



C I E R C O

## The CADEMO Floating Offshore Wind Project

June 2020

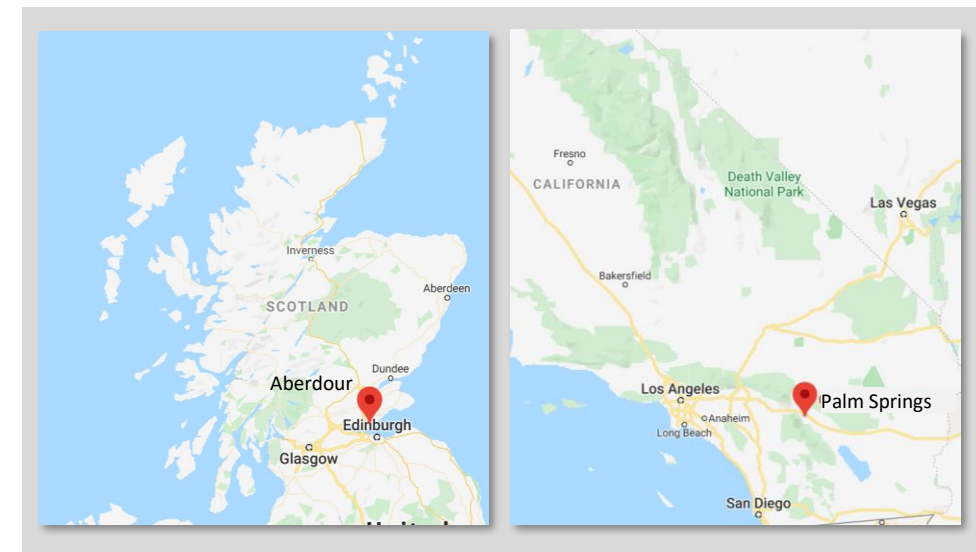
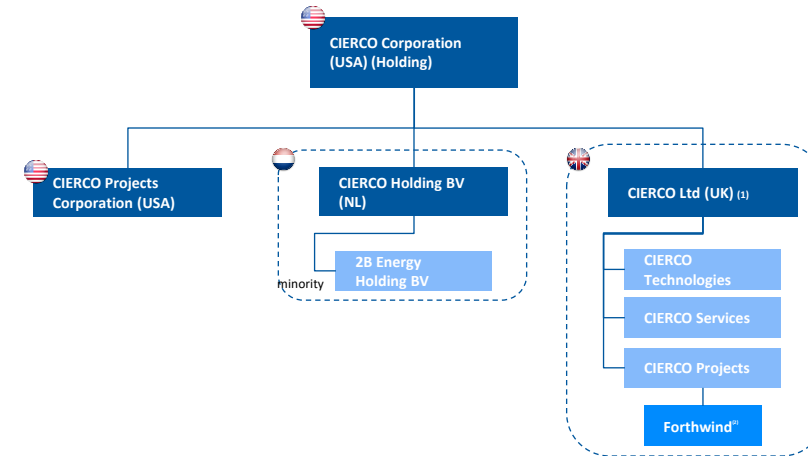


## Contents

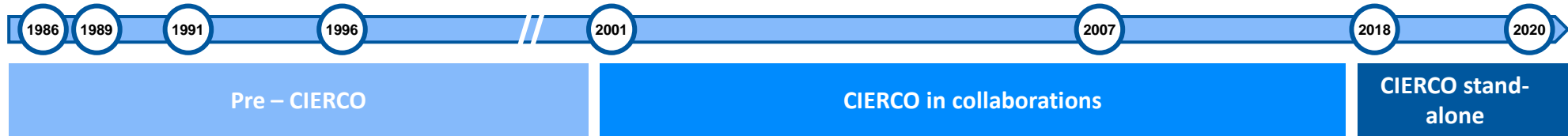
1. CIERCO Background
2. Floating Offshore Wind Overview
3. The CADEMO Project
4. Contact Details

## Corporate structure & locations


- CIERCO Corporation was established in the Nevada, USA in 2001 by Mikael Jakobsson. Prior to 2018, CIERCO’s engagements have been in the background as a member and shareholder in independent or joint venture companies, with partners such as EDF, EON, Shell, Scottish Government etc. Most recently CIERCO was a founding shareholder in the Dutch 2B Energy innovative 2 bladed wind turbine technology
- CIERCO is a technology independent renewable energy company aiming to accelerate its commercial floating wind power readiness through stepwise demonstration and pre-commercial projects.
- CIERCO Ltd. has its main office in Aberdour near Edinburgh in Scotland, mainly focused on the development of demonstration and pre-commercial offshore wind technology projects in the UK
- CIERCO is committed to engaging in the US West Coast offshore wind - we’ve established CIERCO Projects Corporation, with a permanent office base in Palm Springs, California (see map - bottom right) to engage in activities in our home market.
- The company drives a technology neutral strategy, with a wide established network of investors, tier 1 supply chain and leading organizations within the wind community – we intend to take our leaning from Europe into the US.



# CIERCO Team: strong track record with 30+ years of Project experience



**1989**



Nogersund - 1x 220kW - The first offshore wind turbine in the World

**1991-1996**



Swanmill - Multiple wind farms management

**2001**



Middlegrunden - 21x 2MW turbines – Foundation design and installation

**2003**




Utgrunden station - rebuild of lighthouse to a research station

**2005-2008**




Creation of industrial zone for renewable energy in Fife, SCT

**2010-2015**



Aquamarine Power - Development / build of first wave energy Oyster demos

**2015**




6.2 MW - 2B energy innovative turbine “clean sheet” design

**1991-1995**



Development and build of 5x WTG own windfarm on Gotland

**1994**



Construction Management Nedwind 500kW Palm Springs, USA

**2000**




Utgrunden project - 7x 1.25MW project designed and build

**2002**




Sash system - designed, tested and certified new ship mooring system

**2005**




Beatrice Project - 2x 5MW demo on first jacket foundations

**2007**



Facility with hydrogen and 750kW wind turbine

**2014-2015**



First full-size jacket tower & Foundation design & build

**2018** →



Development of floating wind strategy projects in the UK and USA

Source: CIERCO

CIERCO recognise there is a need to approach offshore wind development in a responsible stepwise fashion, the CADEMO project:

- a) Provides an opportunity to understand the required environmental and administrative processes on a “small” scale development.
- b) Diversifies the floating wind technology offering for offshore wind in California.
- c) Reduce risk for offshore wind in advance of the BOEM competitive offshore wind leasing round in California.
- d) Provide an opportunity for the local supply chain, infrastructure and workforce to build the necessary investment, capacity and learning at a manageable rate in advance of large scale deployment
- e) Provide an opportunity for the DoD to develop a familiarity of operational interaction with the technology at a scaled level prior to large scale deployment.
- f) Offer a unique opportunity for industry and academic research to promote educational research, learning and understanding in a wide range of technical fields (e.g. environment, engineering, economics, materials, industrialization, etc)





## CADEMO – CALifornia DEMOnstration

CIERCO has **formed a technology grouping and supply chain partners** to pursue a 4-unit demonstration project offshore in state waters adjacent to the Vandenberg Air Force Base.

The **lease and building permit application has been submitted** and accepted for consideration by the California State Lands Commission.

The **CADEMO project is a pathfinder project** to test, modify and clarify the procedures for obtaining permits and authorizations and to develop the local supply chain and assess infrastructure options for two technologies, before a number of commercial applications are brought to the Bureau of Ocean Energy Management (BOEM) for development along the US west coast.







The CADEMO project has been developed to deliver the following aims:

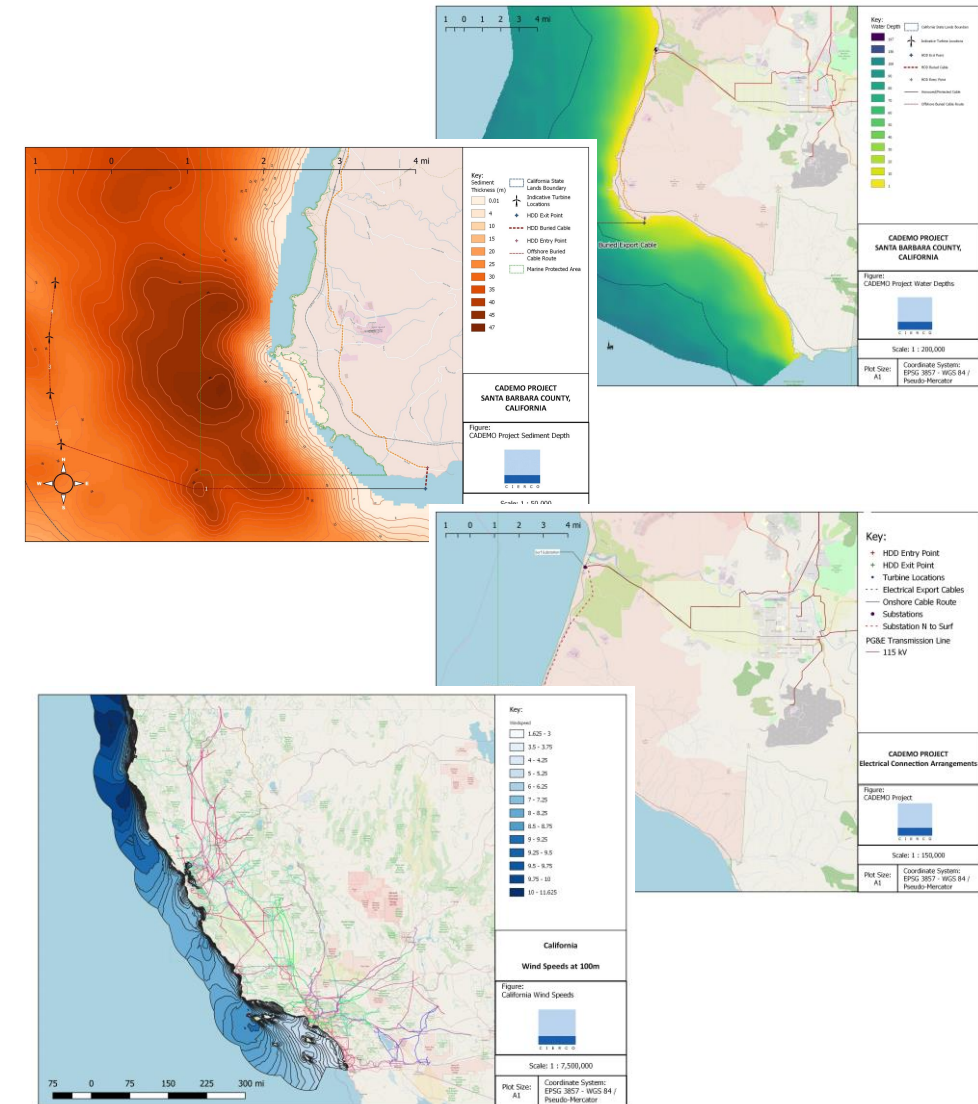
- a) demonstrate 2 different full-scale offshore floating wind technology solutions
- b) optimize the design of floating wind as a small farm
- c) Act as a pathfinder project in piloting floating offshore wind in US west coast waters.
- d) Provide a case study for the US policy makers and regulatory authorities to consider impacts and opportunities;
- e) Learn how floating wind interacts at scale with the natural environment and local interests;
- f) identify and maximize the potential opportunities and benefits to the local Californian supply chain and employment opportunities;
- g) Develop knowledge across a number of innovative floating technologies to address the technology risk profile and high costs in advance of commercial scale development projects.

The initial considerations for a small-scale demonstration project applied during the site selection process included:

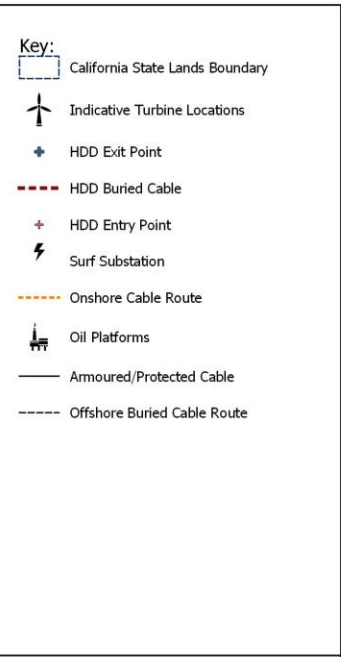
- Identify areas within Californian State Lands (to simplify access and permitting process);
- Focus on areas with depths of between 60 to 100m (for technology purposes)
- Identify areas within a feasible economic distance to available grid connection points and suitable ports for construction and O&M activities (for project economics)
- Focus on areas that provide favorable wind resource and yield (i.e. highest wind – essential for a non-commercial demonstration project);
- Centre on areas where there are few environmental constraints (e.g. avoiding activities within State Marine Reserves);
- Identify areas where there is favorable geotechnical and seabed conditions for mooring design;
- Avoiding areas of heavy marine traffic and recreational activities;
- Avoiding, where possible, areas of high coastal population and minimizing visual intrusion.

The process identified the general area around the Vandenberg Air Force Base. The configuration and final turbine locations will be agreed with the SLC and Department of Defense (DoD); the remaining constraints on finalising the site turbine locations are:

- To remain within SLC lands;
- Avoid encroachment or entering the Marine Reserve;
- Avoid or minimize interference with Vandenberg AFB and DoD operations within the area;
- Maximize energy production through ensuring sufficient spacing between turbines and locating in high wind areas; and
- Minimize visual and environmental aspects where feasible.





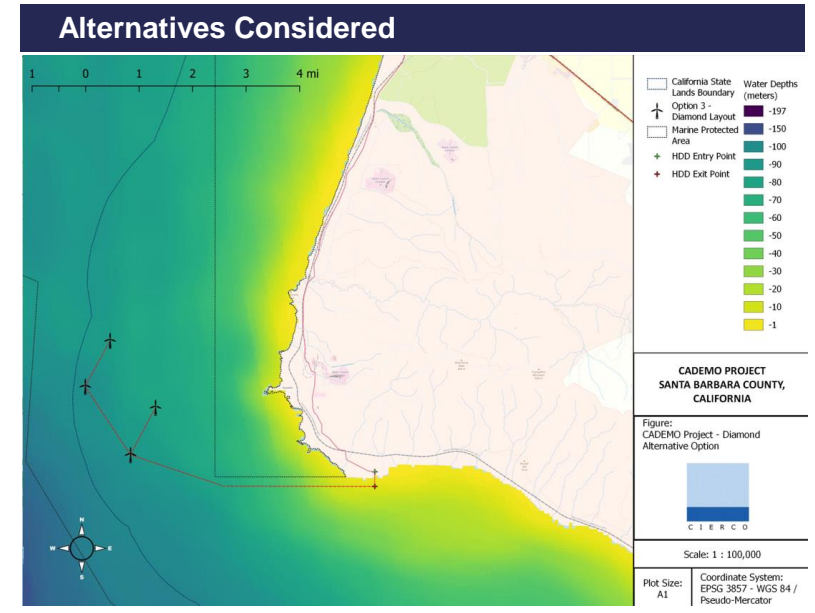


**CADEMO PROJECT  
SANTA BARBARA COUNTY,  
CALIFORNIA**

Figure:  
CADEMO Project Layout

Scale: 1 : 200,000

Plot Size: A1  
Coordinate System: EPSG 3857 - WGS 84 / Pseudo-Mercator



**Water Depths (meters)**

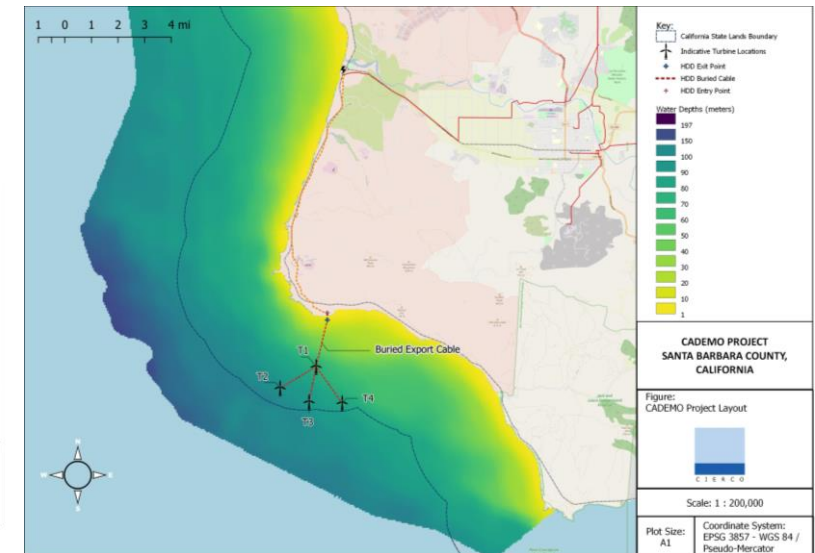
- 197
- 150
- 100
- 90
- 80
- 70
- 60
- 50
- 40
- 30
- 20
- 10
- 1

**CADEMO PROJECT  
SANTA BARBARA COUNTY,  
CALIFORNIA**

Figure:  
CADEMO Project - Diamond  
Alternative Option

Scale: 1 : 100,000

Plot Size: A1  
Coordinate System: EPSG 3857 - WGS 84 / Pseudo-Mercator



**Water Depths (meters)**

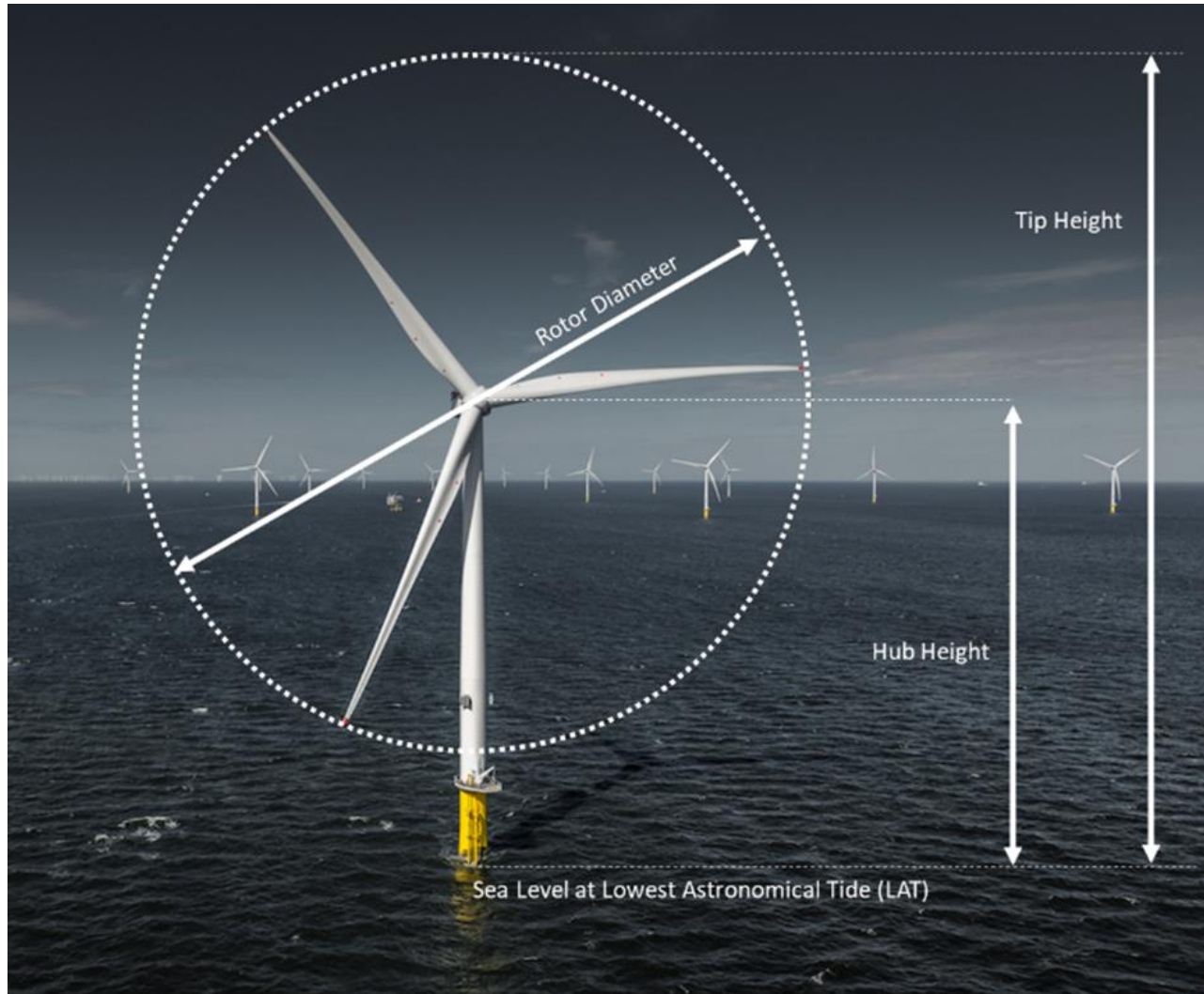
- 197
- 150
- 100
- 90
- 80
- 70
- 60
- 50
- 40
- 30
- 20
- 10
- 1

**CADEMO PROJECT  
SANTA BARBARA COUNTY,  
CALIFORNIA**

Figure:  
CADEMO Project Layout

Scale: 1 : 200,000

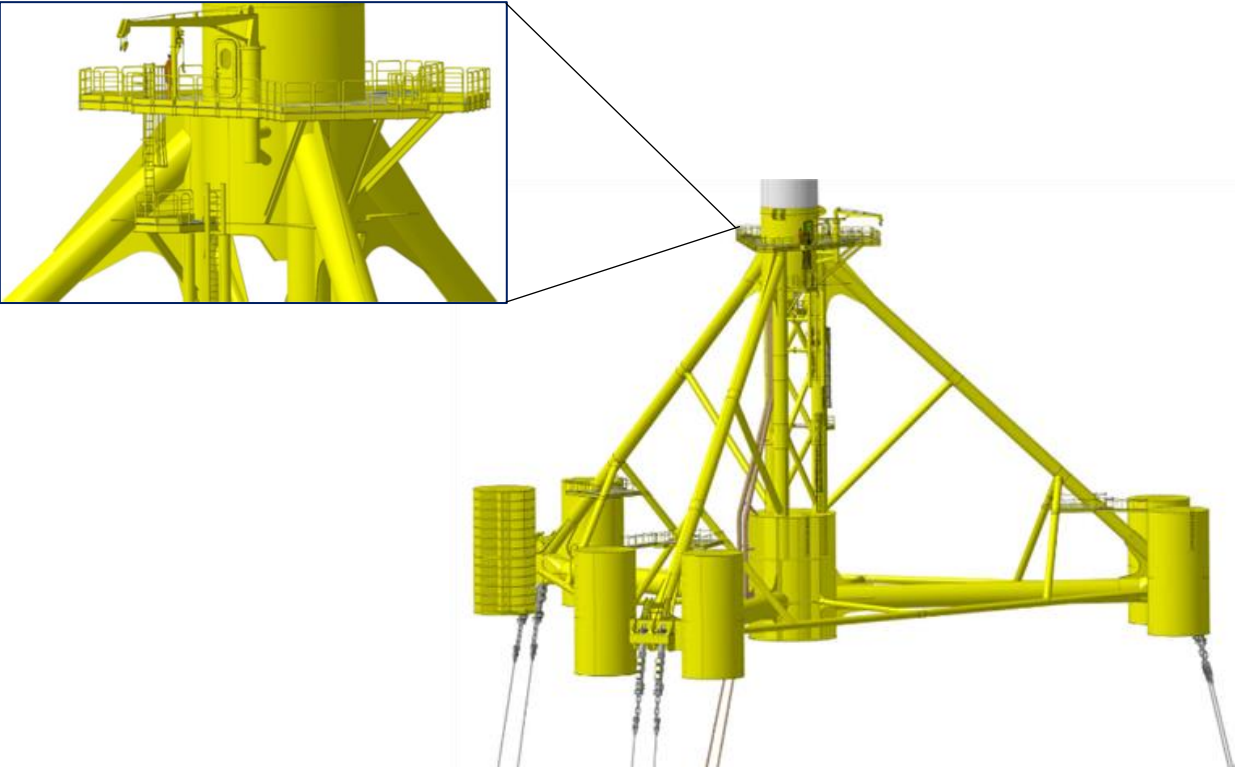
Plot Size: A1  
Coordinate System: EPSG 3857 - WGS 84 / Pseudo-Mercator



| Key Data and Dimensions of the CADEMO Turbine |                                       |
|---|---------------------------------------|
| Number of blades                              | 3                                     |
| Orientation                                   | Upwind                                |
| Direction of Rotation                         | Clockwise                             |
| Rotor Diameter                                | 225 meters                            |
| Length of blade                               | 109.5 meters                          |
| Blade swept area                              | 39,804 m <sup>2</sup>                 |
| Hub height                                    | 137.5 m HAT                           |
| Tip height above HAT                          | 250 m HAT                             |
| Blade Clearance to HAT                        | 25 meters                             |
| Rated Capacity                                | 12 - 15 MW                            |
| Voltage                                       | 66 kV                                 |
| Converter                                     | Full size                             |
| Structure                                     | Tubular Steel Tower                   |
| Foundation                                    | Floating Platform and mooring system  |
| Design Life                                   | 25 years                              |
| O&M Access                                    | Primary: Boat<br>Optional: Helicopter |

- The bottom end of the structure will be painted yellow (RAL 1004 Golden Yellow) from the level of Highest Astronomical Tide (HAT) up to 15 meters
- Above 15m the structure, turbine and blades will be painted grey (RAL 7035 Light Submarine Grey)
- Each turbine will have a unique identification (ID) number, which can be seen by both vessels at sea level and aircraft from above

| General Dimensions of the Tension-Leg Platform |                |
|--|----------------|
| Material                                       | Steel          |
| Length (m)                                     | 85 meters      |
| Width (m)                                      | 72 meters      |
| Height (m)                                     | 45 – 49 meters |
| Draft (m) during construction                  | <10 meters     |
| Draft (m) during operation                     | 30 meters      |

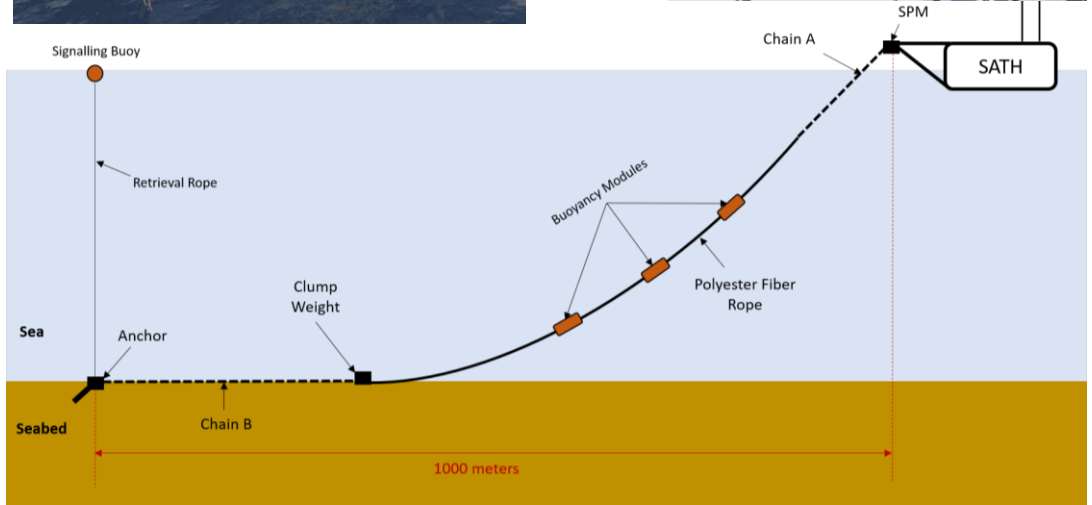
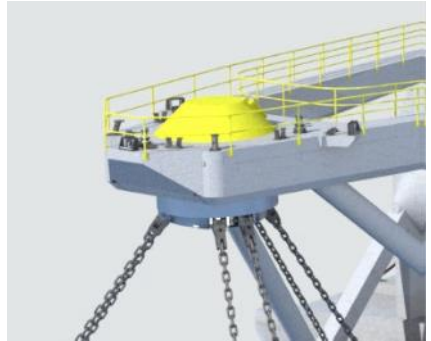




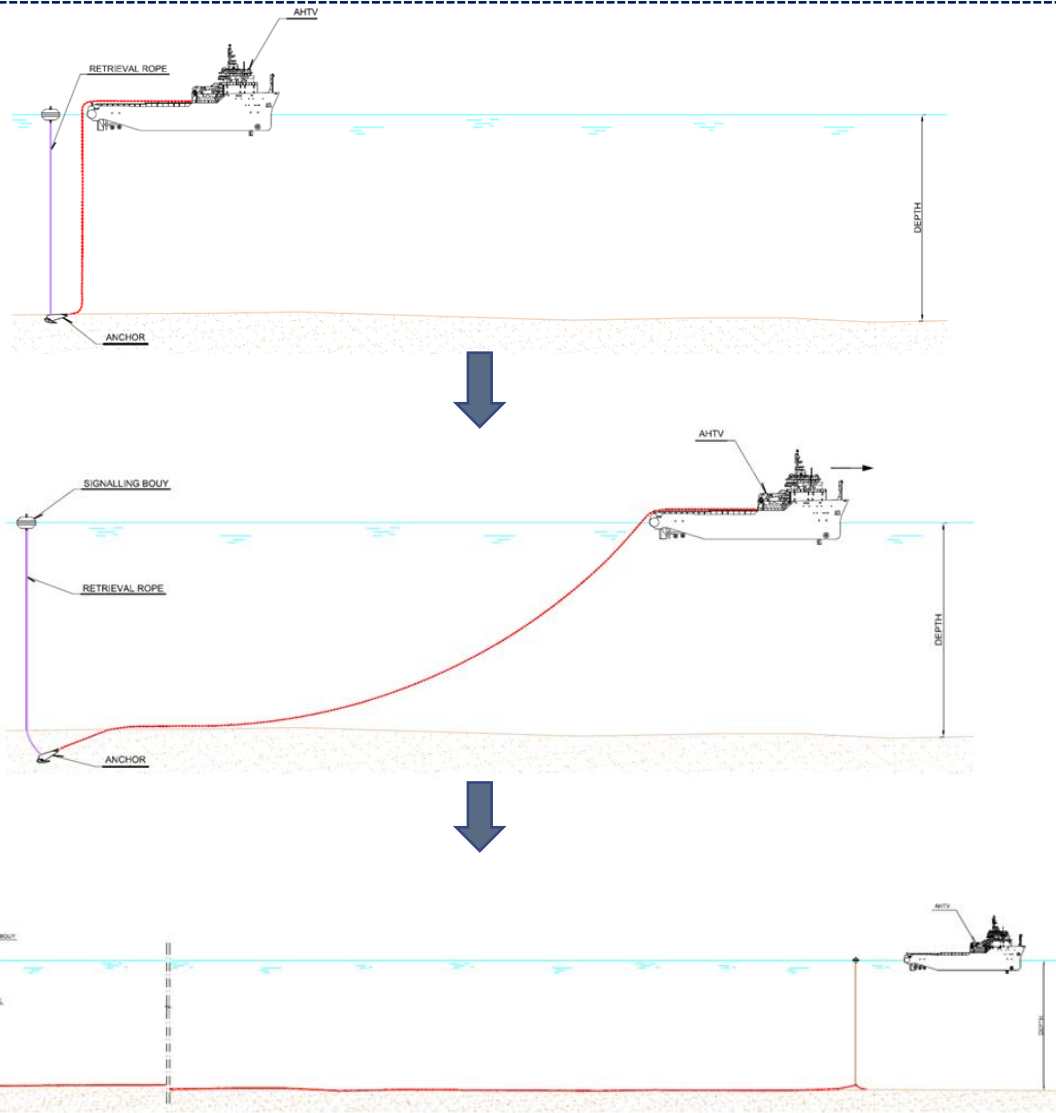


**General Dimensions of a SATH System Floating Barge**

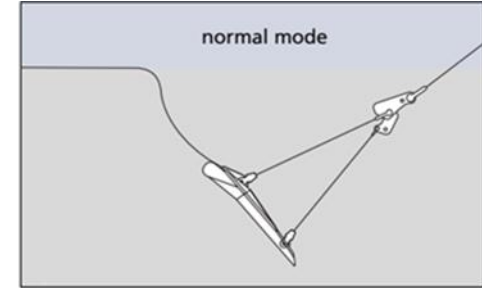
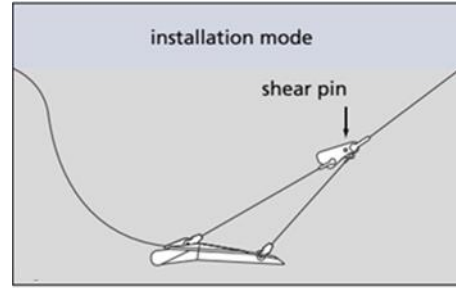
|                 |                  |
|-----------------|------------------|
| Material        | Concrete / Steel |
| Hull Height (m) | 16 meters        |
| Draft (m)       | 9.5 meters       |
| Length (m)      | 105 meters       |
| Width (m)       | 50 meters        |



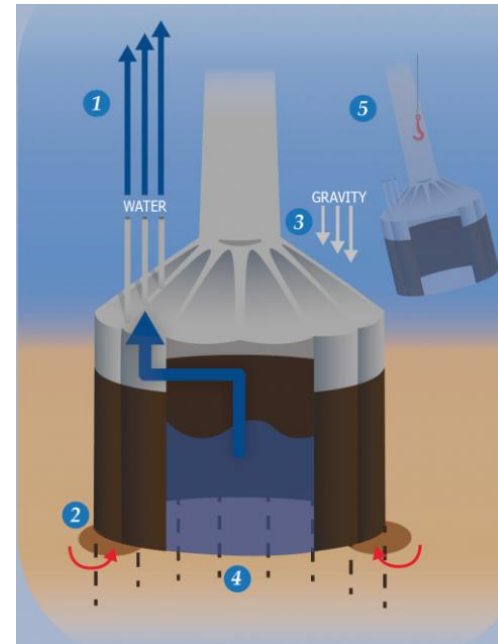
## Installation of Moorings and Anchors



## Anchoring



1. Vertical Load Anchor

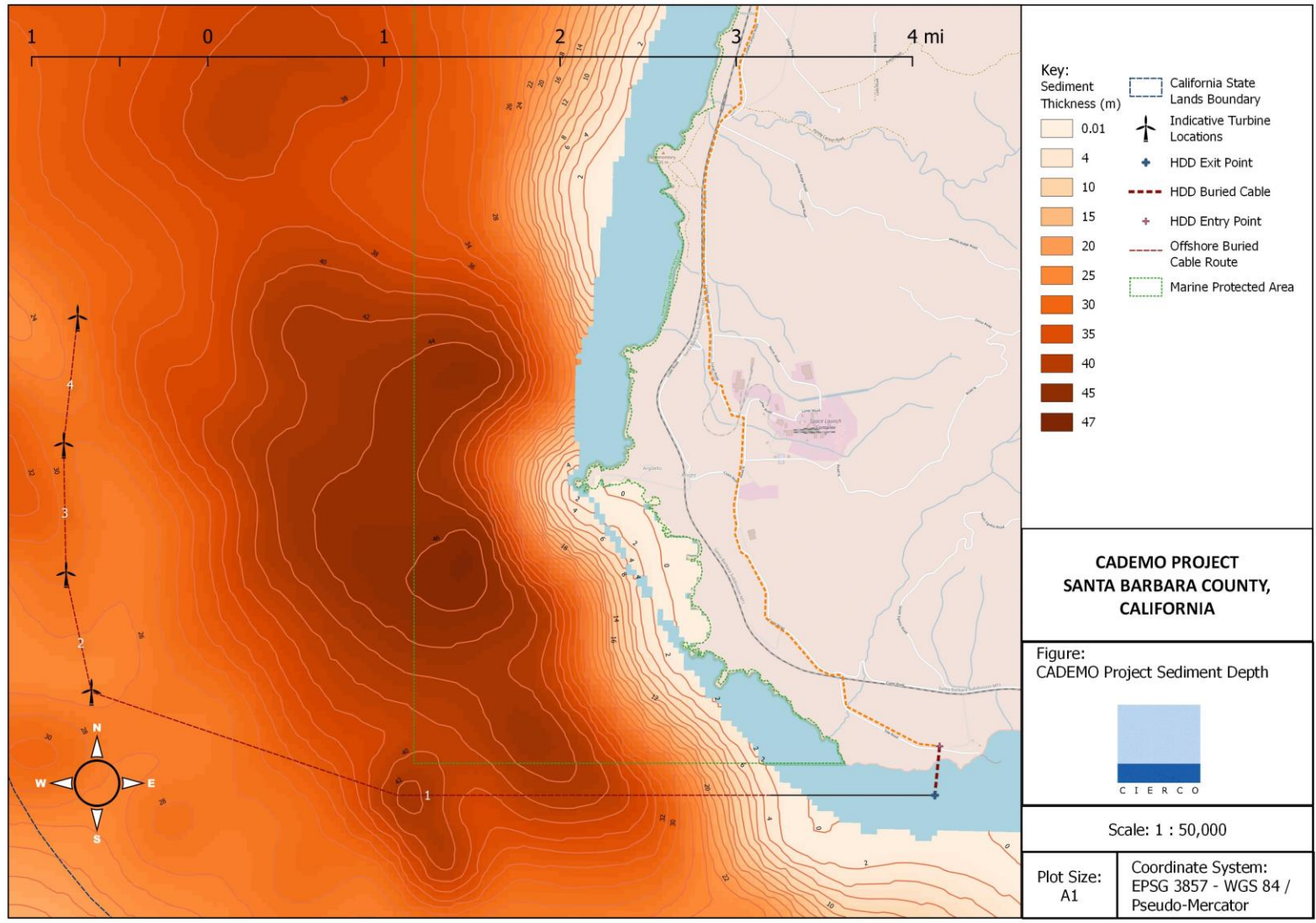


2. Suction Bucket / Caisson Anchor



3. Drag Embedment Anchor





## Cable Installation / Burial Methods

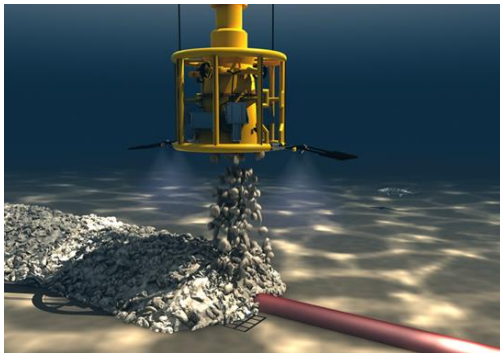


Jet Trench

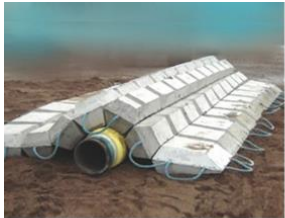


Cable Plough

## Cable Protection Methods



Rock Placement



Concrete Mattress

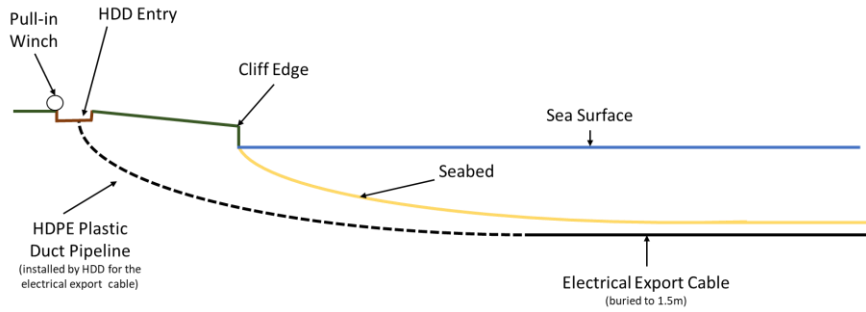


Grout Bag



Articulated Ducting / Armoured Cable

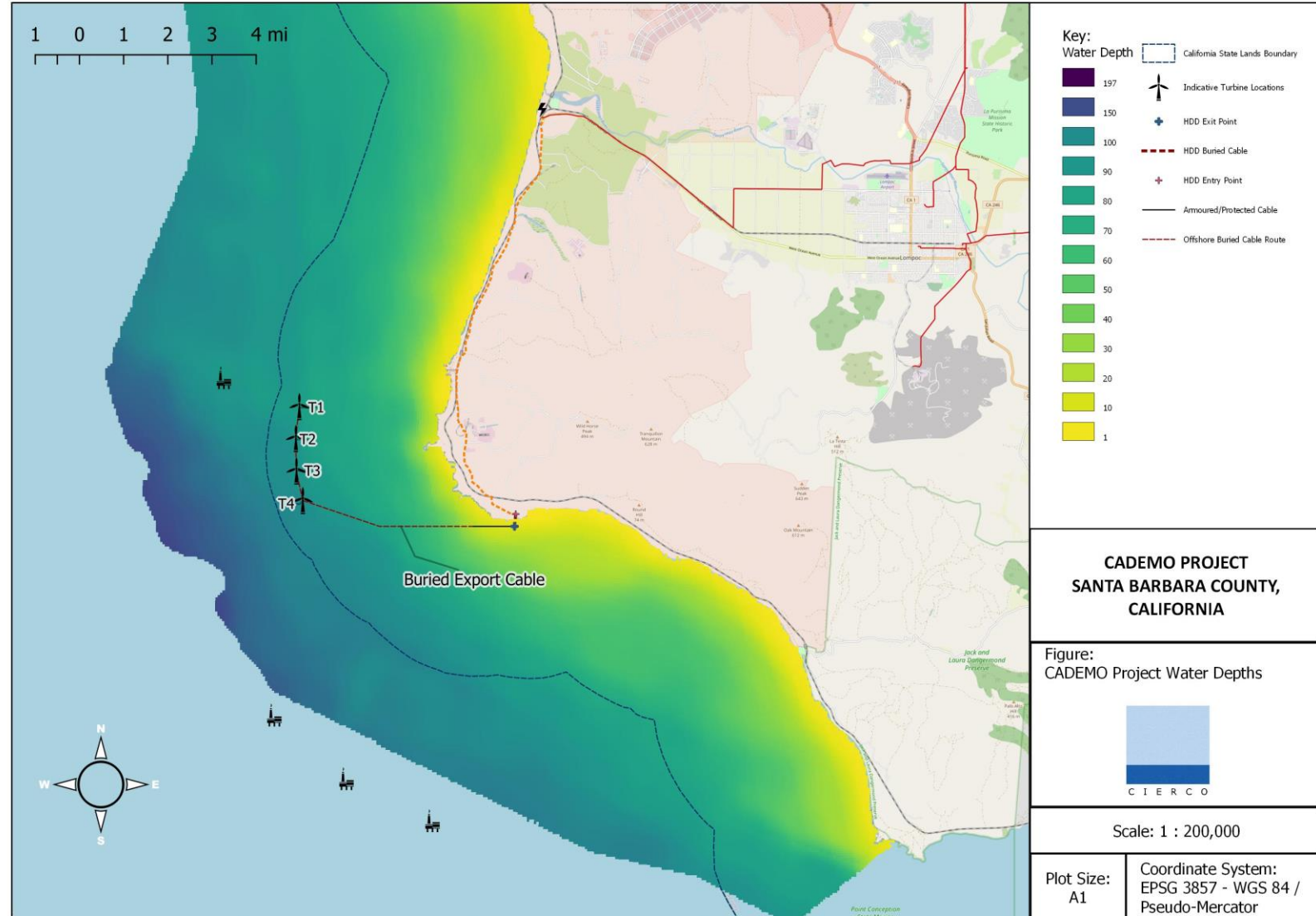




HDD Intertidal area cable arrangement

## Onshore Grid Arrangements

- The cable will land onshore near to the boat dock at Tow Road, Arlight, about 50m landward of the high water mark.
- The cable will be installed using a horizontal directional drill (HDD) method which will install a HDPE duct pipeline in a relatively shallow arc from the landing site offshore. The method avoids trenching in the sensitive inter-tidal areas.
- The exit point will be around 350 yards (320 meters) offshore and if it is not possible to maintain a burial depth of 1.5 meters, cable protection measures (indicated in previous slide) will be used to protect the cable.
- From the onshore landing point, the electricity will be transported via a new overhead wood pole (or similar) lines up to the Vandenberg substation N. Depending on Power Purchase Agreement arrangements the overhead line may be extended to the substation at Surf.



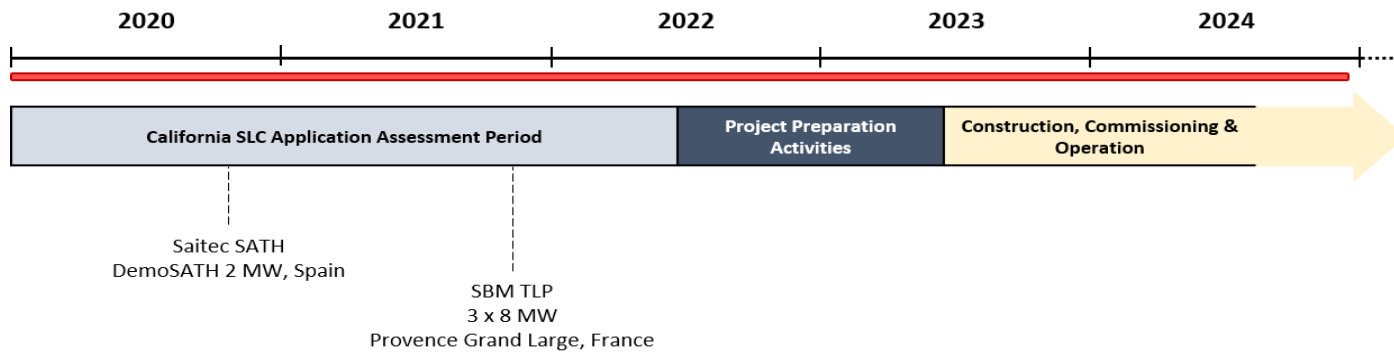


### Environmental and Social Interactions

- **Avian and Marine Mammal** - collision/entanglement risks, displacement, noise, attraction and EMF
- **Historic and Cultural Heritage** – survey requirements, establishing and understanding cultural sensitivities and identifying key areas of importance.
- **Commercial Fisheries** – establishing the current use, fisheries disruption, port and harbour infrastructure, safety navigation risk, entanglement risk, lost gear.
- **Seascape, Landscape and Visual** - views from public access beaches (Surf beach and Jalama beach), U.S. Highway 101 and California State Route 1.
- **Changes to Benthic and Pelagic Habitats** – disturbance from construction and operations.
- **Physical Processes** – changes to hydrodynamic regime.
- **Social, Recreational and Economic Impact** – establishing and quantifying the benefits and disbenefits of the CADEMO project.
- **Onshore Impacts** – Electrical tie-in line, DOD and other existing uses, traffic disruption

## CADEMO Schedule

- The CADEMO project application was accepted (and deemed complete) by the SLC on the 13 April 2020.
- The SLC are preparing to proceed with public outreach awareness through the California Environmental Quality Act (CEQA) process – this is independent and separate to our project stakeholder engagement process/
- The SLC are also working towards a Notice of Preparation (NOP) to solicit public comments for preparation of an Environmental Impact Report (EIR) – a 30 day public comment period.
- Discussions ongoing with the Vandenberg Air Force Base and the DoD



## Key Questions moving forward

- Thoughts on the project purpose and intent?
- What aspects should we take into account into account moving forward on the project – have we missed anything?
- Establish how you'd like to engage moving forward:
  - Direct contact? (email, phone, face to face)
  - Regularity? (weekly, monthly, quarterly, annual, at key points)
  - Website, email, webinar, other -what's appropriate for you?
- Who else should we be speaking to and how should we engage?

End of Slides



**CONTACTS:**

Marc Murray, Projects Director  
CIERCO

810 N. Farrell Dr, Palm Springs CA, 92262

Mob. +44 7808 706753 / [marc.murray@ciercoenergy.com](mailto:marc.murray@ciercoenergy.com)

Website: [www.cademo.net](http://www.cademo.net)