OTEO Project - Offshore Energy Technology Observatory

WavEC Annual Seminar
Blue Economy – Offshore Platforms and Opportunities
26th November 2012, Electricity Museum, Lisbon.

Tiago Morais
AGENDA

1. INEGI
2. OTEO Project
INEGI

Institute of mechanical engineering and industrial management

INEGI is one of the 69 Research Units at the University of Porto.

We are an interface Institution between University and Industry, oriented to the activities of Research and Development, Innovation and Technology Transfer.

<table>
<thead>
<tr>
<th>Permanent Staff</th>
<th>92</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary Staff (scholarships)</td>
<td>63</td>
</tr>
<tr>
<td>TOTAL BOARD</td>
<td>155</td>
</tr>
<tr>
<td>Consultants – University</td>
<td>70</td>
</tr>
<tr>
<td>TOTAL</td>
<td>225</td>
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</tbody>
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Human Resources
INÉGI
Institute of mechanical engineering and industrial management

RESEARCH, DEVELOPMENT AND INNOVATION OFFER

**RESEARCH**
- Research Projects (national and european)
- Research Under Contract for Companies

**INNOVATION AND TECHNOLOGY TRANSFER**
- Product Design and Development
- Composite Structures
- Composite Materials Production Processes
- New Materials
- Equipments Development
- Ceramic Materials Production Processes
- Energy Systems
- Rapid Prototyping and Pre-series Production

**SCIENTIFIC/TECHNICAL CONSULTING & SERVICES**

**CONSULTING**
- Renewable Energies
- Engineering and Industrial Management
- Tailor Made Training Programmes
- Energy Efficiency and Management
- Technology Audits

**SERVICES**
- Rapid Prototyping
- Materials and Structures Characterisation
- Noise and Vibration Analysis
- Environmental Consulting
- Lubricant Analysis
- Clean Room (10K – ISO7)
- Testing of Behavior of Materials and Products to Smoke and Fire
INEGI

Institute of mechanical engineering and industrial management

INEGI offers Research, Innovation, Technology and Consulting Services in a wide market range:

- Automotive and Transports
- Aeronautics, Space and Defence
- Energy
- Equipment and Durable Goods
- Health Care
- Services
- Sea Economy
- Environment
INEGI

Institute of mechanical engineering and industrial management

INEGI has 25 years of experience with many successfully projects for a wide range of clients.

Non-conventional matrix/carbon nanotubes for:

ESA and ASTRIUM

Next generation of brakes for aeronautics. Some Partners:

SAGEM
AIRBUS
MESSIER-BUGATTI
SKODA
IMMG
SAMTECH

Hydrogen as an energetic vector with:

SRE
EDP
EEM,
EFACEC,
VIDROPOL
INETI
IST
AREAM

Wind Power Consulting:
More than 80% of the installed capacity in Portugal has collaboration from INEGI. Now we are present in 11 countries from 3 continents.
The OTEO project - “Offshore Energy Technology Observatory” establishes as a strategy the portuguese and the international knowledge of offshore energy technologies as well as support technologies in order to increase the competitiveness and the entrepreneurship in this sector.

- **PARTNERS:** INEGI, EnergyIN, WavEC
- **PROGRAM FUNDING:** 01/SIAC/2011 - Sistema de Apoio a Ações Coletivas, COMPETE, QREN
- **PROJECT DURATION:** 01.09.2011 a 31.08.2013
The Ocean is one of the less explored resources of the Planet.

- The surface of the planet is composed by: 29.2% of Land and about 70.8% of Water.

- 97.4% of this area is salt water of the Oceans (96.5%) and Seas (0.9%).

- Only 2.6% of this area is freshwater.

- This enormous surface receives the largest amount of energy emitted by the Sun. Solar Energy is the source of all energies leading to thermal gradients currents, winds and waves.
World Energy Consumption: **140,000 TWh/y**

The Ocean: a huge resource – 275,500 TWh/y

<table>
<thead>
<tr>
<th>Type of source</th>
<th>Annual Theoretical Energy</th>
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<tbody>
<tr>
<td>Temperature Gradient</td>
<td>30,000 TWh/year</td>
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<tr>
<td>Salinity Gradient</td>
<td>20,000 TWh/year</td>
</tr>
<tr>
<td>Tidal Stream</td>
<td>2,200 TWh/year</td>
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<tr>
<td>Tidal Range</td>
<td>300 TWh/year</td>
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<tr>
<td>Waves</td>
<td>44,000 TWh/year</td>
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</table>

<table>
<thead>
<tr>
<th>Type of energy</th>
<th>European target</th>
<th>International target</th>
<th>2050 Target</th>
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</thead>
<tbody>
<tr>
<td>Offshore wind</td>
<td></td>
<td></td>
<td>460 GW</td>
</tr>
<tr>
<td>Ocean energy</td>
<td></td>
<td></td>
<td>1150 GW</td>
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<tr>
<td></td>
<td>European target</td>
<td></td>
<td>188 GW</td>
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<tr>
<td></td>
<td>International</td>
<td></td>
<td>748 GW</td>
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<tr>
<td></td>
<td>target</td>
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</table>
OFFSHORE RENEWABLE ENERGY

THERMAL GRADIENT

SALINITY GRADIENT

TIDAL

WAVE

OFFSHORE WIND
ENABLING TECHNOLOGIES
EXTENSION OF THE PORTUGUESE EXCLUSIVE ECONOMIC ZONE

EMAM – Estrutura de Missão para a Extensão da Plataforma Continental

EEZ Exclusive Economic Zone

Continental Portugal (327,667 Km2)
Azores (953,633 km2)
Madeira (446,108 km2)

Present = 1,727,408 Km2
Future = 3,877,408 Km2
OTEPO PROJECT - Aims

- Create a network of Portuguese and international experienced experts in offshore energy projects by monitoring the activity carried out in the main European Research Centres;

- Identify opportunities and threats, strengths and weaknesses of offshore energy technologies from concept to deployment;

- Analyze offshore energy technologies investment projects.

This project aims to help Portugal to become a country that knows how to use the energetic potential of its coast and into a relevant manufacturer and exporter of core and support technologies.
Main Objectives:

- Directory of National Entities (Base) with identifying competencies for the development of offshore energy recovery projects.

- Technology "Roadmap" that identifies actions, their schedules and costs, to develop a national offshore renewable energy sector that maximizes the national value chain.

- Events organization and an international conference on the theme: “OFFSHORE RENEWABLE ENERGY: What solutions to develop in Portugal?”

- Book Publication on Offshore Energy Conversion Technologies to disclose internationally;
ACTIVITIES

• ACTIVITY 1: Report on the State-of-the-art of offshore energies
  • Resource
  • Forms of Exploitation
  • Main Actors
  • Barriers to Development
  • Potential Development
  • Evolution Across the Last Years
  • Objectives and Goals
  • Structuring Projects

• INTERNATIONAL CONFERENCE “OFFSHORE RENEWABLE ENERGY: What solutions to develop in Portugal?” (Oporto, 10th of May)
ACTIVITIES

• ACTIVITY 2: Market study and survey of business opportunities in the renewable offshore energy sector

• ACTIVITY 3: Analysis of offshore energy systems around the world

• ACTIVITY 4: Identification of crucial skills for the development of offshore energy projects

• ACTIVITY 5: Directory of Portuguese Entities with competences in the development of offshore energy projects;

• ACTIVITY 6: Definition of a technological Roadmap to identify the activities, timings and costs to develop an offshore renewable energies sector in Portugal

• ACTIVITY 7: Promotion of a discussion to foster partnerships and projects in the offshore energy sector

• ACTIVITY 8: Disclosure Project - Results
Website: 
http://oteo.inegi.up.pt/
OBRIGADO