Portuguese Pilot Zone

A project that insists on staying on paper
The Portuguese Pilot Zone (PPZ) includes an area of 320 km² and it is located near the town of S. Pedro de Moel, between Figueira da Foz (North) and Nazaré (South).

The Portuguese Pilot Zone constitutes the maritime space delimited, under national sovereignty or jurisdiction, in waters whose depths are between 30 and 90 meters.

Its main objective is to become an open space, in the Atlantic coast, devoted to the development of oceanic energies, from early conception stages until full commercialization stages, with special emphasis in the wave energy.
Legal Framework

- **Creation:** Decree No. 5/2008 of 8 January
- **Base Lease:** Decree No. 238/2008 of 15 December
- **Concession Agreement:** RCM No. 49/2010 of 1 July

In the 23rd of January 2012, the Decree No. 15/2012 was published in order to update the Decree No. 5/2008 and to alter the Decree No. 238/2008, concerning issues related not only to the privatization of the company, but also to the characterization of the initial costs.

The Government as in agenda the discussion and approval, at the Parliament, of the new Decree-Law, that will extend the scope of the Pilot Zone to other forms of offshore renewable energies beside the waves (wind offshore) and defines the technical responsibilities of the concession.

**Note:** until this new legal framework is not publish no infrastructures can be built in the PZ.
ZP Manager Responsibilities

- Licensing of electricity production facilities, including the monitoring of the equipment’s tests, operation and removal phases;
- Supervision of all the electricity production facilities;
- Development of the Rules of Accessing to the Pilot Zone;
- Installation and Maintenance of all the common infrastructures, mainly electrical, maritime and security ones;
- Proposal of the Feed-In Tariff to be assigned to every project, in each development phase;
- Ensure proper mechanism of dissemination and promotion of the Pilot Zone and the production of electricity through oceanic energies.
Development Plan for the Portuguese Pilot Zone

Phase 1 (2011 – 2014):
- Aim – Development of the ZP so that it can receive, in a demonstration of concepts scheme, electricity generation equipment (wind and waves) in the summer of 2014.
- Objective – Installation of the electric infrastructure that allows the injection of 12 MW (4x3MW) in the central grid.

Phases 2 and 3 (as needed):
- Pre-comercial Stage (phase 2) – Injection of up to 80 MW
- Comercial Stage (phase 3) – Injection of up to 250 MW
Existing/planned Test zones in Europe

**European Marine Energy Center (EMEC)**

- Start date: August 2004
- Budget: ~ €16.7 m
- Capacity: 2.2 MW
- Depth: 50 m
- Locations: Scotland
  - Energia das Marés: Fall of Warness
  - Ondas: Billa Croo, Stromness

**The Wave Hub**

- First network connection: November 2010
- Budget: ~ €61 m
- Location: Cornwall (16 miles offshore), United Kingdom
- Capacity: 20 MW (4x5MW)
- Area: 8 km²
- Depth: 60 m
Existing/planned Test zones in Europe

**SEMREV**
- Location: Britannia, France
- Budget: ~ €6 m
- Capacity: 2.5 MW
- Depth: 35 m area
- Bathymetric and Environmental Studies 1 km² already made

**Biscay Marine Energy Platform (BIMEP)**
- Location: Armintza, 20 km from Bilbao, Spain
- Budget: €15 m
- Depths: 50-90 m
- Capacity: 20 MW (4x5MW)
- Area: 5.7 km²
- Distance to the coast: 1,750 m
Portuguese Pilot Zone’s Characteristics

Portuguese Pilot Zone

- Local: São Pedro de Moel, Portugal
- Depths: 30-90m
- Capacity: 12 MW (Concept Demonstration)
- Area: 320 km²
- Distance to Shore: ~5km to ~20 km

**Budget:** ~€15m

- Geophysical Characterization Studies
- Environmental Studies
- Electrical Infrastructure Project
- Engineering:
  - Submarine Power Cables
  - Onshore Substation
  - Submarine Cables’ Joints
  - Submarine Hubs
  - Submarine Cable’s Terminations
  - Installation of Equipment
  - Command & Control
Several tasks were in progress:

- Development of the Pilot Zone’s Access Regulation.
- Assessment of Environmental Impacts.
- Development of the full electrical project for the Phase 1, to be installed in the Pilot Zone’s electrical infrastructures.
- Building of a Services Portfolio, comprising the national enterprises that are able to provide all kinds of services to every promoter that wishes to develop its project in the Pilot Zone.
Some Geophysical Data

Geophysical Characterization of the Pilot Zone
Work Developed

Geophysical Characterization of the Pilot Zone:

• Realized by *Instituto Hidrográfico*, it comprises aspects such as:

<table>
<thead>
<tr>
<th>✓ Bathymetry and morphology</th>
<th>✓ Sedimentary structures</th>
<th>✓ Cartography of the sedimentary cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Establishment of a baseline for water quality and sediment</td>
<td>✓ Object detection</td>
<td>✓ Oceanography</td>
</tr>
<tr>
<td>✓ Sediment dynamics in coastal areas and corridors</td>
<td>✓ Safety of navigation</td>
<td>✓ Data integration and presentation</td>
</tr>
</tbody>
</table>

• According to preliminary data, the Pilot Zone has a **great energetic potential**, with great exposure to the oceanographic elements, especially winds and waves.

• All the information collected is **free and fully available** to the general public-
Some Geophysical Data

Geophysical Characterization of the Pilot Zone:

- **Bathymetry**
- **Acoustic Image**

### Energetic period vs. Significant height

<table>
<thead>
<tr>
<th>Power Class (P) [kW/m]</th>
<th>Global</th>
<th>Summe</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>P ≤ 5</td>
<td>34.43</td>
<td>14.45</td>
<td>3.92</td>
</tr>
<tr>
<td>5 &lt; P ≤ 10</td>
<td>15.68</td>
<td>55.46</td>
<td>26.33</td>
</tr>
<tr>
<td>10 &lt; P ≤ 20</td>
<td>17.11</td>
<td>15.75</td>
<td>18.47</td>
</tr>
<tr>
<td>20 &lt; P ≤ 50</td>
<td>18.90</td>
<td>10.63</td>
<td>27.39</td>
</tr>
<tr>
<td>50 &lt; P ≤ 100</td>
<td>8.65</td>
<td>2.83</td>
<td>14.49</td>
</tr>
<tr>
<td>100 &lt; P ≤ 200</td>
<td>4.02</td>
<td>0.80</td>
<td>7.25</td>
</tr>
<tr>
<td>P ≥ 200</td>
<td>1.21</td>
<td>0.08</td>
<td>2.35</td>
</tr>
</tbody>
</table>

- **Relative Frequency of Wave Power Distribution**
Some Geophysical Data

Geophysical Characterization of the Pilot Zone:

- Backscatter variation due to the presence or proximity of gravel deposits
- Sedimentary Deposits
- Total Current for 10, 20, 30 and 40m of depth
- Peak wave Direction and Energy Distribution (Summer and Winter)
Work done - census of birds and mammals

Common Species

- Cagarra
- Fura-bucho
- Alcatraz
- Gaivota -de-patas-amarelas
Work done - census of birds and mammals

Common dolphin

Common Tortoise

Número de observações de golfinhos

<table>
<thead>
<tr>
<th>Espécie</th>
<th>Observeações de golfinhos</th>
<th>Número de observações</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golfinhos comuns</td>
<td>10</td>
<td>5 - 10</td>
</tr>
<tr>
<td>Golfinhos não identificados</td>
<td>5</td>
<td>10 - 15</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>15 - 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;20</td>
</tr>
</tbody>
</table>

Portugal

Zona Hidro-Portuguesa
Work Developed

Command, Control & Communication
Characteristics of the Portuguese Pilot Zone

- Good resource, without being too destructive;
- Few storms each year, mainly in Winter;
- Good installation/maintenance conditions happen frequently;
- Low intensity of ocean currents and absence of tidal currents;
- Maritime traffic with low intensity;
- Seabed composed mainly of sand and gravel, with no outcrops;
- Proximity to ports and shipyards.

Profile of the seabed in ZP ⇒
Profile of the promoters

Promoters who intend to install test areas mentioned have a two backgrounds: either come from University projects or I&D centers, with scientific state funds; or are companies that, with equity, have developed their own projects.

However, the budgets of each promoter are typically in the range of €5 m to €30 m. Are examples:

- **Project FLOW (Martifer)**
  - ~ €25m

- **Project WindFloat (EDP)**
  - ~ €20m

- **Project WaveRoller (AWE)**
  - ~ €8m
With the coming to the Portuguese Pilot Zone, the promoters will need to resort to certain types of services and equipment that can be provided by national value chain.

For example, it is economically more advantageous a prosecutor build your machine in national shipyards instead of transporting it directly from their country of origin.
Note: the value of the investment made by the promoters essentially depends on the technology. However, it is certain that all sectors will benefit from the investment said referred to acime. A good example of this, is the WindFloat project, EDP innovation, where 90% of the required services were provided by national companies.
Services available near the Portuguese Pilot Zone

- Universities and Institutes devoted for offshore R&D
- Shipyards
- Electrical Industry
- Maritime Operators
- Ports
- Others (see at www.globalfind.globalparques.pt)
A COMPARISON: THE NORTH SEA
Environment - relationship with Populations

• The installation of marine energy conversion equipment has significant impacts on the daily lives of the people who are close to the equipment. The main factors to be taken into account are:
  • coexistence with other activities (fishing, nautical sports, tourism)
  • noise (there are complaints related to the movements of the wind blades)
  • landscape Changes
• there are, however, positive aspects, like for example:
  • Revitalization of the marine sector,
  • job creation
  • Development of the local economy.
The floating offshore wind presents features that allow reducing strongly the costs: the cost of foundations decreases to depths between 30 m and the 100 m. The wind resource presents less turbulence, increasing the capacity factor using larger turbines. Etc.

In the specific case of Portugal, given the characteristics of the West Coast, the relative proximity to the coast allows cost reduction with the transport of energy to Earth. On the other hand, given the extent of Portuguese EEZ, there is plenty of room to install this technology ad infinitum.
One of the major barriers to the development of renewable energies relates to its high LCOE (Levelized Cost of Energy).

It is essential to realize that energy is a business and that the solutions developed are not profitable at market prices, hardly survive without external support as FITs or PPAs.

It is expected that the offshore wind farm cut costs to about € 120/MWh. In the case of wave energy, as is still under development, it is impossible to predict when it will reach maturity and, consequently, be competitive.
Expected evolution of technology

- Osmotic energy
- Wave energy
- OTEC
- Tidal current
- Floating offshore wind
- Fixed offshore wind
- Tidal range

Maturity level

Starting date

- After 2015
- Between 2005 and 2015
- Prior to 2005
Expected evolution of technology

ONSHORE, OFFSHORE WIND & OCEAN ENERGY
PROJECTED GROWTH

Cumulative installed capacity (GW)

- Onshore wind
- Offshore wind
- Ocean energy

1990  2000  2010  2020  2030  2040
One of the major European objectives for the progress of offshore wind is the reduction in the cost of energy to the value of about £100/MWh.

Technological innovation is the main factor which must be addressed. Another important factor should be the creation of policies and strategies that allow this technology compete commercially with fossil technologies.

The expected evolution of the investment
In Summary

- Portugal presents ideal conditions for the development of marine renewables
- There are several test Areas in Europe, but none has the geophysical conditions nor the access requirements that exist in Portuguese Pilot Zone.
- Portuguese Pilot Zone. The Portuguese Pilot Zone has a high energy potential, without having a lot of destructive storms.
- The Prosecutor can develop their project from the concept demonstration phase to commercial always in the same place.
- Portugal will benefit from the development of oceanic energies, in particular with the attraction of foreign investment, the revitalization of the maritime sector and the creation of direct and indirect jobs.
- With the development of these projects, the possibility of major initiatives, like an Atlantic SuperGrid or energy transport in DC, is latent. If they become real, Portugal will have not only energy independence, but will probably become an energy exporter.
In overview, the Portuguese economy has, in the short term to gain from investing in offshore renewable energy. With a relatively small investment, as what is planned for the Pilot Zone, you can attract international investment and avoid that national investment is relocated, streamlining beyond the technological sector of a large part of the energy sector of the sea.

In the medium-long term, if the national energy situation, European and international, not dictate expansion and demand from offshore renewable energy, the Portuguese economy and the economy of the Sea already has won.

If on the other hand there is expansion and offshore renewable energy demand, Portugal will be in prime position to produce to the national and European market as holder of technology, knowledge and developing exportable to other development zones.

It can be concluded that the investment in this subsector will be always, regardless the scenario of economic and energy market, a bet wins.
Questions?

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