

I. OFFSHORE WIND AND WAVE ENERGY

In the recent years Portugal has developed remarkable features on the Renewable Energy sector. The development started with the Governmental commitment to accomplish the European Directive for Renewable Energies (2001/77/CE) and with the definition of national goals which are presently defined by the National Strategy for Energy (ENE) and the ambitious intention of the installation of 8500 MW of wind capacity by 2020 [Costa *et al.* w/d].

The increasing interest in renewable marine energies over the last years and a rapidly rise of enterprises enthusiastic to invest in this field had in Portugal one of its focal points. Facing this increasing interest, a group of 10 mainly Portuguese entities (companies, universities and a R&D institute) formed the Wave Energy Centre (**WavEC**) in 2003. This institution has focused its activity in determining the potential and defining strategies for the development of wave energy in Portugal. WavEC has shown private companies and the Portuguese government the extremely favourable conditions to explore wave energy in Portugal, pointed out possible conflicts zones and concession areas for wave energy farms, and integrating several national and international projects. At the same time, governmental laboratories have the mission to aid and contribute to the implementation and improvement of public policies on offshore energy, especially wind farms. For example, the National Laboratory for Energy and Geology (**LNEG**) has initiated the development of methodologies to identify areas with high wind potential, leading to the creation of a Wind Atlas [Costa *et al.* w/d].

I.1. LEGISLATION IN PORTUGAL

The legislation requirements for the implementation of ocean energy projects at a national scale were initially established for the installation of equipment or infrastructures within the territorial sea and the EEZ (Table I, DL 254/99). The installation of such equipment and infrastructures requires approval from several Ministries, e.g. National Defence and Sea Affairs, Environment, Spatial Planning and Regional Development, Economy and Innovation, Agriculture and Fisheries or Public Works, Transport and Communications [Simas *et al.* 2009].

In 2004 and considering the implementation of the EU Directive 2001/77/CE on electricity production from renewable sources the licensing process for renewable energy projects was established. The obligation for an Environmental Impact Declaration produced by the regional development authority (CCDR), the Nature Conservation and Biodiversity Institute (ICNB) and the Ministry of Spatial Planning and Environment (Table I, Joint order 51/2004) [Simas *et al.* 2009] was also determined. This implies that there is the obligation for an Environmental

Incidence Study if the project is not listed in the EIA legislation (DL 69/2000), which is the case of wave energy projects.

Furthermore, in 2008 the regulation of the Portuguese Pilot Zone (PPZ) for the installation of wave (or similar) energy devices offshore was formalised, with a total area of 320 km² at water depths between 30 and 90 m and an estimated installed capacity of 250 MW (Table I, DL 5/2008). The basis for the operation and the concession of the PPZ is regulated by the DL 238/2008, which also defines the Managing Body.

Finally, in 2010, the concession agreement draft for the exploration in public service of the PPZ was approved by the Council of Ministers. This Resolution also supports the private use of public water resources, including the use of territorial waters during 45 years.

Table I – Portuguese legislation for ocean energy projects (summary).

Legislation	Description
DL 254/1999	The requirements for the installation of equipment or infrastructures within the territorial sea and the Exclusive Economic Zone
Joint order 51/2004	License process of electricity production from renewable energy Sources and the obligation for an Environmental Impact Declaration or Environmental Incidence Study.
Joint order 251/2004 and Joint order 66/2005	Components to be described and evaluated in the Environmental Incidence Study for Eolic and Wave power projects: <ul style="list-style-type: none"> - Gas emissions - Landscape/Seascape - Geology and geomorphology - Hydric resources - Natural values (flora, fauna and natural habitats) - Heritage (archaeological, architectonical and ethnographical) - Noise - Soils - Spatial planning/classification - Population
DL 5/2008	Legal framework for the use of public natural marine resources. Establishes the geographical limits of the Portuguese Pilot Zone and creates a management entity for the zone.
DL 238/2008	Approves the award of bases for the operation of the Portuguese Pilot Zone for the production of electricity from wave energy and gives its award to a company to be formed by REN - Redes Energeticas Nacionais, S.G.P.S., S.A.
Resolution of the Council of Ministers n° 49/2010	Approves the concession agreement draft, under public service, for the PPZ and the private use of water resources in the public domain for the production of electricity from the energy of ocean waves.

2. PORTUGUESE ENVIRONMENTAL RESTRICTIONS

2.1. MARINE PROTECTED AREAS

Protected Areas in Portugal integrate the National Network of Protected Areas, Sites of the National List of Sites and Special Protection Areas included in the Natura 2000, as well as classified areas under international commitments made by the Portuguese government, such as the areas designated under the Ramsar and OSPAR Conventions. These were created to adopt special measures to protect communities and sensitive marine habitats, to ensure marine biodiversity and the enhancement as well as the sustainable use of marine resources. Appendix II shows the distribution of important protected areas in Portugal (mainland), which have to be taken into consideration on the implementation of offshore wind farms.

Continental Portuguese EEZ is included in two OSPAR sub-regions:

- IV - Bay of Biscay/Golfe de Gascogne and Iberian coasts
- V - Wider Atlantic

Protected Areas with marine surface included in Portuguese Network of Marine Protected Areas are:

- Berlengas Natural Reserve
- Arrábida Natural Park
- Nature Park of Southwest Alentejo and Cape St. Vicente Coast
- North Coast Natural Park
- Natural Reserve of Santo André and Sancha Lagoon
- Natural Reserve of Dunas de S. Jacinto

In general, these Marine Protected areas do not achieve the 50 m bathymetric. However, they should be considered as they may be crossed by electric cables in the coastal zone or adjacent land, where the connection with the mainland point has to be established.

Some Portuguese Natura 2000 Areas include a strip of sea extending generally between 10 and 100 m depth. These places are listed below, as well as their maximum depth:

RN2000 site - Birds Directive

- PTZPE0001 Minho and Coura Estuaries, -15m
- PTZPE0004 Ria de Aveiro, - 20 m
- PTZPE0009 Berlengas Islands, - 50 m

- PTZPE0013 Santo André Lagoon, - 10 m
- PTZPE0014 Sancha Lagoon, - 10 m
- PTZPE0015 Southwest Coast, - 40 m
- PTZPE0017 Ria Formosa, -10 m
- PTZPE0018 Castro Marim, -10 m
- PTZPE0050 Espichel Cape, -20 m

RN2000 sites - Habitats Directive

- PTCO0006 Berlengas Archipelago, 0 m
- PTCO0008 Sintra/Cascais, -20 m
- PTCO0009 Tejo Estuary, 0 m
- PTCO0010 Arrábida/Espichel, entre -40 e -100 m
- PTCO0011 Sado Estuary, 0 m
- PTCO0012 Southwest Coast, -20m
- PTCO0013 Ria Formosa/ Castro Marim, 0 m
- PTCO0017 North Coast, <10 m
- PTCO0018 Barrinha de Esmoriz, 0 m
- PTCO0019 Minho River, 0 m
- PTCO0020 Lima River, 0 m
- PTCO0034 Comporta – Galé, 0 m
- PTCO0036 Guadiana, 50 m
- PTCO0052 Arade River/Odelouca, 0 m
- PTCO0054 Fernão Ferro/ Albufeira Lagoon, 0 m
- PTCO0055 Dunas de Mira, Gândara e Gafanhas, 0 m
- PTCO0056 Peniche/Santa Cruz, -20 m
- PTCO0058 Sítio Ria de Alvor, 0 m

In the EEZ, Marine Important Bird Areas (IBAs) were also recently established, based on the BirdLIFE International program [**BirdLIFE**] with local coordination of the Portuguese Society for the Study of Birds (**SPEA**):

- IBAPTM01 Figueira da Foz
- IBAPTM02 Berlengas
- IBAPTM03 Cabo Raso
- IBAPTM04 Ria Formosa

These were determined considering the end of the EU *LIFE* project “Marine IBAs 2004-2008” and the publication of the first national inventory of IBAs. Detailed information regarding these areas can be found at Important Areas for Seabirds in Portugal [Ramírez et al. 2008].

One of those IBAs (Figueira da Foz) partially overlaps the PPZ, which should be properly determined as it corresponds to important limitations on migratory routes as well as bird’s habitat. The possible impact of wave or wind energy devices on the distribution and abundance of seabirds and their potential prey should be cautiously monitored. Petronilho (2004) has reported bird’s agglomerations higher than 1000 individuals that use the area for breeding, feeding or migratory routes. This area is defined by the presence of the Balearic shearwater, a globally threatened bird, which occurs preferentially in shallow coastal areas.

Environmental management details and recommendations for the PPZ should be found on Huertas-Olivares et al. 2007 [[PDF](#)].

2.2. MARINE PROTECTED SPECIES

Several marine species (resident and visiting) occurring along the EEZ are reported on the Portuguese Red Book and listed on the OSPAR List of Threatened and/or Declining Species. Both documents constitute a useful tool in the context of the conservation of species and their habitats.

Invertebrates

- *Megabalanus azoricus* (Azorean barnacle)
- *Nucella lapillus* (Dog whelk)
- *Patella ulyssiponensis aspera* (Azorean limpet)

Birds

- *Puffinus assimilis baroli* (Little shearwater)
- *Puffinus mauretanicus* (Balearic shearwater)
- *Sterna dougallii* (Roseate tern)
- *Uria aalge* (Iberian guillemot)
- *Phalacrocorax aristotelis* (Common Shag)
- *Pandion haliaetus* (Osprey)

Fish

- *Acipenser sturio* (Sturgeon)

- *Alosa alosa* (Allis shad)
- *Anguilla Anguilla* (European eel)
- *Centroscymnus coelolepis* (Portuguese dogfish)
- *Centrophorus granulosus* (Gulper shark)
- *Centrophorus squamosus* (Leafscale gulper shark)
- *Cetorhinus maximus* (Basking shark)
- *Dipturus batis* (Common Skate)
- *Raja montagui* (Spotted Ray)
- *Platichthys flesus* (European flounder)
- *Hippocampus guttulatus* (Long-snouted seahorse)
- *Hippocampus hippocampus* (Short-snouted seahorse)
- *Hoplostethus atlanticus* (Orange roughy)
- *Lamna nasus* (Porbeagle)
- *Petromyzon marinus* (Sea lamprey)
- *Rostroraja alba* (White skate)
- *Salmo salar* (Atlantic Salmon)
- *Squalus acanthias* (Spurdog)
- *Squatina squatina* (Angel shark)
- *Thunnus thynnus* (Bluefin tuna)

Reptiles

- *Caretta caretta* (Loggerhead turtle)
- *Dermochelys coriacea* (Leatherback turtle)

Mammals

- *Balaenoptera musculus* (Blue whale)
- *Eubalaena glacialis* (Northern right whale)
- *Phocoena phocoena* (Harbour porpoise)
- *Tursiops truncatus* (Common Bottlenose Dolphin)
- *Balaenoptera acutorostrata* (Minke whale)
- *Globicephala melaena* (Pilot whale)

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