

# Documentation Part I - General information



**S E E N E O H**  
T I D A L   T E S T   S I T E

## PUBLIC DISSEMINATION

This report is part of a suite of documentation related to SENEOH test site. It describes the general information of the site.



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## 1- Introduction

France possesses the second largest tidal resource in the world, with more than 3.000 MW exploitable in two main areas in Northern France (off the coasts of Bretagne & Normandie). On the Southwest side, the Region of Nouvelle-Aquitaine and the Gironde territory around Bordeaux benefits from a specific feature with strong tidal currents in its estuary. This natural asset goes together with an industrial ecosystem that creates synergies and value in the fields of energy, oceanography, naval, materials.

The estuarine and fluvial environment is more sheltered than an open ocean environment thus facilitating the validation of technological concepts and the analysis of environmental impacts in real conditions, at a lower cost.



Figure 1: View of SEENE OH Test Site. Credit: VISUAILES

## 2- Objective of the document

This document is directed at developers of tidal technologies / turbine manufacturers willing to address the markets of tidal in estuaries, rivers or oceans. It is meant to present the features of Bordeaux SEENE OH tidal test site. This document is the Part I of the Specifications of SEENE OH tidal test site.

### 3- Presentation of SENEOH Tidal Test Site

#### 3.1- Objectives & main features

The purpose of this site is to contribute to the merge of the industry of tidal turbines, a marine renewable energy (MRE) producing electricity from the kinetic energy of oceanic, marine, estuarine and fluvial currents.

A study released in January 2017<sup>1</sup> highlights the existence of nearly 170 tidal turbine technologies around the world, identified on a patent analysis.

SENEOH tidal test site offers a testing field within a natural environment with exceptional conditions and a dedicated range of services:

- Energy performance monitoring
- Environmental impact monitoring
- Mechanical tracking
- Operations & maintenance

The site allows the simultaneous testing of up to 3 tidal turbine technologies connected to the electricity grid for a total capacity of 250 kW. These sites were named BILBAO and BRISTOL in tribute to the twinned cities with Bordeaux, located at the edge of estuaries.

These locations consist of an electrical connection (100kW – 12 optic fibers), oceanographic sensors, a secure system of supervision and data acquisition. Depending on the location chosen, the user can benefit from either the anchoring system only (BRISTOL), or a wide floating platform designed to accommodate a wide range of turbines (BILBAO).

Another type of anchor is being integrated into the site. It will offer a fixed anchoring mode in addition to the currently available floating systems.



Figure 2: Anchoring systems available at SENEOH

SENEOH test site is dedicated to developers who want to test:

<sup>1</sup> Study realized by Energie de la Lune.

- full-scale demonstrators of riverine and estuarine tidal streams;
- Intermediate scale demonstrators of oceanic tidal turbines;
- Components or equipment related to tidal turbines;
- Any ancillary technological component/part requiring real-life testing (e.g. material, cable, etc.).

### 3.2- Location

SENEOH tidal test site is located on the river part of the Gironde estuary in the heart of the city of Bordeaux and the “Port of the Moon”. This 7-hectares area enjoys strong tidal currents during flow tide and ebb tide, when currents are accelerated by the narrowing of the river induced by the presence of the bridge piers (with a maximum velocity of 3.5 m/s under the bridge).

The environmental characteristics of this site make it one of the most suitable sites in Europe for tidal turbine testing, while bringing together many technical assets such as the proximity of port infrastructures required during maintenance phases (GTM installed on the *Quai de Brazza*, GPMB installed on the *Quai du Maroc*) or the short connection distance to the electricity grid (onshore substation on the *Quai Richelieu*).

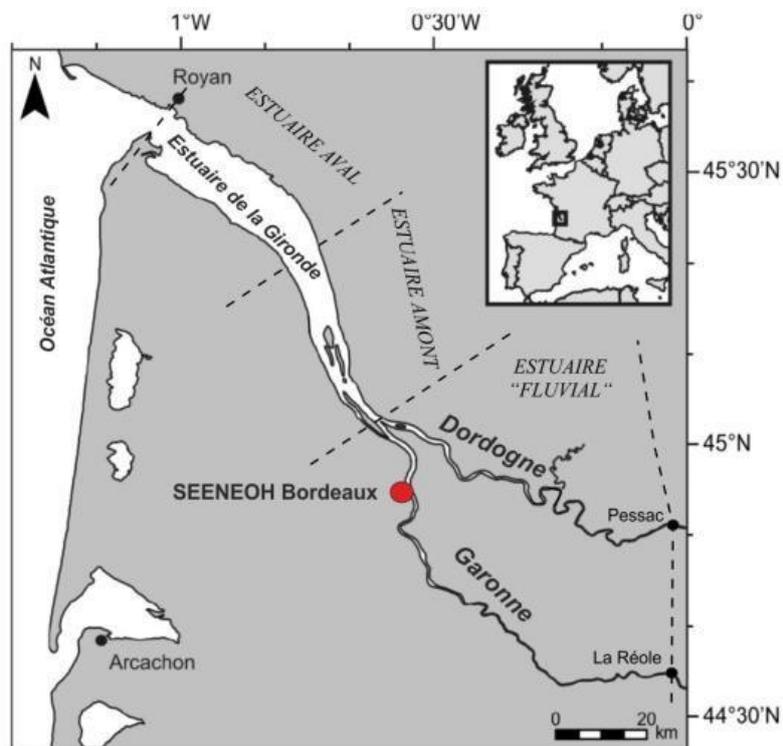


Figure 3: Map of the Gironde Estuary



Figure 4: Pont de Pierre, Bordeaux

## 4- Energetic resource

The hydraulic system of the Garonne in the test site area is run by the river flow and tidal currents. The current thus varies in intensity depending on river and oceanic forcing. The tide of the Aquitaine coast is semi-diurnal with an average of 12 hours 24 minutes. The Gironde estuary is macrotidal, meaning the tidal propagation has an amplitude of 2 to 6 m. In spring tide, the tide gauge of Bordeaux reports a tidal range of 5.8 m.

At SEENEHO test site, the flow tide lasts only 4 to 5 hours and the ebb tide 7-8 hours. Thus, the test site is exposed to varying intensities of two-way currents up to 3.5 meters per second (7 knots) under the bridge.

## 5- Local economic support

Greatly involved in favour of the development of the tidal energy sector, the local stakeholders have gathered their resource and expertise at the service of technical and environmental validations of these new technologies.

The SEENEHO project is the result of a close collaboration between the project leaders: Cerenis, Energie de la Lune, SEML Route des Lasers, Valorem group with a great support of public and private stakeholders locally: the Region Nouvelle-Aquitaine, the Deputation of Gironde, Bordeaux City, the national level through the “Investments for the Future” funding programme run by the National Research Agency, Caisse des Dépôts et Consignations, Bordeaux Port Authority, EDF, Dalkia, Enedis, Mixener, EVIAA Marine, GTM TP/GC South West (Vinci group) and Neotek.

## 6- Skills and expertise

The test site operational companies are responsible of the following tasks:

- Project management: Energie de la Lune
- Administrative & finance: SEML Route des Lasers
- Security & supervision: VALEMO (Valorem Group)
- Maritime engineering: CERENIS

Partners for maritime installation and manufacturing:

- Maritime works: GTM TP/GC Sud-Ouest, Balineau
- Operation and maintenance: Coeur d’Estuaire
- Shipyard: EVIAA MARINE, Workshops of Port of Bordeaux

The region of Bordeaux has developed a network of businesses around shipbuilding, aviation, aerospace, maritime and river infrastructures. Composite materials are also a growing sector in the area. as well as the composite sector. These SMEs and larger companies can be involved from the earliest stage of the project.

These companies operate in the following fields:

- Metal construction,
- Wiring, electrical connections,
- Transportation, handling, seaport services, logistics,
- Installation at sea and maintenance,
- Subcomponents or material

## 7- Port and logistic facilities

Access to the test site can be organized by the sea through several port terminals of Port of Bordeaux. The most appropriate facilities are described below.

TERMINALS:	BASSENS	BORDEAUX	QUAY OF BRAZZA
Distance from SEENE OH Test Site	8 km	3.2 km	3 km
Length of the quay	Cargo terminal of 300 m Ro-ro deck and drydock of 700 m Container terminal of 300 m	200m	50m
Allowable loads	5 tonnes /m <sup>2</sup>	5 tonnes /m <sup>2</sup>	5 tonnes /m <sup>2</sup>
Maximum water draught	7 m	7 m	7 m
Lifting capacity	A 5-ton crane and a 50-ton crane	400 t	None
Management	Port of Bordeaux	Port of Bordeaux	Temporary access under booking (no fee)
Connection to road and rail	YES	YES	Road only
Dry-dock	Length 247 metres, width 34m, depth 18m	2	No
Relevant infrastructure	RO-RO DECK: Floating dock bridge for boarding or unloading of rolling loads up to 60 t for axial ramp ships.	SLIPWAY: 59 m long and 12 m wide, draft of 4,50 m and 4 working dock areas	None

## 8- Organization & management

The project has initially received the support of the “Investment if the Future” national funding programme run by the French National Agency for Research (ANR).

The total investment for the offshore and onshore infrastructure amounts to 3 million € funded by the project partners through financial contributions, grants and repayable loans. The project’s final investment decision was taken in January 2017 with a share of investments between public partners (65%) and private partners (35%).

The site is operated by the entity SAS SEENE OH, created in 2015. The shareholders of SEENE OH SAS are Energie de la Lune (40%), CERENIS (22%), SEML Route des lasers (24%) and VALOREM group (14%); these four companies bringing together their human, technical and financial resources.



### ÉNERGIE DE LA LUNE

*Engineering company in the field of Marine  
Renexable Energies and Oceanographic survey*

- Test Site Management
- Scientific exploitation
- Light vessels operation
- Management of oceanographic instrumentation



### SEML ROUTE DES LASERS

*Supports companies in the innovative sectors of  
Nouvelle-Aquitaine region in their project  
development*

- Finance and administration
- Test site construction operator
- President of SEENE OH SAS since 2015.



### CERENIS

*Marine and Rivers engineering works*

- Engineering of floating platforms for turbine support
- Anchoring system design
- Marine operations for installaton / retrieval



### VALOREM

*Renewable enery utility company, maintenance  
operator through its 100%-owned subsidiary Valemo.*

- Security and Safety supervision
- Electrical interfacing
- Maintenance of electrical equipment
- Communication and data



## 9- Services

SEENE OH brings together environmental, mechanical and electrical skills and facilitates access to commissioning and maintenance operations.

SEENE OH has adequate oceanographic instrumentation as well as a supply vessel dedicated to the test site allowing the team to provide a wide range of testing services:

 **Oceanography and environment**

- Bathymetry
- Courantology
  - Continuous measurements
  - Specific point measurements
- Turbulence analysis
- Passive underwater acoustics
- Fish compatibility testing
- Real-time provision of environmental and technical data
- Electro-magnetism

 **Project development**

- Project review
- Structural design
- Design and manufacture of platforms and anchors

 **Energetic and electric**

- Monitoring and analysis of electrical production
- Certification of the power curve according to IEC 62 600-200
- Certification of grid safety

 **Operation and maintenance**

- 24 hour driving 7 days a week
- Light maintenance operations
- Nautical means of intervention and transport (technical teams and light equipment)