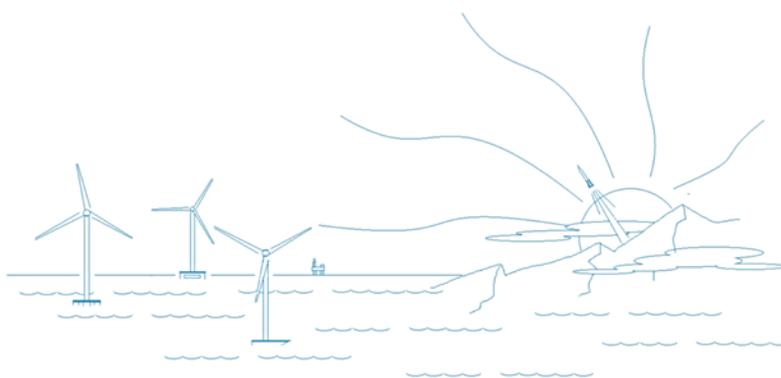




# **CADEMO Research and Demonstration Goals**

## **Resolving California's needs for an offshore wind pilot project**



Prepared by CADEMO Corporation

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**1. PURPOSE OF THE CADEMO PROJECT**

The overall aim of the CADEMO project is to demonstrate new models of floating offshore wind technology to the emerging Californian offshore wind market. This demonstration project will be the first of its kind through permitting, leasing approval and the grid interconnection process in California. CADEMO proposes to install four offshore wind platforms, comprising two different floating designs, with turbines of 12-15 MW each. The deployment of floating platforms with turbines at this scale has not been done anywhere else in the world to date.

**"DEMONSTRATION PROJECTS"** are defined as "projects that put into practice, test, evaluate and disseminate actions, methodologies or approaches that are new or unknown in the specific context of the project, such as the geographical, ecological, socio-economic context, and that could be applied elsewhere in similar circumstances"<sup>i</sup> or "a project that is innovative or new to the state"<sup>ii</sup>.

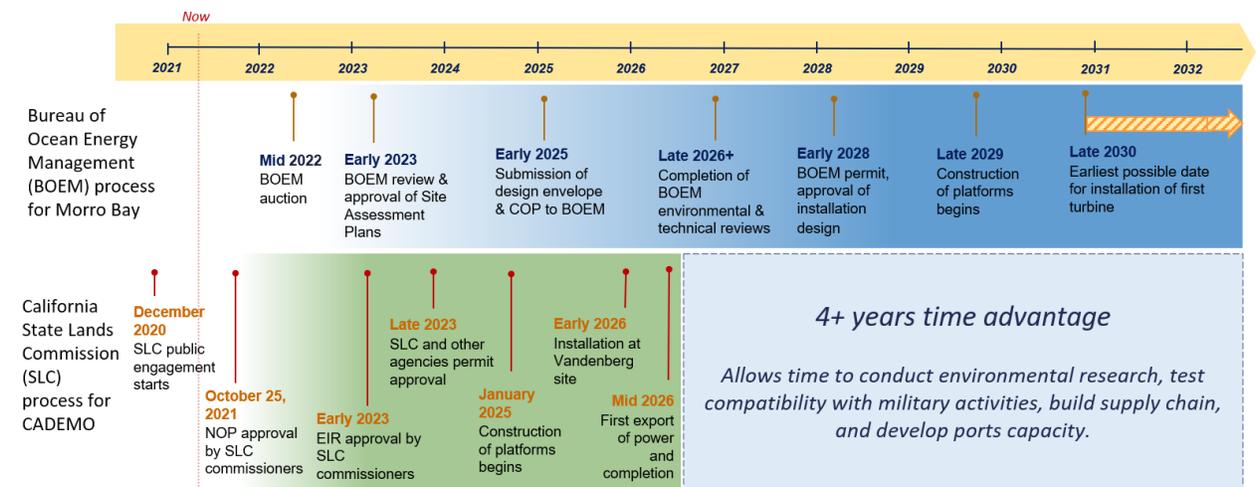
CADEMO will demonstrate the technical, environmental, economic, and social aspects of commercial offshore wind in California. The CADEMO project will not act as a silver bullet to answer all technical, environmental, and social issues associated with commercial offshore wind

**PURPOSE** of the CADEMO project - to be the first:

- ⇒ to install floating wind turbines in the 12 – 15 MW range.
- ⇒ to fabricate, install and test 2 different floating foundation designs.
- ⇒ floating wind project >4 years ahead of federal plans.
- ⇒ to launch local industry for competitive readiness and creation of new jobs.

development in California - no one project can do this, as each deployment environment is unique and will have its own particular set of aspects to consider. The CADEMO project will, however, resolve the state’s need to prove floating platform designs on the largest-scale turbines, study environmental effects in real-world California conditions, and develop an in-state supply chain rather than relying on imports.

The research results and lessons learned from CADEMO will significantly improve the chances of success for California’s offshore wind industry overall. Key to delivering CADEMO as a demonstration project is its ability to be in the water at least four years before any offshore wind project in federal waters.



CADEMO is being developed entirely within California state waters, so it will have no influence on the timing, scale, or decisions to be made within the larger commercial-scale leasing process in federal waters undertaken by the Bureau of Ocean Energy Management (BOEM).

## 2. VALUE OF A DEMONSTRATION PROJECT

The CADEMO site has been carefully chosen to allow suitable access to evaluate both the technology performance and its environmental interactions. The smaller scale of the demonstration project and its proximity to shore means that it will be more feasible to access and learn from this early installation, make corrections, and prove concepts of environmental avoidance and operation. Despite claims from

CADEMO advantages include:

- small enough to avoid significant impacts on fisheries, birds, and marine mammals.
- large enough to provide sufficient scale for research credibility.
- situated close enough to shore to provide accessibility.
- ideal to test and validate technologies and processes needed for deep waters.

other sources, it is not true to state that projects closer to shore cannot provide learning for developments further offshore. In fact, most demonstration projects for fixed offshore wind have been near shore (e.g., ORE Catapult Methil, UK (0.1 miles from shore), Blyth, UK (0.5 miles), Vindby Offshore Wind, DK (1 mile), Aberdeen, UK (1.8 miles), Middelgrunden, DK (2 miles), Haliade X Rotterdam Harbor, NED (0 miles), Block Island, US (3.8 miles)).

The demonstration value of CADEMO can be summarized in four categories: **Technical**, **Environmental**, **Economic** and **Social**. While we are providing examples of some of the demonstration ambitions of the CADEMO project, we know that more opportunities will be identified as we engage further with stakeholders and the local supply chain.

### Technical

The U.S. West Coast is fundamentally different from the locations where most offshore wind projects have been deployed to date. California's waters are deeper, and the maritime physical,

#### TECHNICAL BENEFITS:

- Test a new generation of wind turbines and floating platforms.
- Full scale of technologies deployed.
- Provides results before deployment of 200-270 wind turbines in Morro Bay.
- Validate advanced mooring systems and cabling strategies and DoD equipment, paving way for future deployments.
- Test and validate projections of Levelized Cost of Energy.

environmental, and social aspects are completely different. In addition, floating offshore wind technology is relatively new. Only three floating wind platform designs have been deployed at scale to date and none of these in U.S. waters. The mere fact of deploying new floating offshore wind platforms in the Pacific is a demonstration action in itself. It will enable technology learning in how to fabricate, install and operate floating turbines at this scale in Pacific sea conditions – including how the turbines behave, their control systems and testing installation and O&M strategies. The

project will also offer opportunities to test and demonstrate modular technologies that have the

potential to reduce the Levelized Cost of Energy (LCOE), applicable across floating platform technologies and in deeper water, thus enabling offshore wind to be competitive in California power markets. Cierco has already discussed opportunities with several technology developers (including partnering on research opportunities) on unique anchoring and mooring systems intended to be deployed on the CADEMO project.

### **Environmental**

Some stakeholders have legitimate concerns that the projects proposed for development in federal waters are at such large scale that they may pose a significant risk of unforeseen environmental harm, the CADEMO project can address those issues at an appropriate scale before they are installed. A demonstration project in state waters allows for carefully controlled management of wildlife interaction, environmental risks, and the testing of effective mitigation measures before large-scale build-out proceeds. Currently, little or no research has been conducted of the interactions of West Coast fish, bird, and marine mammal species and wind turbines and barge moorings. CADEMO will allow studies of the impacts of floating offshore wind projects on a broad variety of relevant species, including birds, bats, cetaceans, fish, reptiles, and invertebrates (corals and shellfish) – all on a relatively small scale that poses minimal risk to habitats and species.

For example, gray whales migrate generally close to shore than three nautical miles and are potentially present in the project area, so evaluation of effects is likely to be more accurate and representative than further offshore. Impacts to gray whales are unlikely, but the demonstration project can confirm this and provide greater certainty for a major industry going forward. More widely, the project offers an outpost to examine the abundance and movement of listed cetaceans (humpback, blue, fin, sei, sperm, and northern right whales) closer to shore and monitor their interactions with offshore wind turbines at small scale with low risk.

The project also provides a unique opportunity to identify issues, and test mitigation and monitoring strategies at a small scale prior to wider commercial roll out. For example, floating barges may present unforeseen opportunities for pinniped haul out, the project offers the prospect to monitor potential haul-out areas on the floating barges (which have never been deployed in California) to understand the risk likelihood, and test haul out deterrent methods if needed. There are numerous other opportunities to test technology offshore – for example night-time radar surveillance for bats/birds, remote monitoring of moorings for derelict/ghost fishing gear and techniques for removal, turtle interaction surveillance, etc. The project will be a good

#### **ENVIRONMENTAL ADVANTAGES:**

- The area provides a wide range of species, where interactions and behavior around the wind turbines can be documented
- Test and validate methodologies and equipment to mitigate or eliminate impact.
- Valuable information can be documented around 4 wind turbines instead of 200 - 250 units.
- Opportunities to deploy equipment to undertake long term monitoring and document species in the actual environment.

opportunity to adopt a “survey, deploy and monitor” approach throughout the permitting process, providing an opportunity to test the effectiveness of monitoring and mitigation systems, procedures, and techniques prior to the wider commercial deployment.

### Economic

Offshore wind is a global, competitive industry, and California project developers will face considerable market pressure to source foreign-manufactured and constructed inputs rather than locally made products. CADEMO will enable the development of a local supply chain, ports, and workforce for the large-scale commercial opportunity.

#### ECONOMIC VALUES:

- The project is active part in a State High Road Training Partnership with trade unions and work force development groups to identify opportunities for job creation and training.
- Early launch of industry is required to mature industry for competitiveness to avoid imported options.
- Local industry is required to reach the targeted job creation numbers by state and federal government.
- Work with fishing industry to document impact on fishing and fishing methods as well as access.

CADEMO provides an opportunity to set a workforce development “high road” standard for the industry. CADEMO has partnered with the Tri-Counties Building and Construction Trades Council, IBEW 1245, and other groups in a High Road Training Partnership (H RTP), funded by the California Workforce Development Board. Our H RTP is aimed at identifying options for CADEMO to incorporate a high road California supply chain and to ensure community benefits such as pre-apprenticeship programs with

hiring targets for local disadvantaged communities. This is key to establishing the offshore wind industry as a model for a “just transition” to clean energy with well-paying union jobs and social equity.

The fishing sector is a key industry impacted by the deployment of commercial scale offshore wind in California. The potential impacts range from loss of access to fishing grounds to risks of radar interference and navigational safety. CADEMO is an ideal small-scale demonstration project to identify key issues, test potential solutions and formulate good inter-industry working practices prior to wider commercial implementation. Some examples are testing of radar systems, Automatic Identification System (AIS) trials, and fishing technique interaction requirements.

### Social

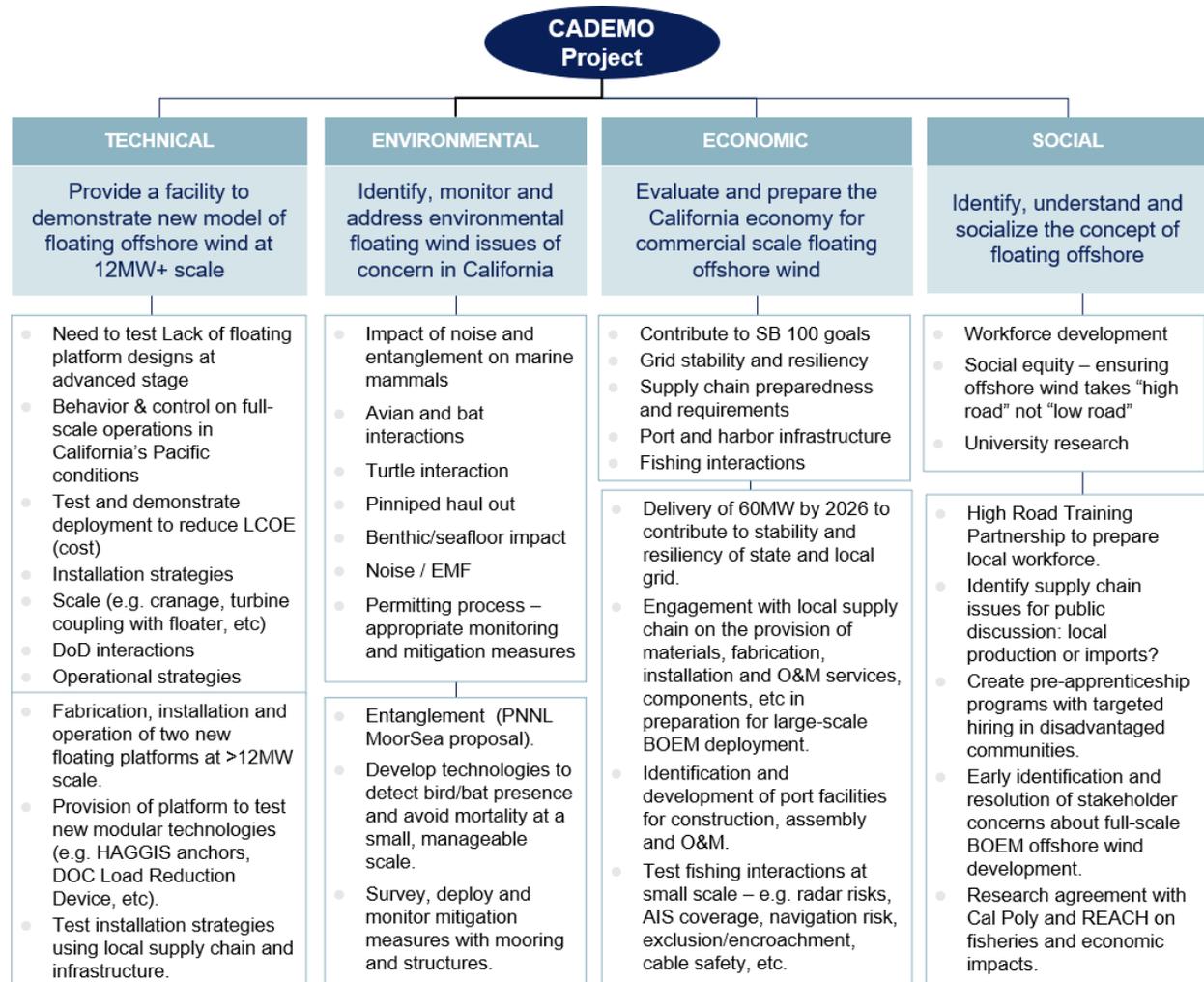
As a new technology on the West Coast, a small-scale demonstration will enable a deeper understanding of the technology, social context and stakeholder views in the region before large-scale development in federal waters. Installing a demonstration project by 2026 will prove that California can host and deliver offshore wind,

#### SOCIAL BENEFITS:

- Identification and validation of key stakeholder issues on the West Coast.
- Confirmation of the potential of offshore wind to contribute to attainment of SB 100 goals.
- Testing concept of security of decentralized supply in a vulnerable area

providing confidence that offshore wind can provide a significant contribution to the state’s SB 100 goal of carbon-free energy by 2045.

Finally, the project will provide a source of energy in an area vulnerable to unplanned power outages. The concept of large-scale offshore wind energy supply to provide resiliency to vulnerable grid areas can be monitored and evaluated. Understanding the technical interactions of offshore wind with the local electrical grid will enable assessment of various modes of energy management including hydrogen generation and battery storage to explore decentralized power systems.



<sup>i</sup> [https://www.euro-access.eu/calls/demonstration\\_projects\\_-\\_nature\\_biodiversity](https://www.euro-access.eu/calls/demonstration_projects_-_nature_biodiversity)

<sup>ii</sup> <https://www.legis.iowa.gov/docs/aco/arc/2140c.pdf>