB 525, including fishermen, labor unions, industry, environmental justice organizations, environmental organizations, and other ocean users.[7] Detailed outreach to specific entities is described in **Volume II, Chapter 4**.

Summary of Overall Comments on the Draft Strategic Plan

The CEC received numerous comments on the draft report *Assembly Bill 525 Offshore Wind Energy Strategic Plan* (Draft Strategic Plan) including more than 500 pages of written comments, and additional comments from the public workshops held on March 20 and 29, 2024. Comments also include information shared during intertribal working groups. The following highlights some of the high-level themes contained in the comments. Most parties expressed appreciation for the comprehensive and detailed analysis and discussion presented in the three Draft Strategic Plan volumes. Several commenters suggested that the overall recommendations needed further detail to provide necessary direction for the responsible and timely development of the offshore wind industry while protecting coastal, marine, and tribal resources.

7 The term interested parties is used throughout the report to refer to stakeholders.

Several environmental organizations noted the CEC's recognition that offshore wind represents a promising opportunity to simultaneously address climate change and stimulate economic growth. In contrast, some commenters raised concerns about the uncertainly surrounding potential impacts and the rapid pace of proposed offshore wind development. Some tribes and representatives from the fishing industry expressed opposition to offshore wind development. Many parties noted the importance and need for more data, science, and research, a coordinated and comprehensive permitting framework, and called for more specificity regarding agency responsibilities, timeframes, and milestones in the final strategic plan.

Many parties called out the importance of port development, noting the critical role of staging and integration sites to the success of the offshore wind industry. However, commenters raised concerns about the potential impacts of port development, including the implications to environmental justice communities. They emphasized that offshore wind development must benefit underserved and tribal communities by ensuring local employment opportunities, investments in clean energy, and energy reliability improvements, especially on the North Coast. Several parties encouraged expeditious joint agency planning and coordination of transmission to facilitate the timely development of infrastructure that aligns with proposed offshore wind project timelines. More detailed comments relating to the topics addressed in the strategic plan are presented by chapter in **Volume II**.

Organization of the Report

This strategic plan is composed of three volumes: **Volume I — Overview Report**, **Volume II — Main Report**, and **Volume III – Technical Appendices**. **Volume I** is a high-level overview of Volume II. **Volume II** provides the in-depth analytical framework for each of the components of the strategic plan, as well as recommendations to move the state towards achieving its vision and goals for offshore wind. **Volume III**, which includes four appendices, details floating offshore wind technologies, identifies types of potential impacts anticipated to arise from the development and operation of offshore wind projects, expands upon the approach, methodology, and data inputs used to identify suitable sea space, and provides offshore wind transmission schematics.

CHAPTER 2:
Creating a California Offshore Wind Industry

Offshore wind development will create a new industry in California with the potential to bring significant economic and environmental benefits. If developed at scale, offshore wind energy presents an opportunity to attract investment capital and provide economic and workforce development benefits to the state, California Native American tribes, and local communities.

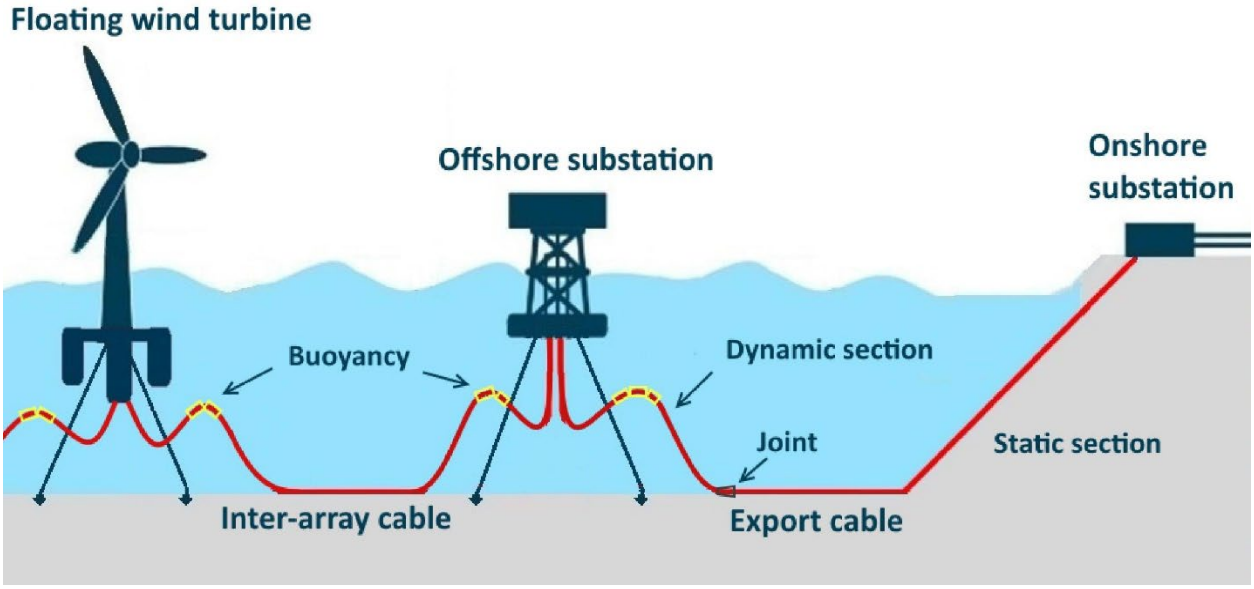
To date, most offshore wind energy projects have used fixed-bottom foundations, which are more suitable for shallow waters of 60 meters (about 200 feet) or less. At the end of 2022, there were only 10 floating offshore wind energy projects operating globally, totaling 123.4 MW.[8] The deep waters of the Pacific Outer Continental Shelf off California's coast have steep drop-offs and will require offshore wind turbines installed on *floating platforms*, also referred to as floating foundations.

There are several designs for floating platforms which vary depending on several factors, including sea and seabed conditions and depth, wind speeds, turbine size, and the availability and location of manufacturing facilities, or the availability and price of imported components and equipment. These designs include three primary types of floating offshore wind platforms: spar-buoy, semi-submersible, and tension leg platforms. The industry has indicated that semi-submersible platforms made of concrete, steel, or a hybrid are likely to be a preferred technology.

These floating platforms will include midwater-suspended electrical cables linking the turbines with electrical cables to transport the energy from the turbines to a substation, either onshore or offshore, feeding into the bulk transmission grid and distribution system. Mooring cables and anchors attach the floating platforms to the seafloor. Continued advancements in floating offshore wind technology will be needed to achieve the state's offshore wind planning goals. An example floating offshore wind technology configuration is shown in **Figure 2-1.**

8 Musial, Walter, Paul Spitsen, Patrick Duffy, Philipp Beiter, Melinda Marquis, Daniel Mulas Hernando, Jennifer King et al. August 2023. *Offshore Wind Market Report: 2023 Edition*. Available at https://www.nrel.gov/wind/offshore-market-assessment.html.

Figure 2-1: Floating Offshore Wind Configuration



Source: Lerch, De-Prada-Gil, and Molins. 2020 (https://doi.org/10.1016/j.ijepes.2021.107128)

Ports and Waterfront Facilities

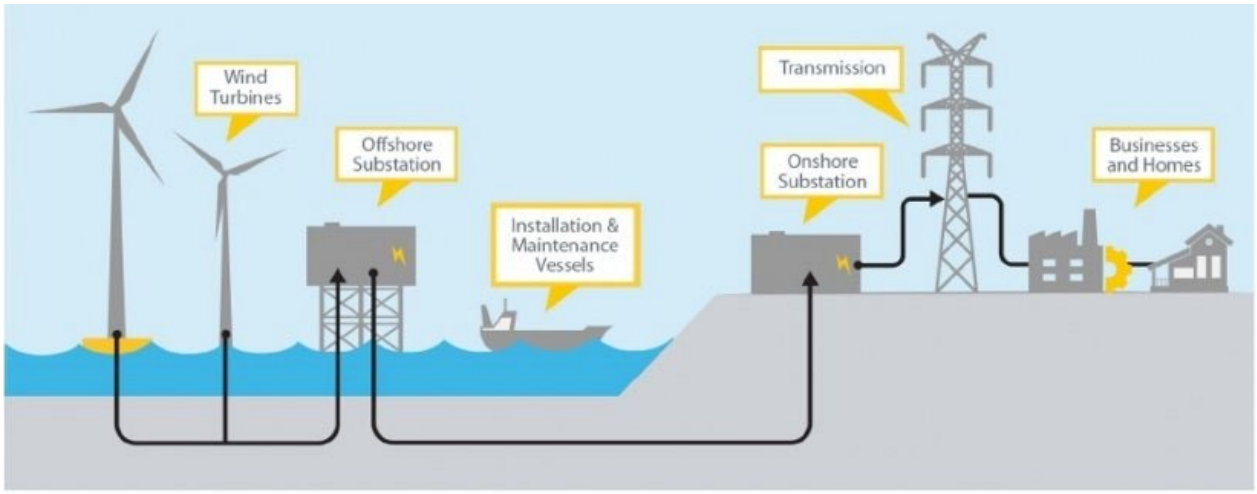
Seaports (or ports) and waterfront facilities are essential for developing a new offshore wind industry and will be an important driver of potential economic benefits, including jobs and economic growth opportunities. Offshore wind development will require upgrades to ports and waterfront facilities to support a range of activities, including construction and staging of floating platform foundations, manufacturing and storage of components, final assembly, and long-term operations and maintenance.

Types of port sites needed to support the industry may vary depending on the type of floating turbine design, location, mooring systems, distance from shoreline, and water depths for turbine operation. Regardless of the specific floating technology used, staging and integration port sites will be needed to receive, stage, store, assemble, and load offshore wind components. These staging and integration sites are critical to development of the offshore wind industry as components must be received and assembled in ports and towed out to the offshore wind lease areas. Operations and maintenance sites will be needed to support operation and maintenance vessels. Manufacturing or fabrication sites will be needed to receive raw materials and manufacture and assemble larger components. Additional detail on port types can be found in **Volume II, Chapter 6**.

Transmission

Transmission infrastructure is essential to developing an offshore wind industry, as it will be needed to deliver offshore wind generation to the transmission and distribution systems, as shown in **Figure 2-2**. The electricity system on the North Coast is relatively isolated from the larger California grid and serves primarily local communities, so additional transmission infrastructure will be needed in this region. Existing transmission on the South-Central Coast is robust, however there is still a need for long-term planning for future additional infrastructure.

Figure 2-2: Offshore Wind Transmission Infrastructure



Source: EERE *Offshore Wind Energy Strategies Report*. 2022 (https://www.energy.gov/sites/default/files/2022-01/offshore-wind-energy-strategies-report-january-2022.pdf)

CHAPTER 3:
Offshore Wind Potential Economic and Workforce Benefits

Creating a durable domestic floating offshore wind industry in California can provide good paying jobs and career paths for Californians, particularly those in communities near ports and waterfront facilities. To ensure these opportunities are realized, California will need to develop a skilled and trained workforce capable of developing offshore wind to meet the AB 525 planning goals of 2 to 5 GW for 2030 and 25 GW for 2045. The skilled workforce will include jobs in construction, manufacturing, engineering, operations and maintenance, sales, and maritime services. Many other jobs will also be created, such as longshoremen and tugboat and other watercraft operators.

The CEC's *Preliminary Assessment of Economic Benefits of Offshore Wind Related to Seaport Investments and Workforce Development* highlights the importance of port improvements and the development of a supply chain in California to maximize potential benefits, all of which will require significant investments.[9] A more detailed discussion of economic and workforce benefits can be found in **Volume II, Chapter 3**.

Quantifying Economic and Workforce Benefits

Many of the potential offshore wind economic and workforce benefits are expected to come from construction at ports, which are short-term and end once construction is complete. Although economic benefits come from multiple offshore wind activities, most are expected from long-lasting (more than 20 years) and well-paying jobs created in the manufacturing and supply chain sectors. These jobs will develop as the supply chain matures, and offshore wind businesses acquire materials, services, and parts from throughout California. Income generated from offshore wind activities can be re-spent into local, regional, and state economies, stimulating economic activity throughout the state, in both the short- and long-term, and increasing local, state, and federal tax revenue.

Several studies have been completed that estimate the potential economic and workforce benefits from offshore wind. Catalyst Environmental Solutions estimates that a $124 million investment at the Port of Humboldt, a $20 million training center, and workforce development could create 500 annual short-term jobs by 2030 and 14,000

9 Deaver, Paul and Jim Bartridge. December 2022. *Preliminary Assessment of Economic Benefits of Offshore Wind: Related to Seaport Investments and Workforce Development.* CEC-700-2022-007-CMD. Available at https://www.energy.ca.gov/publications/2022/preliminary-assessment-economic-benefits-offshore-wind-related-seaport.

annual long-term jobs by 2045 (in addition to the direct jobs included in the workforce).[10] In 2045, upward of $5 billion in state-level gross domestic product could be generated. In addition, $1.2 billion in labor income and $385 million in fiscal revenue could be generated by 2045. These benefits could be increased by about 20 percent if the state adopts robust policies and incentives to promote in-state supply chain capacity.

A similar assessment of the California Offshore Wind High Road Training Partnership being deployed by the proposed CADEMO project estimates the economic and workforce benefits for constructing the proposed 60 MW offshore wind demonstration project in state waters. In addition, the study evaluated a larger, hypothetical 1 GW Morro Bay project off the Central Coast.[11] The study found the proposed 60 MW CADEMO project could create more than 900 full-time jobs, with more than $200 million in economic output each year for the three years of construction. The larger 1 GW project could create more than 13,000 full time jobs, about $1.09 billion in earnings, $3.23 billion in economic output, and $1.57 billion in gross domestic product. A separate study by the Natural Resource Defense Council and Environmental Entrepreneurs estimates that 10 GW of offshore wind development in the Morro Bay and Humboldt offshore wind areas could create more than 169,000 jobs and more than $45 billion in short-term economic benefits to the state.[12]

Benefits for Communities

In addition to economic and workforce benefits, offshore wind development can improve public health, services, and resiliency, while benefitting those most impacted by the historical inequities of energy and other industries. The communities that should receive benefits can include California Native American tribal and underserved communities, the fishing industry, subsistence and cultural fishing, longshoremen, coastal visitors, nearby communities, those historically impacted by the energy industry, and those potentially impacted by the new offshore wind industry.

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10 The $124 million investment would only cover a relatively small portion of the costs needed to fully upgrade the Port of Humboldt. Additional port upgrade costs are discussed in Chapter 6.

Catalyst Environmental Solutions. April 2023. *Analytical Guidance and Benefits Assessment for AB 525 Strategic Plan: Seaport and Workforce Development for Floating Offshore Wind in California*. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=250296.

11 Collier, Robert, David Vallee, Miriam Noonan, and Stephanie Tsai. July 2023. *Trial Run for California's Offshore Wind Workforce: Lessons Learned From the CADEMO High Road Training Partnership*. Available at https://offshorewindhrtp.slocoe.org/.

12 Environmental Entrepreneurs. February 2023. *California's Offshore Wind Opportunity: Creating jobs by developing a new clean energy resource, and capitalizing on a robust job creation potential*. E2R: 22-10-B. Available at https://e2.org/reports/ca-offshore-wind-opportunity-2022/.

CHAPTER 4:
Potential Impacts of Offshore Wind and Avoidance, Minimization, and Mitigation Strategies

AB 525 specifies that offshore wind should be developed in a manner that protects coastal and marine ecosystems to ensure avoidance, minimization, and mitigation of significant adverse impacts. The CEC and coordinating agencies conducted extensive outreach to understand impacts and strategies to address them. This included numerous confidential tribal consultations, community engagement, weekly and biweekly meetings with working group calls, public workshops, webinars, consultation discussions, and in-person meetings. A detailed discussion of impacts and strategies can be found in **Volume II, Chapter 4**.

Potential Impacts from Offshore Wind Projects

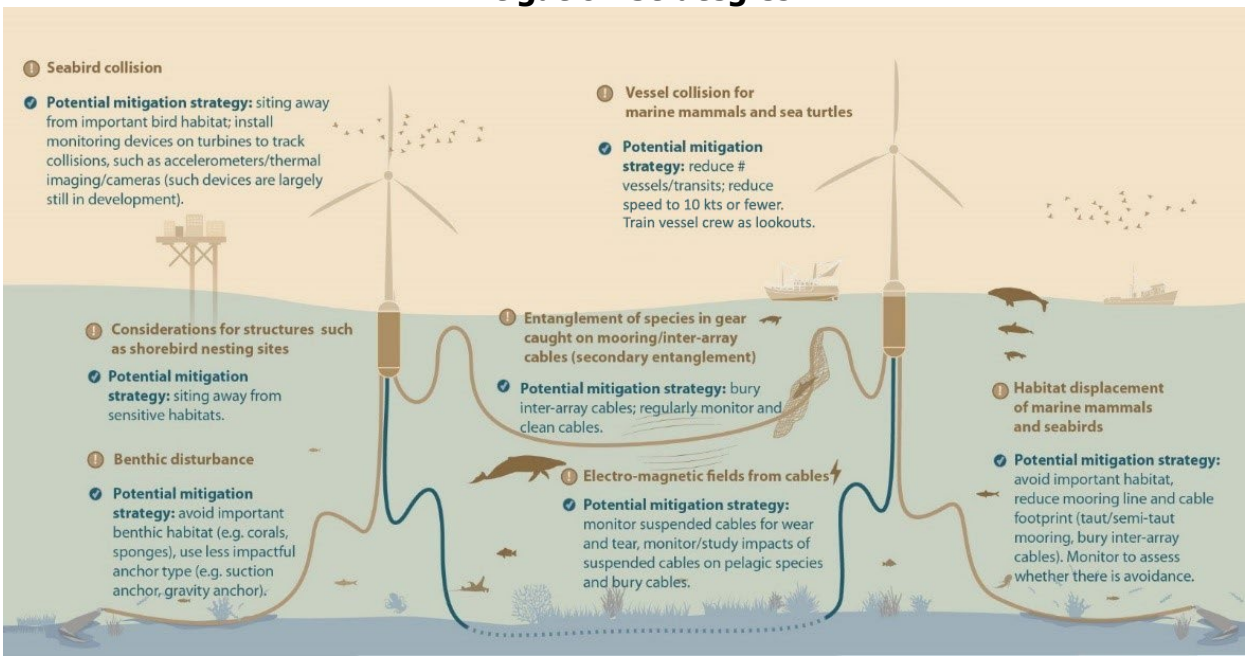
Installation and operation of offshore wind projects will likely impact tribal, cultural, and natural resources as well as existing uses in California's coastal and marine environment. The coastal resources that may be impacted include terrestrial and marine ecosystems (habitats and species), air and water quality, visual resources, sacred and culturally significant places and items, religious and cultural practices, commercial, subsistence, and recreational fishing, national defense readiness, public access to and along the shoreline, recreation, and industrial infrastructure.

While permitting agencies and developers have extensive experience with development and operation of various types of onshore and nearshore facilities, including deepwater oil and gas platforms, there is a great deal of uncertainty about the impacts from large-scale floating offshore wind facilities anchored more than 20 miles off California's coast. Nevertheless, reasonable inferences can be drawn regarding the types of impacts that may occur from developing and operating an offshore wind project. Based on the experience of projects elsewhere and other marine-based activities, it is possible to anticipate a range of potential impacts that may occur from developing and operating an offshore wind project. In addition to the information in the AB 525 Strategic Plan **Volume II, Chapter 4**, a detailed analysis and consideration of impacts in the current Morro Bay and Humboldt lease areas can also be found in the CCC's consistency determinations.[13] While this chapter addresses high-level impacts, as shown in **Figure**

13 The California Coastal Commission application of CZMA to BOEM's consistency determinations and the final reviews and adopted conditions and findings for each wind energy area: Humboldt WEA Coastal Commission Consistency Determination Adopted Findings and Conditions and Morro Bay WEA Coastal Commission Consistency Determination Adopted Findings and Conditions.

4-1, additional environmental reviews will be conducted to identify more specific impacts as projects develop.

Figure 4-1: Impacts of Floating Offshore Wind Components and Potential Mitigation Strategies



Source: Maxwell, et al. 2023 (https://doi.org/10.1016/j.jenvman.2022.114577)

Marine Biological Resources: Overview of Impacts and Strategies

The impacts to marine biological resources from offshore wind development will vary based on development phases, seasonality of climate (for example, seasonal upwelling, El Niño), and species life history (for example, migration, spawning). Offshore wind project impacts will also vary by type and intensity as well as the location of development and ongoing operation activities within the offshore wind lease areas. In addition, impacts will vary along the seafloor as infrastructure brings energy to shore, and within near and onshore areas affected by cable landings and port development. Understanding these potential impacts will allow regulators to work with project developers to avoid, minimize, or mitigate these impacts.

The scale and duration of offshore wind development and operations will potentially affect a wide range of marine biological resources including impacts to specific species (for example, humpback whales, albatross) and to habitats (for example, deep sea rocky reefs, coral and sponge habitat, estuarine habitat, and eelgrass beds). Potential impacts from offshore wind development and operation may result from surveys, installation, turbine operation and associated disturbance, underwater noise and electromagnetic fields (EMFs) from transmission cables. These impacts may include

damage or destruction of marine and coastal habitats, changes in oceanographic conditions, injury or mortality of wildlife caused by direct impacts (for example, bird strikes) or indirect impacts (for example, changes in behavior such as avoidance or shift in feeding or migratory patterns, and secondary entanglement).

Offshore within the wind lease areas, cable and mooring lines, increased vessel traffic, rotating turbines, and geophysical surveys for site assessment can potentially affect targeted groups of animals. Seabirds and bats may be impacted through collision with rotating turbines (or bird strikes). Marine mammals may be impacted through primary or secondary engagement with cables and mooring lines or fishing gear that has been snagged on turbine infrastructure. Increased underwater noise, from site assessment and turbine operation, may mask marine mammals' ability to hear. In addition, higher ship traffic may increase marine mammals risk of collision with vessels (or ship strikes). Some fish, crustaceans, sharks, skates, and rays may be impacted by the presence of EMFs that are produced from the flow of electricity through inter-array and export cables. Impacts that will be more dispersed throughout habitats include potential displacement and attraction, habitat disturbance or degradation, oil spills, introduction of invasive species, and changes in oceanographic processes such as upwelling.

Installation of transmission or export cables has the potential to create impacts to the seafloor along the length of the cable route from the lease areas to nearshore landing sites. Like the impacts described above, export cables can potentially increase primary and secondary entanglement risk and EMFs may affect marine species. Some of the impacts of the export cables may differ from the offshore impacts because export cables may encounter habitats that only occur closer to shore, such as kelp forests.

The impacts from port development on estuarine habitats are expected to be extensive. Port expansion or new construction may affect sensitive nearshore habitats such as eelgrass beds and construction activities like pile driving may affect nearby marine mammals and fishes. Like the offshore effects, increases in vessel traffic and activities in ports may increase the potential for oil spills, introduction of invasive species, underwater noise, and air pollution. The potential air emissions and water quality effects also raise environmental justice concerns for the surrounding port communities.

A more detailed discussion of impacts can be found in **Volume II, Chapter 4** and the Aspen Environmental Group analysis found in **Volume III, Appendix B.** Detailed analysis and consideration of impacts in the current Morro Bay and Humboldt lease areas can also be found in the CCC's consistency determinations.[14]

14 Ibid.

Strategies for Addressing Marine Impacts

Given the high degree of uncertainty surrounding the scope and scale of impacts associated with construction and operation of offshore wind development, comprehensive monitoring plans and adaptive management strategies for offshore wind projects will be key in ensuring that marine resources are protected. Significant research has been and continues to be conducted on this topic. Additional discussion of strategies is presented in **Volume II, Chapter 4**.

Some strategies to address marine impacts could include:

- Conduct siting surveys to characterize existing conditions, identify resources potentially at risk, and guide project design to avoid or minimize effects on sensitive resources.
- Undertake habitat restoration, the creation and maintenance of comparable habitat, and payments to appropriate approved mitigation funds.
- Monitor construction areas for the presence of species such as whales and sea turtles and implement response actions based on approved plans.
- Use shielding on subsea cables and other electrical infrastructure where EMFs are determined to have potential adverse effects.
- Minimize marine species entanglement by using best available mooring systems, ensuring appropriate tension on mooring lines, and the shortest practicable line lengths. All equipment should be designed to minimize species entrapment and undergo periodic or targeted maintenance and cleaning.
- Reduce seafloor habitat impacts by requiring anchoring and mooring designs that minimize seafloor disturbance.
- Implement a robust scientific monitoring program to assess potential changes to key physical processes (for example, upwelling) and ecological parameters (for example, primary productivity).
- Develop appropriate partnerships and infrastructure to implement before-after-control-impact monitoring design to assess impacts, including:
    - Establishing robust baseline data.
    - Using open-source environmental data practices and shared data portals.
    - Leveraging existing long-term data sets to understand natural and climate variability in the marine environment.
    - Identifying specific data gaps and mobilize resources to collect information quickly and efficiently.
- Identify and use appropriate permitting mechanisms to revisit and adaptively manage offshore wind projects if severe or unexpected impacts occur.

Native American Tribes and Peoples: Overview of Impacts and Strategies

AB 525 requires the CEC to prepare a strategic plan that identifies and proposes strategies for potential impacts to Native American and Indigenous peoples. For the purposes of this report, the CEC has interpreted Indigenous peoples to mean people indigenous to the state of California. Since the passage of AB 525, the CEC and the coordinating agencies have engaged in tribal consultations with California Native American tribes to discuss the potential impacts from future offshore wind projects in the development of the strategic plan.[15] A consistent theme in tribal comments was a strong desire to have a direct role in the decision-making process throughout the planning, permitting, operation, and decommissioning of offshore wind projects and associated infrastructure.

California Native American tribes exercise sovereign authority and self-governance over their members, lands, and internal affairs. Many California Native American tribes called for tribal energy sovereignty to be incorporated into offshore wind planning. Several tribal comments regarding tribal energy sovereignty centered around three main themes: meaningful consultation, energy reliability, and an equal governmental participatory role. Respect for tribal sovereignty in statewide energy planning requires early, often, and meaningful consultation during all stages of the offshore wind process. Many tribes emphasized the need for participation support through comments in working groups, public meetings, and submittals to the docket.

Many California Native American tribes and peoples have connections to the Pacific Ocean, the coast, and marine habitats and species. Each California Native American tribe has its own perspective, concerns, and priorities regarding offshore wind. Overall, California Native American tribes are concerned that the development of offshore wind is a continuation of resource extraction that will not have meaningful benefits to their governments and communities.

There is great concern about impacts to ancestral territories, sacred sites, and their direct connection and reliance on marine and coastal habitats and species. Tribes would like to see additional studies and monitoring to inform the decisions about identification of new sea space and future offshore wind leases. Tribes are also concerned that the influx of nonlocal workers to support a new industry, such as offshore wind, could lead to a potential increase of violence resulting in higher numbers of missing and murdered Indigenous peoples. Tribes are also concerned with uncertainties about potential

15 For the strategic plan, the CEC is relying on the following definitions: California Native American tribes include federally and nonfederally recognized Native American tribes located within California. Native American tribes include federally and nonfederally recognized Native American tribes within the United States of America. Indigenous people include individuals who identify as Indigenous, Native American, and who may be, but not are not necessarily, members of Native American tribes.

impacts of floating technologies and the development of ports and transmission infrastructure to support offshore wind.

Native American tribes have expressed deep concerns about the impacts of offshore wind and associated infrastructure on tribal cultural resources. This includes the impacts of offshore wind and associated infrastructure on sacred and culturally significant sites, features, places, and objects in the ocean, coast, and inland.[16] Tribes also have concerns about impacts to cultural landscapes such as viewsheds, interconnectivity of important and sacred sites, and biological resources, including plants, animals, and their habitats. In addition, they raised significant concerns about unknown weather impacts, including altered microclimatic conditions such as surface temperature, wind speed, and fog dispersion, as well as related impacts to species and habitats.

Many tribal members depend on local fishing and harvesting of sea life for cultural, subsistence, and commercial needs, and have concerns about the potential impact on their ability to feed their families and loss of income from commercial fishing. On the North Coast, tribes expressed significant concern about the impacts on the population and migration patterns of the already endangered salmon and other species.

Tribes noted concerns about the lack of local grid reliability and limited access to offshore wind generation if new transmission and distribution infrastructure does not include upgrades to local and tribal areas. They also desire increased accessibility to distributed energy resources and microgrids to provide local power and improve their local reliability.

Tribes seek to ensure they receive economic benefits associated with new jobs created by the offshore wind industry and want access to jobs and training programs that benefit tribal and local community members first. Tribes have also requested the development of tribal CBAs with lease holders to ensure benefits are provided to their tribes and tribal communities. Tribes are also concerned about the fiscal impact and burden for participation in ongoing and frequent meetings and consultations about offshore wind development, permitting processes, and other activities.

Strategies for addressing impacts to California Native American tribes could include conducting meaningful consultation with tribal representatives, supporting the establishment of strong, legally binding tribal CBAs, and collaborating with tribes on avoidance, mitigation, and co-management opportunities. In addition, strategies could include exploring public safety measures to reduce violent crime and sexual and gender-based violence against California tribes and other vulnerable populations and continuing to study these impacts. Additional discussion of strategies to address tribal impacts can be found in **Volume II, Chapter 4**.

16 Ocean tribal cultural resources include submerged sites and objects resting on top of the sea floor and underground. Coastal and in-land tribal cultural resources include a wide variety of sites, features, places, and objects that contain deep cultural and sacred significance to California Native American tribes.

Fisheries: Overview of Impacts and Strategies

Offshore wind development and ongoing operation can impact commercial and recreational fisheries in California with consequences to local economies and livelihoods. Fishing industry representatives have described several potential impacts to the commercial and recreational fishing industry through in-person and virtual outreach meetings, webinars, and written comments. The section below summarizes some of the potential impacts to commercial and recreational fishing from offshore wind development.

Offshore and nearshore, the construction, ongoing presence, and operation of floating turbines and substations, and related undersea infrastructure, can interfere with or restrict access to fishing areas used by commercial and recreational fishermen. Changes to access may result from hazards to navigation and present safety issues, such as interference with navigational radar from offshore wind turbines and project components and potential interference with United States Coast Guard (USCG) rescue efforts. Additionally, there are potential hazards from increased vessel traffic and potential snagging or loss of fishing gear associated with offshore wind project vessels and infrastructure. There is concern about the potential prohibition of fishing within leased and developed offshore wind areas that could potentially result in increased fishing pressure as fishing areas are reduced. In addition, fishermen fear the potential negative economic impacts to fishing and industries that support commercial and recreational fishing.

The fishing industry could also be affected by port construction, development, and ongoing activities to support manufacturing, assembly, and operation of offshore wind facilities. Fishing industry representatives also identified concerns about unknown environmental impacts from offshore wind development and expressed frustration about the uncertainty surrounding offshore wind overall, often commenting about lack of data, information, and engagement from the lessees.

Commenters from the fishing community, including commercial and recreational fishermen, raised concerns about what they perceive as the lack of measured and logical study of the possible negative effects posed by offshore wind development and the industrialization of the ocean. They identified concerns with upwelling, loss of fishing areas, site survey work, food security, socioeconomic concerns. They also note concerns with port dredging and materials, turbidity, oil spills, harbor entrance and vessel safety, air quality, and many other issues.

Fishing industry commenters are concerned that the negative impacts from offshore wind development are superficially acknowledged in the Draft Strategic Plan and noted that the report does not reflect existing studies they provided or address the cumulative impacts from all aspects of offshore wind development. Certain fishing industry commenters expressed a desire that the first offshore wind leases serve as pilot projects to gather data and information on impacts prior to moving forward with

additional leasing and development activities. They recommend creating offramps if detrimental impacts from offshore wind occur.

Strategies for addressing impacts to fisheries include the continuation of the Condition 7c California Offshore Wind and Fisheries Working Group,[17] as required by SB 286 (McGuire, Chapter 386, Statutes of 2023) to develop strategies to avoid or minimize impacts on the fishing community. In addition, the CCC is charged with adopting strategies from the working group by May 1, 2026, that include developing communications plans with the fishing community in areas affected by the offshore wind leases, maximizing continued access for fishermen to productive fishing areas, developing a template CBA for fishermen, and considering opportunities to compensate fishermen for economic losses. A more detailed discussion of potential marine impacts and strategies can be found in **Volume II, Chapter 4** and **Volume III, Appendix B**.

National Defense: Overview of Impacts and Strategies

Mission essential Department of Defense (DOD) operations in California are based inland, in coastal facilities, and in the ocean itself. DOD testing, training, and readiness activities include high- and low-level flights, search and rescue, marine transit, and they rely on radar and other tracking technologies. The construction and operation of floating offshore wind turbines can alter radar signals and present additional risk of collisions between military marine vessels or aircraft and floating turbines.

Military marine vessels may collide with or snag mooring cables, inter-array cables, and turbine anchor systems. Onshore transmission lines can present hazards to DOD activities, especially for low-altitude flights. In ports and harbors, offshore wind construction and operation, and maintenance could compete with military uses of port facilities and traffic lanes. The increase in marine vessel traffic may also increase the number of events requiring search and rescue actions by the USCG.

Avoidance of conflict with DOD coastal, marine, submarine, offshore ranges, and air operations would be ensured through coordination among the Office of Secretary of Defense (OSD) Siting Clearinghouse, BOEM, and offshore wind project developers during leasing, siting, design, and operation activities. Mitigation would focus on avoidance of conflicts, considering potential interference with navigational radar, risk of collisions with infrastructure (including anchoring systems and floating turbine structures), risk of electromagnetic emissions conflict, and risk of snagging or being entangled with underwater cables. Coordination in advance of offshore facility construction and operation should also include the development of communications plans and vessel transit routes to ease vessel lane management, law enforcement, and

17 The text of Condition 7c can be found in the CCC's concurrence letter is available at https://documents.coastal.ca.gov/assets/upcoming-projects/offshore-wind/CD-0004-22_ConcurrenceLetter.pdf

search-and-rescue activities by the USCG. Additional discussion of potential military impacts and strategies is addressed in **Volume II, Chapter 4**.

Underserved Communities: Overview of Impacts and Strategies

Underserved communities have experienced a disproportionate level of impacts from a combination of economic, health, and environmental burdens, which include poverty, high unemployment, air and water pollution, the presence of hazardous waste, as well as high incidences of asthma and heart disease.[18] Developing an equitable energy system requires that the economic, health, and social benefits accrue across all levels of society, regardless of ability, race, or socioeconomic status. This requires intentionally designing systems, technologies, procedures, and policies that help lead to the fair and just distribution of energy system benefits. California's clean energy transition and the development of offshore wind provides a unique and historic opportunity to ensure benefits to communities who have suffered the most from systemic injustices.[19]

Investments in offshore wind transmission and distribution infrastructure have the potential to provide reliability and resilience benefits to rural and remote communities with inadequate energy services that limit their ability to participate in the clean energy economy. Offshore wind development could provide significant equity benefits by creating well paying, sustainable jobs from upgrading port and waterfront facilities, developing local supply chain capacity, manufacturing of components, and assembly of offshore wind turbines. Local workforce partnerships and training and education programs can support the development of an equitable and diverse workforce that reflects California's population.

Community groups expressed strong support for zero emission goals for ports, and electrifying trucking and goods movement as much as possible. While offshore wind presents potential benefits to underserved communities, the construction of these facilities may add to the cumulative impacts of environmental burdens from existing industrial development and environmental hazards for port communities. Industrial activity and development at ports can impact underserved communities living near ports through air, water, noise, and light pollution. Additional air pollution may occur from increased vehicle emissions on land and offshore to transport raw materials and turbines. The construction and operation of offshore wind turbines using oil-based

18 California Public Utilities Commission. 2021. "Disadvantaged Communities." Available at https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/disadvantaged-communities.

19 Governor Gavin Newsom. September 2022. *Executive Order N-16-22*. Available at https://www.gov.ca.gov/wp-content/uploads/2022/09/9.13.22-EO-N-16-22-Equity.pdf?emrc=c11513.

lubricants and other products that can spill may cumulatively add to existing environmental burdens for local communities.

The CEC and the coordinating agencies met with community members and environmental justice advocates in the development of this report. While there is support for the potential benefits that offshore wind could bring, there are also concerns about the potential burdens to port communities. The strategic plan discusses strategies and considerations raised by advocates to reduce and mitigate potential pollution burdens from the offshore wind planning and development process. Advocates would like to see increased engagement with potentially impacted communities, zero-emission goals for ports, a timely transition to clean energy resources, and strong legally binding CBAs.

Strategies also include conducting early and meaningful community outreach and engagement efforts throughout the process, identifying opportunities to support the capacity of communities to participate in the process, and holding informational meetings at trusted locations in the affected communities at times convenient for working families. Strategies to mitigate and reduce pollution should be considered from the beginning of the offshore wind planning and development process.

Additional strategies for addressing impacts to underserved communities include prioritizing infrastructure projects that also have co-benefits for communities. These could include projects that address reliability issues for communities most impacted during climate emergencies (for example extreme heat, wildfire) and other emergencies such as public safety power shutoffs. Further strategies include supporting the development of enforceable community benefits and CBAs as incentivized and finalized by BOEM and Bureau of Safety and Enforcement (BSEE). Other strategies could include exploring CBA requirements in state licensing of offshore wind projects, and supporting training, hiring, and recruiting for employment opportunities within underserved communities and communities most impacted by offshore wind development. A more detailed discussion of potential impacts and strategies related to underserved communities is provided in **Volume II, Chapter 4**.

CHAPTER 5:
Sea Space for Offshore Wind Development

AB 525 directs the CEC, in coordination with the CCC, CDFW, OPC, and CSLC, to work with interested parties, other state, local, and federal agencies, and the offshore wind energy industry, to identify sea space in two phases. First, identify the sea space established by BOEM in its 2018 call for nominations and any other relevant information necessary to achieve the offshore wind planning goals of 2 to 5 GW by 2030. Second, identify suitable sea space for future development of offshore wind to accommodate the 2045 offshore wind planning goal of 25 GW.

AB 525 also directs the CEC, in identifying suitable sea space, to consider existing data and information on offshore wind resource potential and commercial viability along with the existing and necessary transmission and port infrastructure, while protecting tribal, cultural, and biological resources with the goal of prioritizing least-conflict ocean areas. In addition, AB 525 requires the CEC to incorporate the information developed by BOEM's California Intergovernmental Renewable Energy Task Force and from the California Offshore Wind Energy Gateway. A more detailed discussion of suitable sea space can be found in **Volume II, Chapter 5**.

Identification of Suitable Sea Space

The process for identifying sea space includes spatial mapping of locations potentially suitable for offshore wind in federal waters from about 3 miles offshore to the 200-mile federal boundary. Working with other state agencies, the CEC identified six sea space locations for further screening: five areas off the North Coast and one off the South-Central Coast just north of the current Morro Bay Wind Energy Area. Each sea space location is characterized by the following factors: average wind speeds greater than 7 meters per second, average water depth of 2,600 meters or less, ocean bottom slope of 10 percent or less, and a minimum distance of 20 miles from shore.

Offshore wind development in waters up to 1,300 meters deep is more feasible in the near term considering the current status of offshore technologies. In addition, the shorter distance to ports and transmission infrastructure, access to components and construction materials, and transportation costs are generally more favorable for offshore wind development and associated activities at 1,300 meters. To accommodate the offshore wind planning goals, sea space was identified that could support deployment in deeper waters up to 2,600 meters to help the industry meet the longer-term 2045 goals. The CEC assumed projects could be developed at up to 2,600 meters as offshore wind technologies advance over the next two decades. Development in deeper waters is anticipated to be less challenging as technology matures and scales up

and associated costs decline. As efficiency improvements are made in the technology, less sea space would be needed to meet the offshore wind planning goals.

The CEC identified potential conflicts in these areas including marine biological resources such as benthic habitats,[20] marine birds, marine mammals, and sea turtles. The CEC also screened for ocean and coastal uses including the viewsheds, cultural resources, and practices of California Native American tribes and Indigenous peoples. Other existing ocean uses such as commercial fisheries and shipping, and DOD military testing, training, and readiness activities were included in conflict screening. The shape of the sea space areas was not changed due to the existence of these potential conflicts, with the exception of distance from shore.

Throughout the spatial data analysis, CEC found that ocean use activity and the presence of marine species are generally highest within 20 miles from shore. Therefore, identification of sea space beginning 20 miles from shore avoids the highest conflict areas and minimizes impacts. A map of suitable sea space that the CEC identified can be found in **Figure 5-1**. More detailed descriptions and maps showing these potential large-scale conflicts are presented in **Volume II, Chapter 5** and **Volume III, Appendix C**.

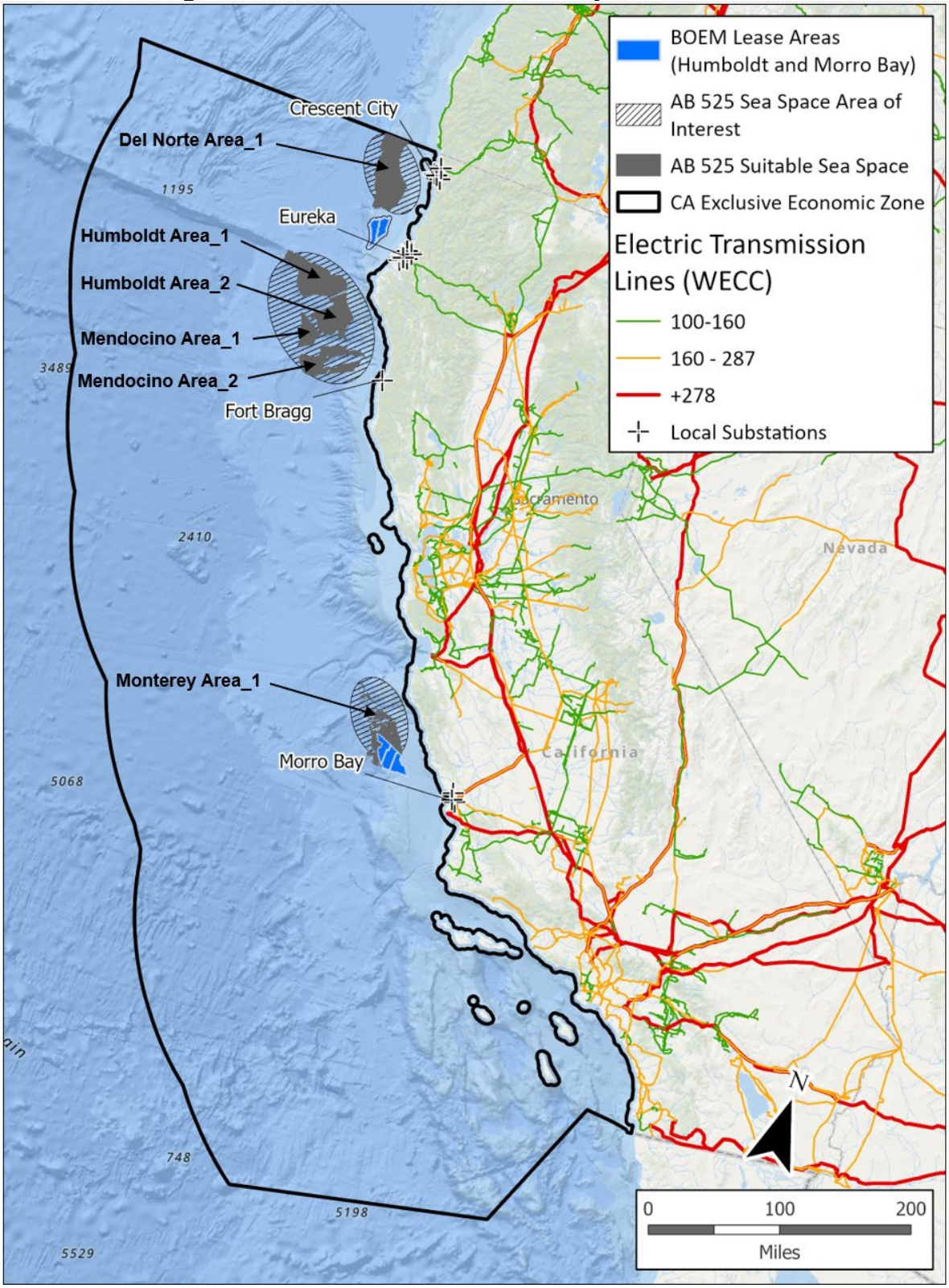
Similar to the process used by BOEM to establish the 2018 offshore wind Call Areas, identification of sea space for future Call Areas should involve robust outreach and engagement with members of coastal communities, fishing communities, California Native American tribes, local, state, and federal agencies, the commercial shipping industry, and the DOD OSD Siting Clearinghouse. In addition, the process should engage academics, scientists, environmental organizations, renewable energy developers, and other interested parties. Data received through that outreach and engagement should be added to the California Offshore Wind Energy Gateway and will support BOEM in issuing future Call Areas.

Sea Space Conclusions

It is expected that the 2030 goal of 2 to 5 GW can be met from projects developed in the existing lease areas. The CEC also identified sufficient sea space area to meet the 2045 offshore wind planning goal of at least 25 GW. Available information indicates that up to 50 percent of sea space identified could be unsuitable for offshore wind development due to conflicts with marine resources and other uses of the sea space. Visual comparison of available geospatial layers within the sea space shows large-scale conflicts with benthic habitats, commercial shipping lanes, and military activities. These conflicts could reduce the amount of available sea space, depending on decisions made regarding ocean use conflict minimization and marine resource protection.

20 The term benthic refers to anything associated with or occurring on the bottom of a body of water.

Figure 5-1: AB 525 Suitable Sea Space Identified



Source: CEC. 2023

CHAPTER 6:
Port Infrastructure Needs

AB 525 directs the CEC to develop a plan to improve ports and waterfront facilities to support offshore wind energy development as part of the strategic plan. Ports and waterfront facilities will play a critical role in developing an offshore wind industry in California. Existing California port infrastructure is unable to support an offshore wind industry in the state. As it will take a decade to make the needed port improvements that can support the full offshore wind supply chain, the state may need to import components from other parts of the world to meet the state's 2030 offshore wind planning goals. However, to meet the state's 2045 offshore wind planning goals significant investments in port infrastructure upgrades are required.

Offshore wind turbines deployed off the California Coast are likely to be between 15 to 25 MW and the only feasible way to transfer components from one location to another is over water. As a result, staging and integration port sites where floating offshore wind turbines will be assembled are critical and must be available in time to support the future of offshore wind in California. Once assembled, fully integrated wind turbine generator systems can be towed out to the installation site.

Waterfront facilities at ports will also be needed to manufacture offshore wind components such as turbine blades, towers, nacelles (the housing for generating components), and floating foundations. Port sites will also be needed to support ongoing operations and maintenance for offshore wind facilities. Furthermore, port development provides an opportunity for California to maximize the economic benefits associated with developing an offshore wind industry by creating jobs and developing a local supply chain within the state.

A more detailed discussion of port infrastructure and the findings from the *AB 525 Port Readiness Plan* (Port Plan) for ports to meet the offshore wind planning goals can be found in **Volume II, Chapter 6**.[21]

Port Infrastructure Conclusions

No single port site in California can serve all the needs of the offshore wind industry. Instead, a coordinated multiport strategy will be needed and could require more than

21 Lim, Jennifer and Matt Trowbridge (Moffat & Nichol). July 2023. *AB 525 Port Readiness Plan*. 221194/02. Available at https://slcprdwordpressstorage.blob.core.windows.net/wordpressdata/2023/07/AB525-Port-Readiness-Plan_acc.pdf.

16 large and 10 small port sites to support offshore wind development over the next decade or more. Staging and integration sites, and operations and maintenance sites are essential, unlike manufacturing and fabrication sites, since components can be imported. The Port Plan identifies several port sites within the state that can be used for these offshore wind activities, and notes that these sites must be developed as soon as possible to provide the state with the best opportunity to achieve the offshore wind planning goal of 25 GW by 2045.

The number of needed port sites or acreage potentially required for the different types of offshore wind facilities are summarized in **Table 6-1** below. The Port Plan identifies that three to five 80-acre sites are required for staging and integration, and 12 sites will be required for manufacturing and fabrication (including two sites for blades, one site for towers, one site for nacelles, four sites for floating foundation subcomponent manufacturing, and four sites for floating foundations assembly). Nine to 16 berths at several port sites will be required for operations and maintenance activities.

Table 6-1: Number of Port Sites or Acreage to Meet 25 GW Offshore Wind Energy by 2045

Type of Site	Number of Port Sites or Acreage Required
Staging and Integration Sites	**3 to 5**
Blade Manufacturing and Fabrication Sites	**2**
Tower Manufacturing and Fabrication Sites	**1**
Nacelle Assembly Sites	**1**
Foundation Subcomponent Manufacturing and Fabrication Site	**4**
Foundation Assembly Sites	**4**
Service Operations Vehicles Berths for Operations & Maintenance Activities	**9 to 16**
Mooring Line and Anchor Storage Sites	**20 to 65 acres**
Electrical Cable Laydown Sites	**12 to 22 acres**

Source: Port Plan. 2023

Staging and integration sites are critical to support the development of offshore wind as there are few locations that meet the offshore wind port requirements. The Port Plan concludes that the Ports of Humboldt, Long Beach, and Los Angeles are the most appropriate locations for staging and integration sites. The Ports of Humboldt and Long Beach are actively working to become staging and integration sites to meet the most immediate needs of the offshore wind industry. Furthermore, an estimated investment of about $11 to $12 billion is needed to upgrade existing port infrastructure to meet the 2045 offshore wind planning goal. A collaborative port development strategy to support various port upgrades and programs to encourage early-stage port development (including port readiness, concept design, engineering, and permitting and environmental assessments) are needed.

CHAPTER 7:
Workforce Development

AB 525 directs the CEC to analyze offshore wind workforce development needs, including the need for skilled and trained workers with specialized skills and adequate safety training to support the offshore wind industry. It also requires the CEC to develop recommendations for workforce standards, including prevailing wage, apprenticeship, local hiring, and targeted hiring standards that ensure sustained and equitable economic development benefits.

Workforce benefits can accrue from the development and preservation of a skilled and trained workforce, the creation of long-term jobs, and the development of a local offshore wind supply chain. The workforce to support offshore wind includes workers to install offshore wind turbines, cables, offshore or onshore substations, as well as workers to upgrade infrastructure across the state, such as port and waterfront facilities and transmission infrastructure. The development of a local workforce presents an opportunity to attract investment capital and provide significant economic benefits to the state and local communities.

In preparing the strategic plan chapter on workforce, the CEC relied on two recent studies: the *Analytical Guidance and Benefits Assessment for AB 525 Strategic Plan*,[22] and the *AB 525 Workforce Development Readiness Plan*.[23]

Workforce Development Needs

The type and number of jobs needed vary during each phase of project development (supply chain and manufacturing, integration and assembly, and operations and maintenance) and by component type (turbines, nacelles, blades, foundations, cables for transmission and mooring, and others). The offshore wind workforce requires a diverse set of skills for each job type. The job types can be grouped into 6 categories: technicians and trades, construction and assembly, maritime and port workers, engineers, management, and administrative and clerical.

22 Catalyst Environmental Solutions. April 2023. *Analytical Guidance and Benefits Assessment for AB 525 Strategic Plan: Seaport and Workforce Development for Floating Offshore Wind in California*. TN 250296. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=250296.

23 Fox, Brooklyn and Sarah Lehmann (Moffatt & Nichol). June 2023. *AB 525 Workforce Development Readiness Plan*. 221194/02. Available at https://slcprdwordpressstorage.blob.core.windows.net/wordpressdata/2023/07/AB525-Workforce-Readiness-Plan_acc.pdf.

Roughly two-thirds of the offshore wind workforce is centered around the supply chain and manufacturing of key components while approximately 20 percent is responsible for wind project operations and maintenance.[24] The integration and assembly of offshore wind projects requires highly skilled and trained workers, which represent only 11 percent of the total workforce needed. Supply chain and manufacturing jobs will be distributed across the state as the offshore wind supply chain expands, and port facilities are upgraded to manufacture and provide materials, services, and components.

These careers and high-paying jobs do not require a bachelor's degree; instead, much of the education will be centered on some form of postsecondary education or training and certification. The build-out of the offshore wind supply chain will have the highest demand for skilled-trade standards because of the broad range of activities they perform across the various project phases.

Workforce Standards

Workforce standards are proactive policy mechanisms that support the creation of high-quality jobs by enacting specific requirements regarding worker job quality and job access. Workforce standards can include prevailing wage, workforce skills, workforce training, apprenticeship programs, local hiring initiatives, targeted and equitable hiring standards. These standards can ensure worker safety and quality control in all phases of offshore wind development.

Workforce safety is a top priority for the offshore wind workforce and industry. Offshore wind project activities are conducted both onshore and offshore, presenting a need to delineate responsibility for workforce safety to the appropriate federal and state entities. Onshore worker safety is primarily under the authority of the California Division of Occupational Safety and Health, with some aspects also regulated at the federal level. Offshore worker safety is primarily overseen by the federal entities, including the USCG, which is primarily responsible for maritime safety, security, and environmental stewardship in U.S. ports and inland waterways.

Workforce standards, including prevailing wage, can be part of Project Labor Agreements, which BOEM historically requires for offshore wind projects. In BOEM's December 2022 California offshore wind lease sale, bidding credits were offered in exchange for commitments to fund workforce training programs and CBAs. California offshore wind lessees committed at least $23.34 million toward general CBAs and at least $29.35 million toward lease-area use CBAs.

24 BVG Associates Limited. October 2017. *U.S. Job Creation in Offshore Wind: A Report for the Roadmap Project for Multi-State Cooperation on Offshore Wind*. NYSERDA Report 17-22. Available at https://www.cesa.org/wp-content/uploads/US-job-creation-in-offshore-wind.pdf.

Workforce Training Programs and Apprenticeships

Offshore wind occupations differ by type of education, certification, or credentialing. Most occupations will require some form of postsecondary education or training, such as a bachelor's degree, apprenticeship, or technical certification. In the CEC's engagement with representatives of key labor organizations, manufacturers, offshore wind project developers, training entities, and apprenticeship experts, they identified the need for education in science, technology, engineering, and math (STEM), including computer competency, for operating and maintaining offshore wind components and facilities. Offshore wind project developers and training entities highlighted the importance of maritime training, and note that maritime experience, engineering, and technical skills needed for the offshore wind industry are transferable from other existing industries.

Workforce Development Conclusions

The most needed skills in the near term for the offshore wind industry are in the trades, technician, and construction sectors. In the longer term, the majority of jobs are in the supply chain and manufacturing sector. A workforce with the right skillsets will require training that must be timed to accommodate industry needs for different types of workers. Many skilled-trade jobs will require specific training and certifications that can be obtained from apprenticeships, pre-apprenticeships, and vocational training programs. Effective workforce development depends heavily on partnerships between industry, educational and training institutions, government entities, and the community. A more detailed discussion of workforce development can be found in **Volume II, Chapter 7**.

CHAPTER 8:
Transmission Technology and Alternatives Assessment

AB 525 requires the CEC, in consultation with the CPUC and the California ISO, to assess the transmission investments and upgrades necessary, including subsea transmission options, to support the 2030 and 2045 offshore wind planning goals. The assessment must include relevant cost information for subsea transmission and network upgrades, as well as the extent to which existing transmission infrastructure and available capacity could support offshore wind energy development.

Transmission and interconnection infrastructure is needed to transport power from offshore wind projects and connect them to the larger transmission system to deliver generation to load centers. Further, existing distribution infrastructure will need to be improved and upgraded to address local reliability concerns and allow future load growth and the connection of North Coast tribes and their communities to the grid.

Some of the key technologies needed to interconnect large amounts of offshore wind to meet the planning goals are viable but still emerging and not yet commercially available. Continued research and development on dynamic cables, floating substations, direct current circuit breakers, and other technologies are needed to meet California's long term offshore wind planning goals. In addition, innovative approaches such as networked or backbone systems needed to efficiently interconnect offshore wind projects and minimize environmental impact will be required.

Because the existing system in the North Coast serves relatively small local loads and does not have an interconnection to major existing transmission paths in California, the Schatz Energy Research Center assessed several offshore wind geographic locations and various potential transmission scenarios for Northern California and Southern Oregon offshore wind development.[25] The scenarios assessed a range from 7.2 to 25.8 GW within the study area, which includes five offshore wind areas.[26] The Schatz Energy Research Center study presents 10 transmission alternatives specific to the Northern California and Southern Oregon transmission systems. The different transmission alternatives include overland transmission, subsea transmission, high voltage

25 Zoellick, J., G. Adams, A. Mustafa, A. Cooperman, et al. 2023. *Northern California and Southern Oregon Offshore Wind Transmission Study*. Schatz Energy Research Center. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=252604.

26 These areas include, from north to south, the Coos Bay Call Area, the Brookings Call Area, the Del Norte planning area, the Humboldt Wind Energy Area, and the Cape Mendocino planning area.

alternating current and direct current options. In addition, a high-level feasibility assessment examined potential environmental impacts and the siting viability for developing the alternatives. Unlike the North Coast, the Central Coast has a robust transmission system in place. Additional transmission alternatives to interconnect offshore wind generation on the Central Coast will require further study.

Large investments in transmission upgrades and new transmission infrastructure will be needed to accommodate offshore wind development to meet the state's planning goals and deliver offshore wind power to local communities and the larger grid to serve major load centers. The study recommends a phased approach to transmission development and implementation that can provide for both cost-savings and reduced environmental impacts, while helping the state achieve the offshore wind planning goals. This can avoid stranded transmission investments built for near term needs that must be removed and replaced in later stages of development. **Volume II, Chapter 8** provides additional detail and discussion of transmission technologies and alternatives for offshore wind.

Transmission Technology and Alternatives Conclusions

While currently available technology has met the needs of existing offshore wind projects, some of the transmission technologies needed to bring offshore wind energy to shore and interconnect with the larger bulk transmission system are still emerging. Continued research and development will be needed on dynamic cables, floating substations, direct current circuit breakers, and other transmission technologies to minimize environmental impacts, accommodate offshore wind projects located in deeper waters, and to export larger volumes of power in an efficient manner. Although several studies have evaluated potential transmission needs on the North and Central Coasts, additional detailed evaluation will be required. Finally, exploring transmission alternatives that connect regionally can maximize the potential benefits of offshore wind across the Western Interconnection.

CHAPTER 9:
Transmission Planning and Interconnection

AB 525 identifies the need for transmission planning to deliver offshore wind generation. The transmission system will need to expand dramatically to meet the state's clean energy and climate policies, not just the offshore wind planning goals. This chapter discusses transmission planning and interconnection, which are long lead-time activities that need to be done in an integrated process. A more detailed discussion of transmission planning and interconnection can be found in **Volume II, Chapter 9**.

California has enhanced its transmission planning processes over the last several years and today has robust processes in place. The California ISO, CPUC, and CEC bolstered transmission planning with a December 2022 memorandum of understanding (MOU) to tighten the linkages between the agencies. While these processes ensure development of transmission projects for reliability, economic, and policy reasons, innovative planning approaches may be needed to identify and move offshore wind transmission projects forward. Progress on identifying future transmission needs and the development of specific transmission projects is being made both in the California ISO's annual transmission plan and their *20-Year Transmission Outlook*.

On May 23, 2024, the California ISO Board approved the *2023-2024 Transmission Plan* which included new transmission projects needed to accommodate offshore wind resources from the Humboldt area.[27] The project includes a new Humboldt substation and an approximately 260-mile line to interconnect to a substation near the northern Greater Bay area. In addition, the project includes an approximately 140-mile line to interconnect to a southern Shasta County substation. The total estimated cost of these upgrades is $3.1 to $4.5 billion with an estimated in-service date of 2034.

Another important aspect of transmission planning is ensuring sufficient transmission corridors that can accommodate new and expanded transmission. The CEC has conducted landscape-level planning over the years to identify and prioritize appropriate locations for renewable energy and transmission development. A landscape-scale approach considers a wide range of potential constraints and conflicts, such as environmental sensitivities, habitats, existing land uses, tribal cultural resources, and others. Landscape planning, along with the possible use of the CEC's corridor designation authority, could expedite transmission development, especially for North Coast offshore wind resources where transmission availability is severely constrained.

27 California ISO. May 2024. *2023-2024 Transmission Plan*. Available at https://www.caiso.com/documents/iso-board-approved-2023-2024-transmission-plan.pdf

To support the California ISO's new transmission project to access offshore wind resources from the Humboldt area, the CEC conducted a high-level corridor assessment of land-use and environmental constraints associated with alternative corridors for transmission infrastructure.[28] This evaluation provides supplemental information for interested parties and potential project developers on permitting challenges that may be faced in developing such transmission infrastructure.

In recent years, interconnecting generation and battery storage projects has become increasingly challenging as the California ISO's interconnection queue has been inundated with interconnection requests for new resources. To address this, interconnection process enhancements are underway. In addition, innovative approaches may be needed to interconnect offshore wind projects, including network, backbone, and meshed systems currently being explored on the East Coast and in Europe. These approaches will use emerging technologies that could more efficiently interconnect wind projects and potentially reduce environmental impacts from this infrastructure.

Large amounts of transmission upgrades will be needed in the coming decades to support the development of clean and renewable resources including offshore wind. Commenters in the AB 525 process raised concerns about the length of time it takes to approve transmission projects. To facilitate transmission development, the state's permitting processes may require enhancements to eliminate possible duplication in need assessment, permitting, and environmental review at the CPUC and California ISO. In addition, some commenters suggest that targeted transmission planning, similar to the planning undertaken to accelerate transmission development for wind generation in the Tehachapi area, may be needed to identify and permit sufficient transmission for offshore wind.

Transmission Planning and Interconnection Conclusions

Proactive planning and innovative interconnection approaches will be needed to bring transmission projects online to meet the offshore wind planning goals. Ongoing landscape-level planning for transmission can evaluate potential corridor options and associated environmental and land use conflicts not historically addressed in existing transmission planning processes. Conducting corridor routing studies, environmental permitting analyses, community and tribal engagement, and cost assessments can provide valuable input to the transmission planning processes and regulatory decisions. Eliminating duplication in need determinations and environmental reviews for transmission projects can help ensure they come online in a timely and efficient manner.

28 CEC. *Transmission Corridor Evaluation: Humboldt Wind Energy Area*. May 2024. Prepared by Aspen Environmental Group. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=256193.

In addition to planning for bulk transmission, assessing the potential to provide reliability and resiliency benefits to offshore wind host, tribal, and other rural communities along transmission routes can help address equity issues. Further, examining the potential role of energy storage to complement new offshore wind transmission is important as it can relieve congestion, minimize curtailment, and optimize the use of offshore wind energy when it is most valuable.

CHAPTER 10:
Offshore Wind Permitting

AB 525 directs the CEC to develop a permitting roadmap and a chapter in the strategic plan addressing offshore wind permitting.[29] The permitting process for any large infrastructure project, such as offshore wind, is complex and involves numerous state, federal, and local agencies, with differing information requirements, timelines, and processes. Different agencies have responsibilities for permitting different aspects of offshore wind development, along with different application and review processes. The Desert Renewable Energy Action Team (REAT) was a coordinated multi-agency permitting approach developed in 2008 that streamlined permitting for utility-scale renewable energy projects in the California desert. For a coordinated, comprehensive, and efficient permitting process for offshore wind infrastructure, the Desert REAT model could be applied to the ocean and marine environments.

Proposed Ocean REAT Approach

There are several potential elements of the proposed structure for a coordinated REAT permitting approach applied to the ocean and coastal environment for offshore wind and related development, referred to as the *Ocean REAT approach*. These include:

Establish Ocean REAT Entities:

- **Ocean Renewable Energy Policy Group (REPG)**: The Ocean REPG would be composed of executives and principals from state, federal, tribal, and local entities with a role in the planning, environmental review, and permitting aspects of California offshore wind projects. The Ocean REPG would receive updates from agency staff and resolve potential issues, disputes, or conflicts that emerge.
- **Ocean Renewable Energy Action Team (REAT)**: The Ocean REAT would be composed of staff from the entities identified above. This interagency staff working group would coordinate with lessees, interested parties, and tribes in the review of applications and preparation of environmental documents. They would regularly update the Ocean REPG and elevate issues, disputes, or conflicts for resolution.

The Ocean REAT agencies would work with relevant federal, tribal, local entities, and underserved communities to encourage participation and ensure coordination. This process would designate an agency responsible for coordinating and convening

29 Jones, Melissa, Kristy Chew, Eli Harland, and Jim Bartridge. 2023. *AB 525 Assembly Bill 525 Offshore Wind Energy Permitting Roadmap*. California Energy Commission. Publication Number: CEC-700-2023-004. Available at https://www.energy.ca.gov/event/workshop/2023-06/workshop-assembly-bill-525-offshore-wind-energy-permitting-roadmap.

meetings to ensure accountability, tracking progress, and defining overall schedules and milestones for permitting processes.

Volume II, Chapter 10 provides an illustrative timeline for completing coordinated NEPA, CEQA, and permitting reviews. The timeline assumes that the federal NEPA Environmental Impact Statement (EIS) and state CEQA Environmental Impact Report (EIR) documents are completed within 24 months of a construction and operations plan being deemed complete by BOEM. In addition, assuming the EIS and EIR provide complete supporting analysis, the other final permits could be approved within an additional 6 months, for a total review period of approximately 30 months.

The 30-month timeline assumes that during the site assessment phase of a lease, MOUs and any other necessary agreements are put in place before the 30-month timeline begins. This includes the CSLC issuing a lease for the parts of the project in state waters and permits from the CDFW. The CCC would issue a coastal development permit for any component of the project in the coastal zone or offshore within state waters. The CCC would also need to issue a coastal consistency certification before the Record of Decision is approved to comply with federal and state laws. A more detailed discussion of offshore wind permitting can be found in **Volume II, Chapter 10**.

CHAPTER 11: Recommendations

Offshore wind presents an opportunity for California to continue advancing the state's clean energy and climate goals by diversifying the state's energy portfolio and supporting a reliable and resilient electric grid, while also creating economic development and workforce benefits. This will require time, effort, and funding to implement offshore wind in California. The pace of implementation will depend upon the feasibility and availability of resources. **Volume II, Chapter 11** shows a conceptual timeline for the development and permitting of offshore wind projects, ports, and transmission infrastructure needed to achieve the state's offshore wind planning goals. This strategic plan, with the below recommendations, provides direction and guidance for the development of offshore wind in a responsible and timely manner.

Addressing Potential Impacts of Offshore Wind

Consistent with AB 525, the following recommendations address the potential impacts of offshore wind on coastal and marine resources, California Native American tribes, fisheries, and national defense. Although not required by AB 525, recommendations to address the potential impacts of offshore wind on underserved communities are also included.

Marine Impacts

- Promote comprehensive environmental research and monitoring that uses best available science and monitoring technologies, traditional ecological knowledge, and baseline and long-term monitoring to guide project siting, assess project-level and cumulative impacts during construction and ongoing operations, and inform adaptative management strategies throughout the project lifecycle and future sea space planning and lease sales. This effort should incorporate scientific advice from academia, governments, tribes, nongovernmental organizations, the offshore wind industry, and other interested entities.
- Continue promoting coordination and collaboration among lessees on surveys, comprehensive monitoring plans, and project implementation to minimize environmental impacts, leverage resources, and increase efficiency.
- Develop a comprehensive mitigation framework that prioritizes avoidance and identifies strategies to minimize and offset impacts to marine life and habitats from offshore wind development and ongoing operations, including impacts

from port development. Adaptive management strategies should also be considered to facilitate rapid response to unanticipated impacts.

Tribal Impacts

- The study, development, and operation of offshore wind related projects should include early, often, and meaningful consultations with California Native American tribes and collaborative development of appropriate avoidance, minimization, and mitigation strategies for impacts to tribal cultural resources, natural resources, cultural, social, economic, and other interests.
- Encourage project proponents to continue to study and develop public safety measures to reduce violent crime and sexual and gender-based violence particularly against Native American and other vulnerable populations.
- Encourage project proponents to contract with California Native American tribes for cultural and environmental monitoring pre-, during, and post-construction of offshore wind projects, port improvements, and expansion of transmission infrastructure.
- The state should work closely with BOEM and help encourage project proponents to enter into meaningful CBAs with California Native American tribes to help address tribal concerns associated with offshore wind and advance tribal priorities for their communities.
- State and federal agencies should explore opportunities for increased tribal access and stewardship in state and federal waters, including in science and research, informing the adaptive management of offshore wind.
- The state should support tribal capacity through technical assistance, including informational working group spaces and webinars.
- As tribes pursue federal funding, the state should support the federal government funding participation in alignment with the federal trust relationship.

Fisheries Impacts

- The latest commercial, recreational, subsistence, and cultural fishing data should be used to conduct analyses assessing spatial and temporal trends in fishing effort and value metrics in the offshore and nearshore environments, in consultation with California Native American tribes and fishing representatives, including those on the California Offshore Wind Fisheries Working Group. These efforts will inform deployment within existing lease areas and planning for port development and sea space for future offshore wind projects.

- Continue to convene the California Offshore Wind Fisheries Working Group in developing a statewide strategy for avoidance, minimization, and mitigation of impacts to fishing and fisheries that prioritizes fisheries productivity, viability, long-term resilience, and safe navigation.
- Continue working with researchers, offshore wind leaseholders, tribes, and other state and federal agencies to develop strategies to avoid, minimize, and mitigate impacts to ongoing fisheries surveys that inform fisheries management.

National Defense Impacts

- The state should continue to coordinate with the DOD's OSD Siting Clearinghouse throughout the planning, design, permitting, construction, and decommissioning processes, with an emphasis on early coordination, to prevent potential offshore wind development from encroaching on military testing, training, and operations areas.

Underserved Communities Impacts

- The study, development, and operation of offshore wind related projects should include early, regular, and meaningful community outreach and engagement with underserved communities, nongovernmental organizations, local governments, state entities, and other potentially impacted groups.
- Offshore wind development and operation should avoid, minimize, or mitigate impacts to underserved communities, including those in and around ports, and support actions to protect already overburdened communities, such as air and water pollution burdens and considerations for mitigations.
- Evaluate and identify ways to increase capacity for interested parties to engage in the permitting, development, and mitigation of offshore wind development.
- When possible, explore community-led convenings and structures to identify and implement community benefits and project labor agreements negotiated with impacted communities.

Sea Space

The following recommendations encourage the identification of suitable sea space in a way that prioritizes least-conflict ocean areas:

- Participate in suitable sea space identification, research, analysis and refinement, in coordination with BOEM, USCG, and DOD's OSD Siting Clearinghouse to inform the feasibility of offshore wind development that minimizes impacts to California's coast and ocean resources.

- Engage and coordinate planning efforts with California Native American tribes, underserved communities, fishing industry, the shipping industry, environmental nongovernmental organization, and others to ensure valuable perspectives are meaningfully considered during the offshore wind planning process.

Port Infrastructure Needs

The following recommendations will help provide adequate port infrastructure:

- Early prioritization of staging and integration sites as permitting and leasing in California can take multiple years.
- Explore opportunities to improve permitting and environmental review coordination for port project development.
- Continue to support, in coordination with federal, tribal, and local governments, developers, DOD's OSD Siting Clearinghouse, and underserved and local communities, a port development and readiness framework. This should include consideration of potential funding sources and strategies, as well as local content and prevailing wages, to identify port site developments needed for offshore wind project development and operations.
- A port development and readiness framework should continue to be coordinated with larger West Coast port network evaluation efforts and state and national supply chain development. It should prioritize the development of staging and integration sites to meet the most immediate requirements for floating offshore wind.
- Collaborate with ports, harbor districts, DOD's OSD Siting Clearinghouse, tribal governments, underserved communities, local communities, port users and tenants, and developers to understand the unique challenges and opportunities of each port and harbor district and their potential role in supporting offshore wind development and operations.
- Identify federal funding opportunities, tax credits, and other resources in the Infrastructure Investment and Jobs Act, Inflation Reduction Act, and other structures, for modernization and expansion of ports and support inclusion of local content and prevailing wage in port projects.
- Continue to engage with industry leaders, developers, and supply chain entities to explore options to support local supply chain development.

Workforce Development

The following recommendations will help California develop an equitable, skilled, and trained workforce to support the offshore wind industry:

- Identify immediate and long-term workforce needs, understand diversity gaps, develop targeted and equitable hiring standards, establish training curriculum and programs, set local and equitable hiring standards, including tribal hiring standards in consultation with California Native American tribes, prioritize prevailing wage and union labor.
- Coordinate with local communities, California Native American tribes, workforce training centers, government agencies, community organizations, employers, high schools, community colleges, and universities to create or support career opportunities, workforce training, and economic development benefits.
- Encourage the development of project labor agreements, community benefits agreements, and social impact partnerships that provide local and underserved communities and California Native American tribes with meaningful economic benefits from offshore wind development.
- Promote partnerships between industry, education, and training institutions, government entities, and community organizations to address offshore wind energy workforce needs efficiently, effectively, and equitably.
- Promote relevant training, trade certifications, apprenticeships, and academic pathways for both professional and entry-level workers to train and educate an adequate workforce.
- Encourage developers to use pre-apprenticeship programs to attract and train underserved populations entering the workforce.
- Continue outreach and engagement with local communities, California Native American Tribes, underserved communities, workforce training centers, government agencies, employers, community colleges, and other training apprenticeship providers to ensure equity and inclusion in the workforce and adequately prepare workers for the offshore wind industry.

Transmission Technology and Alternatives

The following recommendations support technology development and alternatives assessment to effectively plan for offshore wind transmission:

- Continue assessing transmission alternatives for the North and Central Coast offshore wind development to meet the offshore wind planning goals, including analyzing corridors, routes, and rights-of-way for promising transmission pathways, including land-based (overhead and underground, HVAC and HVDC) and subsea cable alternatives.

- Consider phased approaches to transmission development to examine both short-term and long-term offshore wind development needs, costs, and benefits that balance these factors against risks to ratepayers.
- Continue to use federal resources to analyze corridors, routes, and rights-of-way for promising transmission pathways needed to support offshore wind planning goals, including land based (overhead and underground, HVAC and HVDC) and subsea cable alternatives.
- Continue to explore the technologies and configurations for interconnecting offshore wind projects to achieve efficiencies and minimize environmental impacts.

Transmission Planning and Interconnection

The following recommendations support planning and interconnection processes to bring transmission projects online in a timely manner to meet the offshore wind planning goals:

- Foster regional bulk transmission planning efforts to support offshore wind development along the West Coast to maximize the potential benefits throughout the Western Interconnection.
- Coordinate with other Western states to address state offshore wind policy goals and interregional transmission challenges in their planning work.
- Consider utilizing an interregional transmission planning structure as referenced by FERC Order 1000 and FERC Order 1920 (for example, California ISO, NorthernGrid, and WestConnect).
- Coordinate with CPUC and California ISO to explore competitive transmission solicitations and other procurement options needed to develop coordinated offshore transmission infrastructure solutions. This includes innovative approaches, such as networked or backbone systems, and implementation mechanisms, to efficiently bring offshore wind energy to shore to meet the offshore wind planning goals.
- Inform existing transmission planning processes by systematically identifying and prioritizing alternative points of interconnection that limit the number of landfall sites and minimize environmental impacts and long run costs.

Offshore Wind Permitting

The following recommendations address the need for a coordinated, comprehensive, and efficient permitting and environmental review process:

- Develop and implement coordinated permitting for offshore wind and related projects based on the previously successful Desert Renewable Energy Action

Team (REAT) and Renewable Energy Policy Group (REPG) model. An *Ocean REAT* structure could potentially be used for offshore wind projects, and possibly for additional types of offshore wind-related projects (for example, port and waterfront facilities, transmission) as appropriate for coordinated permitting.

- The state should engage early and consistently with the DOD's OSD Siting Clearinghouse to prevent, minimize, or mitigate adverse effects on military training, testing, and readiness.
- The state should engage early and consistently with BOEM on its offshore wind programmatic environmental impact study to ensure the analysis is reflective of the state's priorities as it relates to data collection, analysis methodology, impact identification, and mitigation measures.