

# Renewable Energies in the Canary Islands

Presentation



Washington, June 29<sup>th</sup> , 2010

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## Canary Islands has a great potential to be at the forefront of the renewable energies due to the combination of three different factors

What makes a sector attractive to invest in...

# Why invest in Renewable Energies in the Canary Islands?

... are the factors involved in the business model...

1

### Renewable resources

- Solar resources
- Wind resources
- Tidal resources

2

### Technology and industrial development

- State-of-the-art technology
- Spain is leading country in the field of renewable energies
- Proven track record in Canary Island and Spain
- Decline in renewable energy investment costs

3

### Legal framework

- Premium system guaranteed
- Distributor obliged to buy electricity from renewable energy sources.
- Incentives for participation in the electricity market

... that secure a profitability where all risks are completely identified and measured



## Low risk investment with high profitability

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**A. Why invest in Renewable Energies in the Canary Islands?**

**B. Renewable resources**

**C. Technology and industrial development**

**D. Legal framework**

**E. Investment profitability**

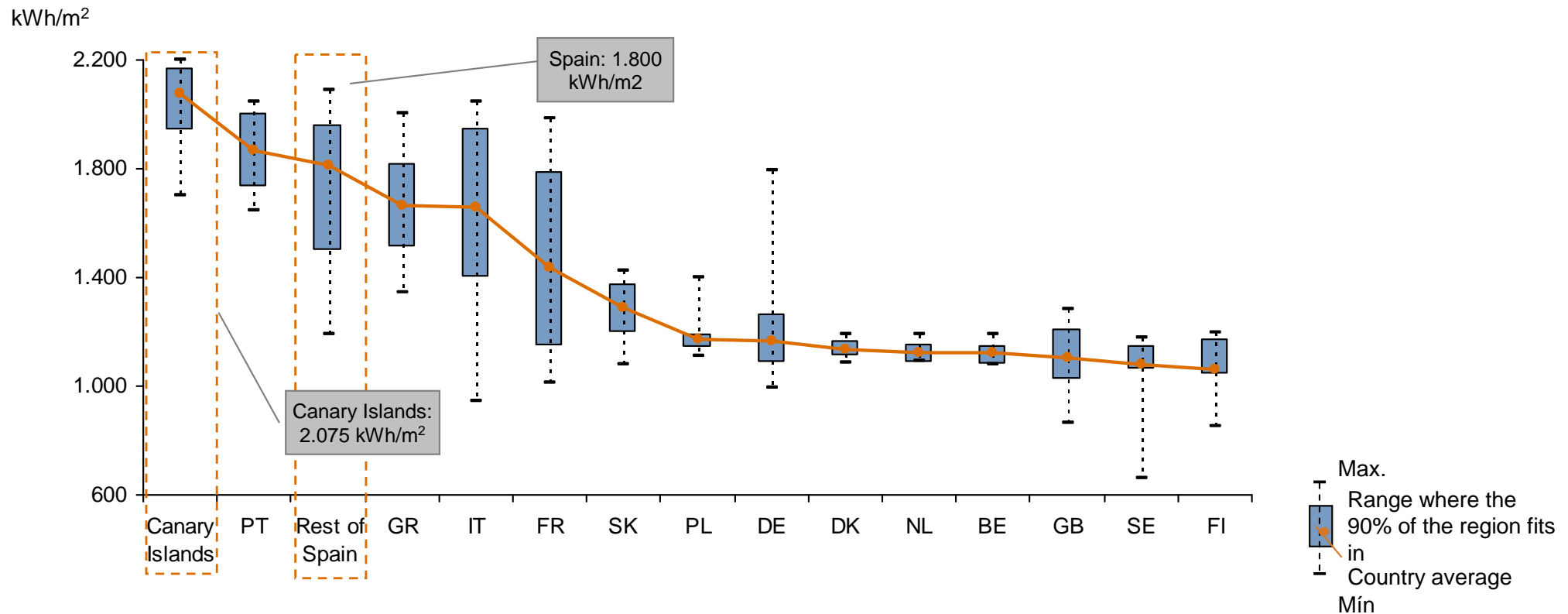
**F. What can Idom do for you?**

**G. References**

# Canary Islands stands out amongst other regions in Europe due to its annual solar irradiation ...

## High annual solar irradiation

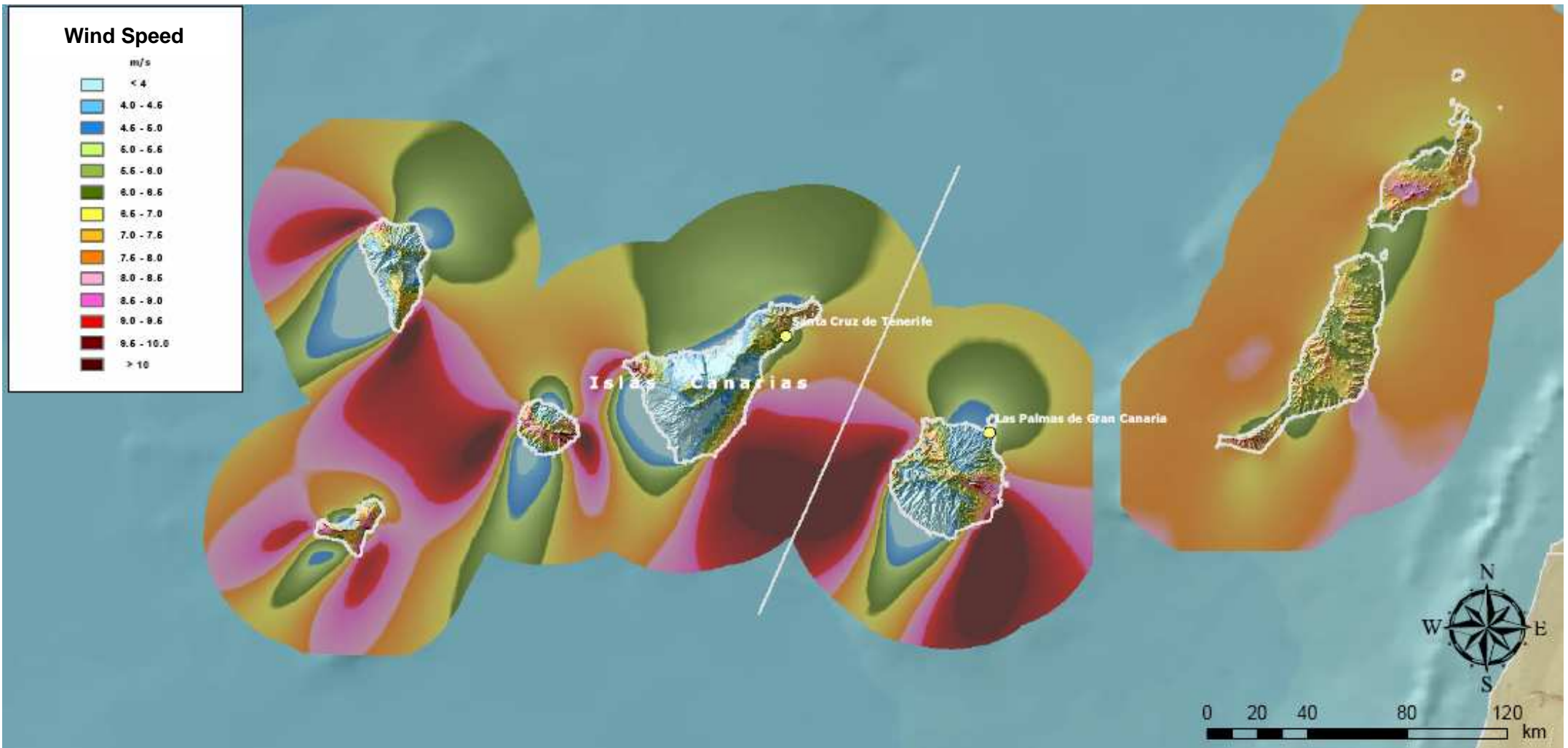
Comparison of yearly global irradiation incident on optimally-inclined photovoltaic modules in European regions



Source: "Regional differences of the PV electricity production in EU 25 countries", European Commission, June 2004; Idom analysis

## Renewable resources Canary Island wind conditions

... and, additionally, the wind resources around the seacoast generate long periods of high wind speed



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**A. Why invest in Renewable Energies in the Canary Islands?**

**B. Renewable resources**

**C. Technologies and industrial development**

**D. Legal framework**

**E. Investment profitability**

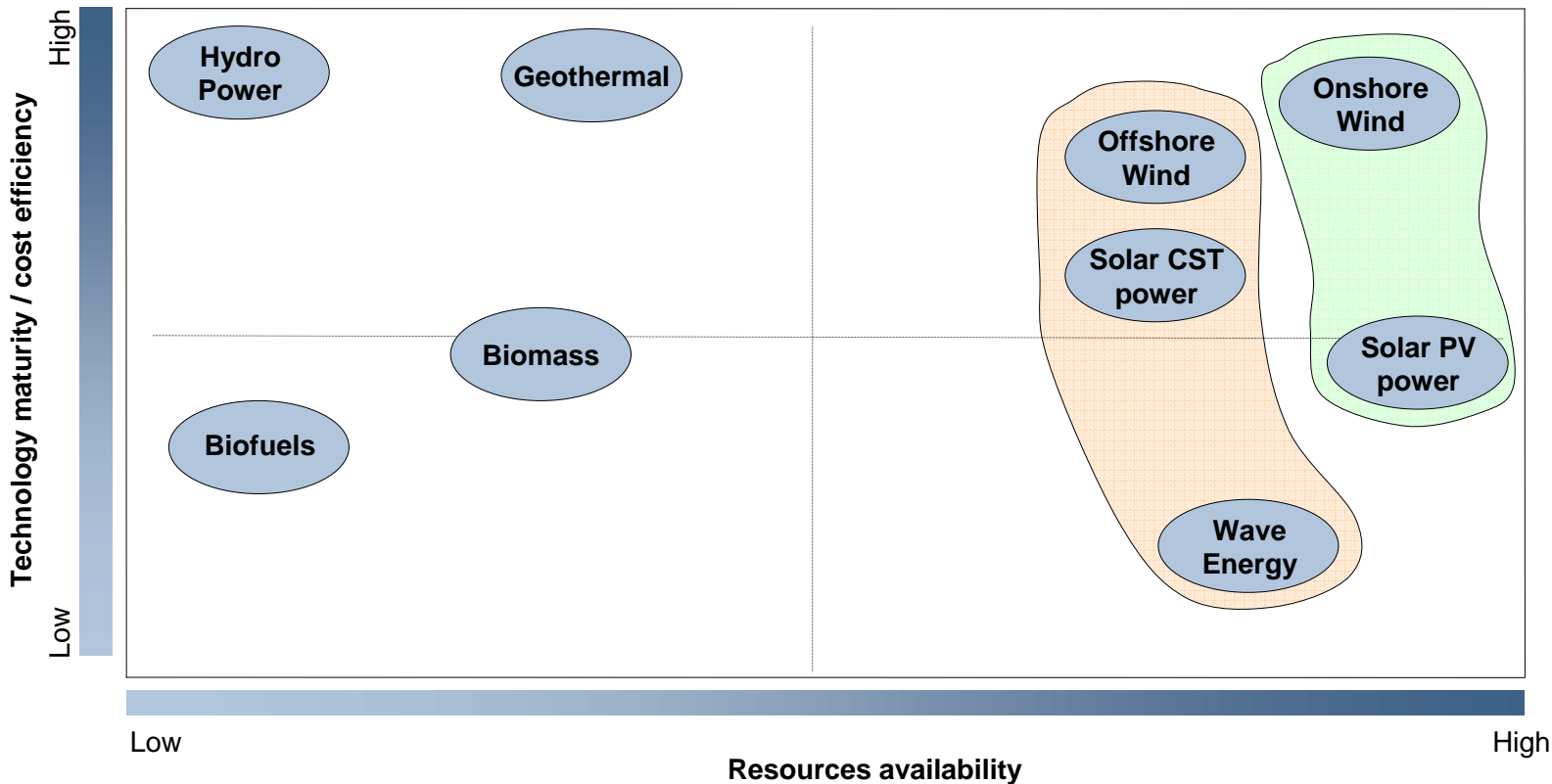
**F. What can Idom do for you?**

**G. References**

**Currently, the most developed renewable energy technologies in the Canary Islands are solar photovoltaic (PV) power and wind power...**



...however, there are other renewable energy technologies that might gain importance over the following years due to its potential and commercial development

**Business opportunities in the Canary Islands**



**Conclusions**

- Business opportunities identified with higher potential to be developed in the Canary Islands in terms of resources availability and Tech maturity / cost efficiency:
  - Onshore Wind Power
  - Solar PV Power
  - Offshore Wind Power
  - Solar CST Power
  - Wave Energy

	Technologies currently developed in the Canary Islands
	Technologies to be developed in the Canary Islands

**Currently, the most developed renewable energy technologies in the Canary Islands are photovoltaic power and wind power...**

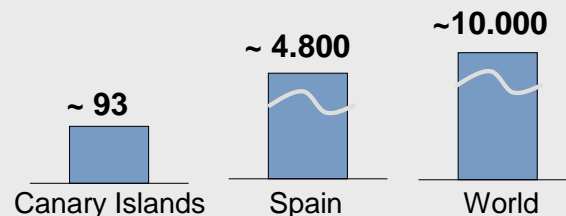
**Key characteristics**

**Installed Capacity  
 MW, 2009**



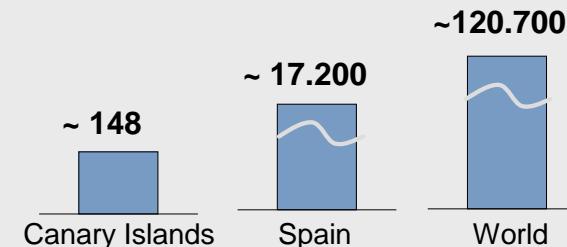
**Photovoltaic (PV)**

- Uses light-absorbing material (semiconductor) to generate **electricity**
- High modularity (1 kW – 50 MW)
- Uses direct and indirect sunlight – suitable for almost all location
- Incentive widely available
- Mainly used as distributed power, some incentive encourage large solar farms



**Onshore Wind Power**

- Wind power is the conversion of wind energy into **electricity** by using wind turbines
- Large-scale wind farms are connected to the electric power transmission network
- High modularity (500 kW – 300 MW)
- Incentive widely available
- Wind power is non-dispatchable

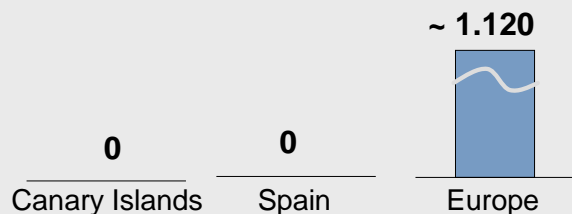


**...however, there are other renewable energy technologies that might gain importance over the following years due to its potential and commercial development**



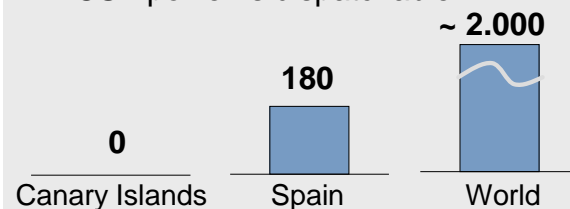
**Offshore wind power**

- Wind power is the conversion of wind energy into **electricity** by using wind turbines allocated over a sea platform
- Within offshore zone, wind recourses might be up to 30% higher than onshore zones
- Modularity above 50 MW
- Incentive widely available
- Wind power is non-dispatchable



**Concentrated Solar Thermal**

- CST systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam
- The concentrated light is then used as **heat** or as a heat source for a conventional power plant to generate **electricity**
- modularity (20 MW – 300 MW)
- Incentive widely available
- CST power is dispatchable



**Wave power**

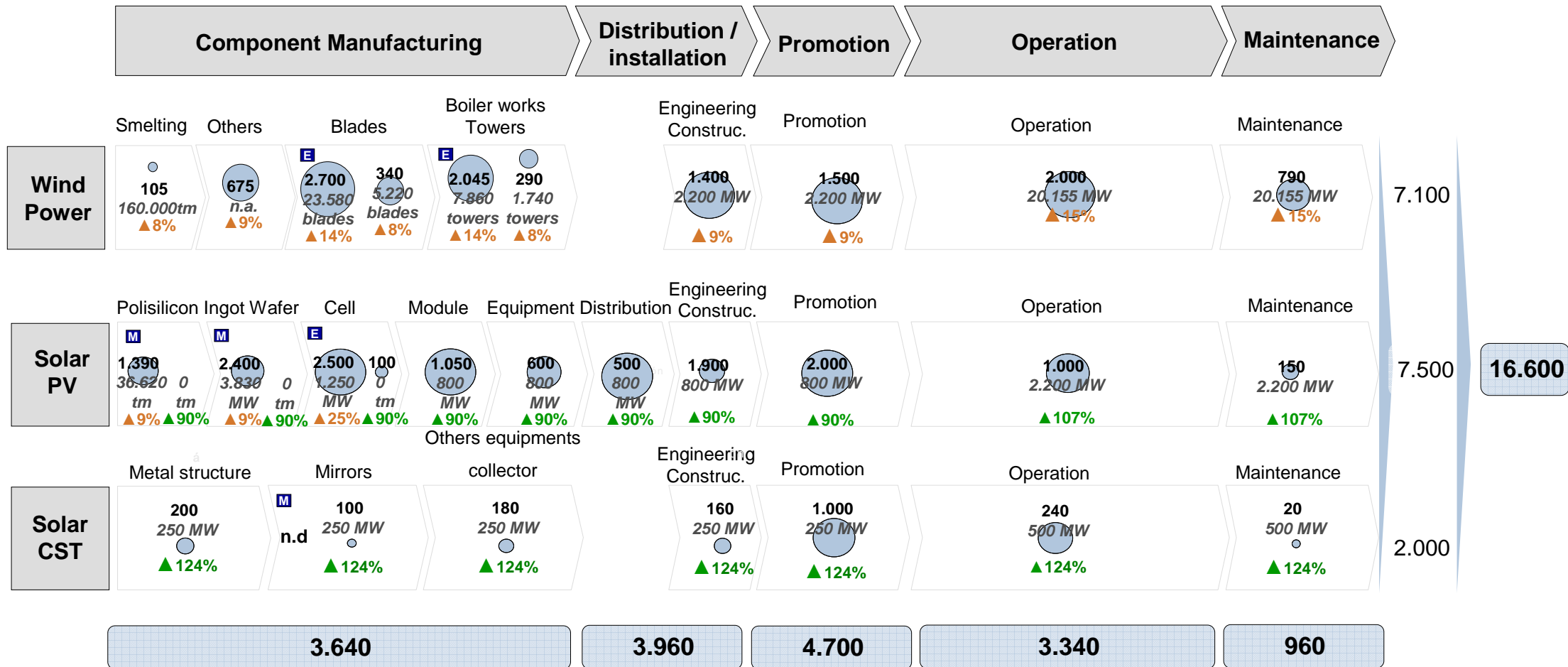
- Wave power is the transport of energy by ocean surface waves, and the capture of that energy to generate **electricity**
- Wave power devices are generally categorized by the method used to capture the energy of the waves
- Locations are shoreline, near shore and offshore
- The world's first commercial wave farm, the Aguçadora Wave Park, is located in Portugal in 2008 using three Pelamis P-750 machines



**Key characteristics**

**Installed Capacity MW, 2009**

In 2006, Idom conducted studies within the renewable energy field and estimated an investment of 16.600 M€ from 2006 to 2010 in Spain for wind, PV and CST technology



x Market 2010 (Mill EUR)  
 xxud. Market Volume  
 ▲x% TACC 2006-2010

E Data refer to Europa  
 M Data refer to the World  
 ▲<20%    ▲>20%

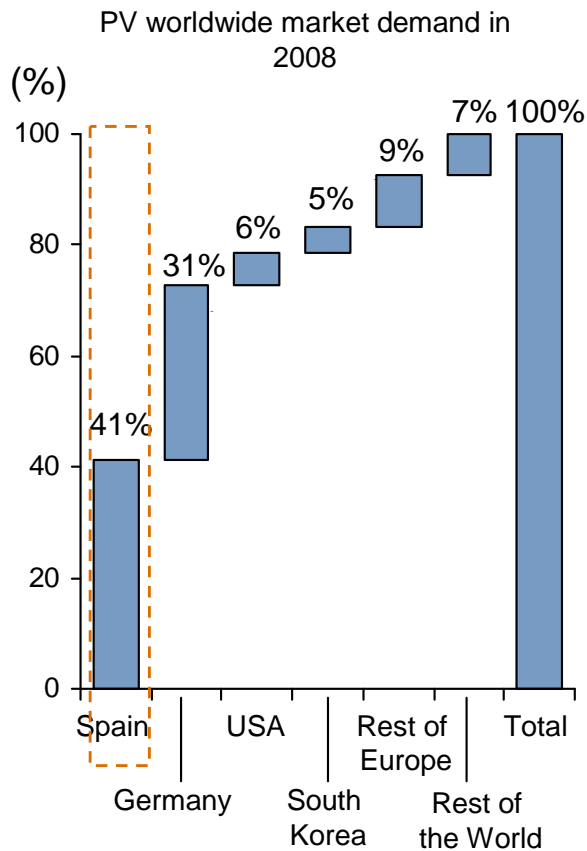
>1.500    ≤1.500 >1.000    ≤1.000 >500    ≤500 >250    ≤250 >100    ≤100



Sources : National Energy Commission (CNE), Deutsche Bank, Renewable Energy Plan, Analysis Idom

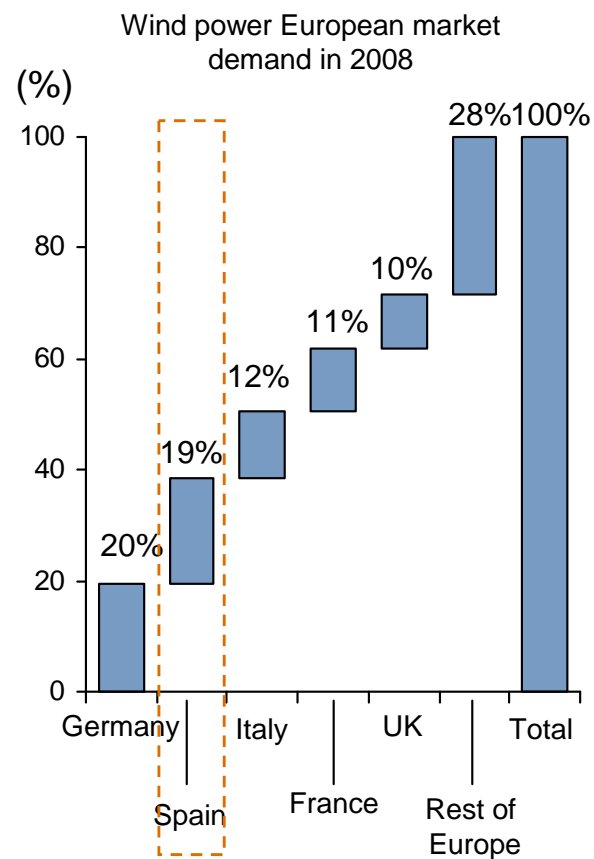
**In 2008, the Spanish industry led the worldwide market demand in both solar PV and solar CST whereas, in the wind power sector, took second place in Europe**

**Situation of the PV Spanish industry**



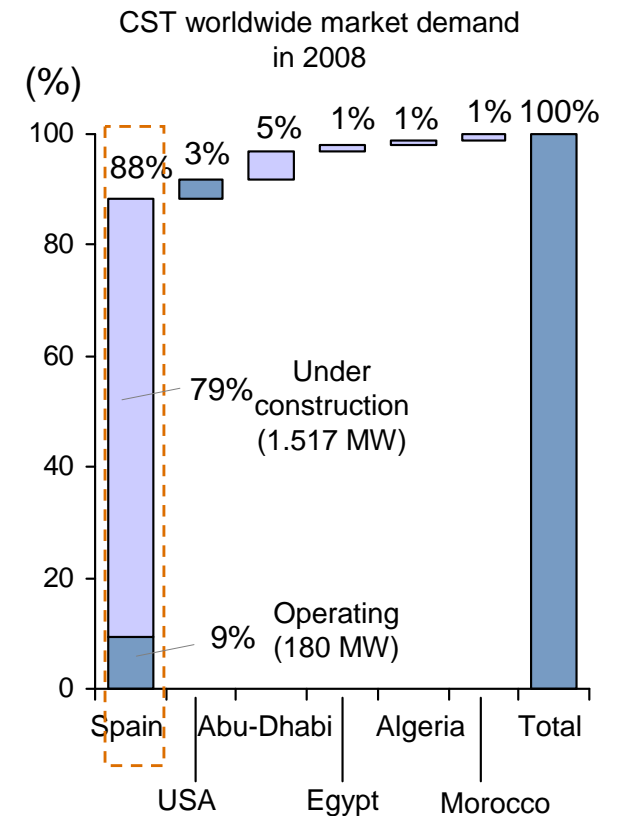
**Total PV market: 5.950 MW**

**Situation of the wind power Spanish industry**



**Total Wind market: 8.484 MW**

**Situation of the CST <sup>(1)</sup> Spanish industry**

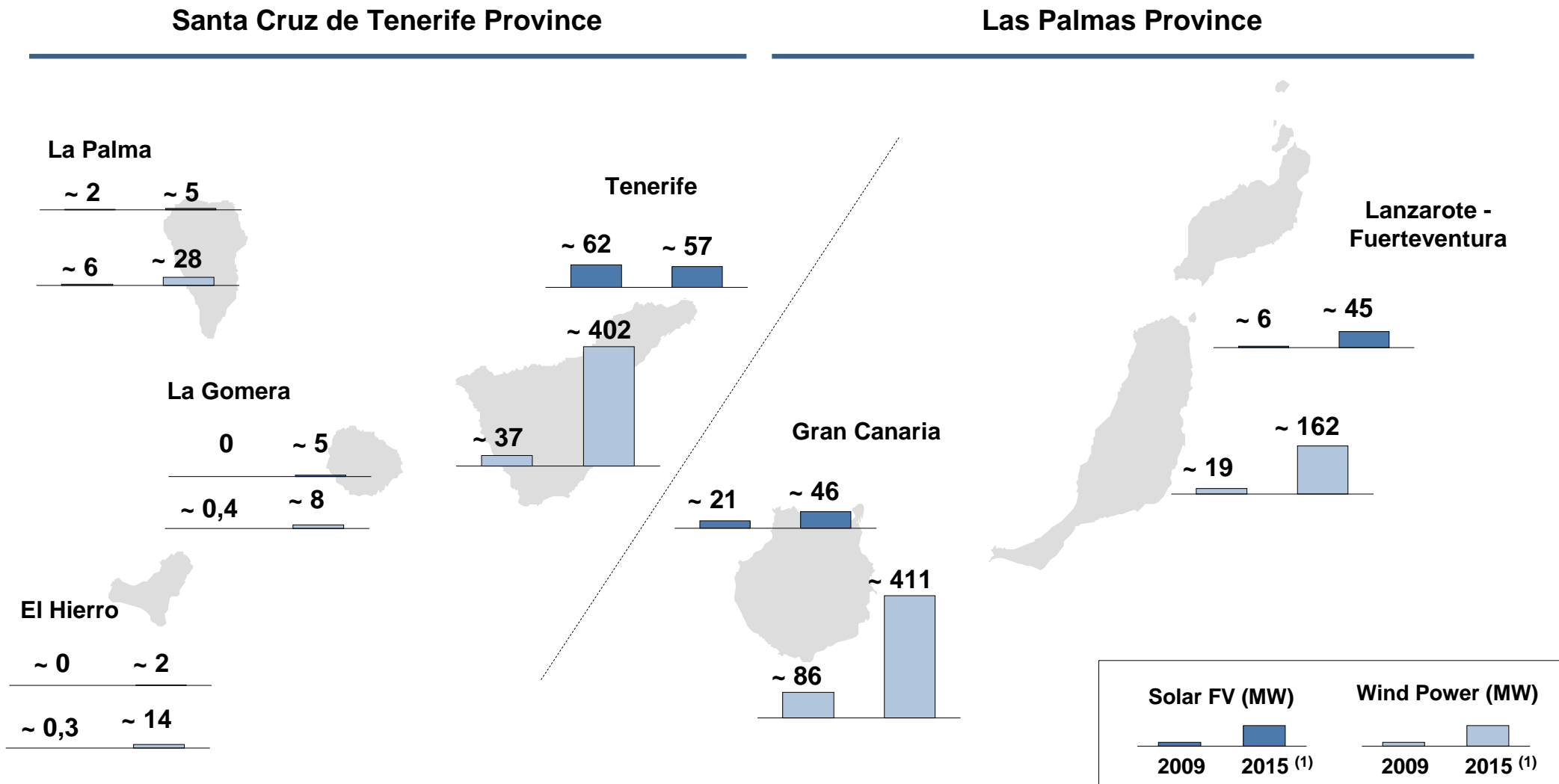


**Total CST market: 1.922 MW**

Note: 1) Concentrated Solar Thermal (CST) Power.

Source: "Solarbuzz "MarketBuzz "2008, March 2009; "Wind power installed in Europe 2008" EWEA; "Solar Power from Europe's sun belt" ESTELA 2009; Idom analysis

**Throughout Canary Islands, solar PV and wind power facilities are widely developed**  
 However, there is an attractive growth potential so as to reach the PECAN objectives <sup>(2)</sup>



Note: 1) 2015 objectives set by Canary Islands Energy Plan (PECAN)

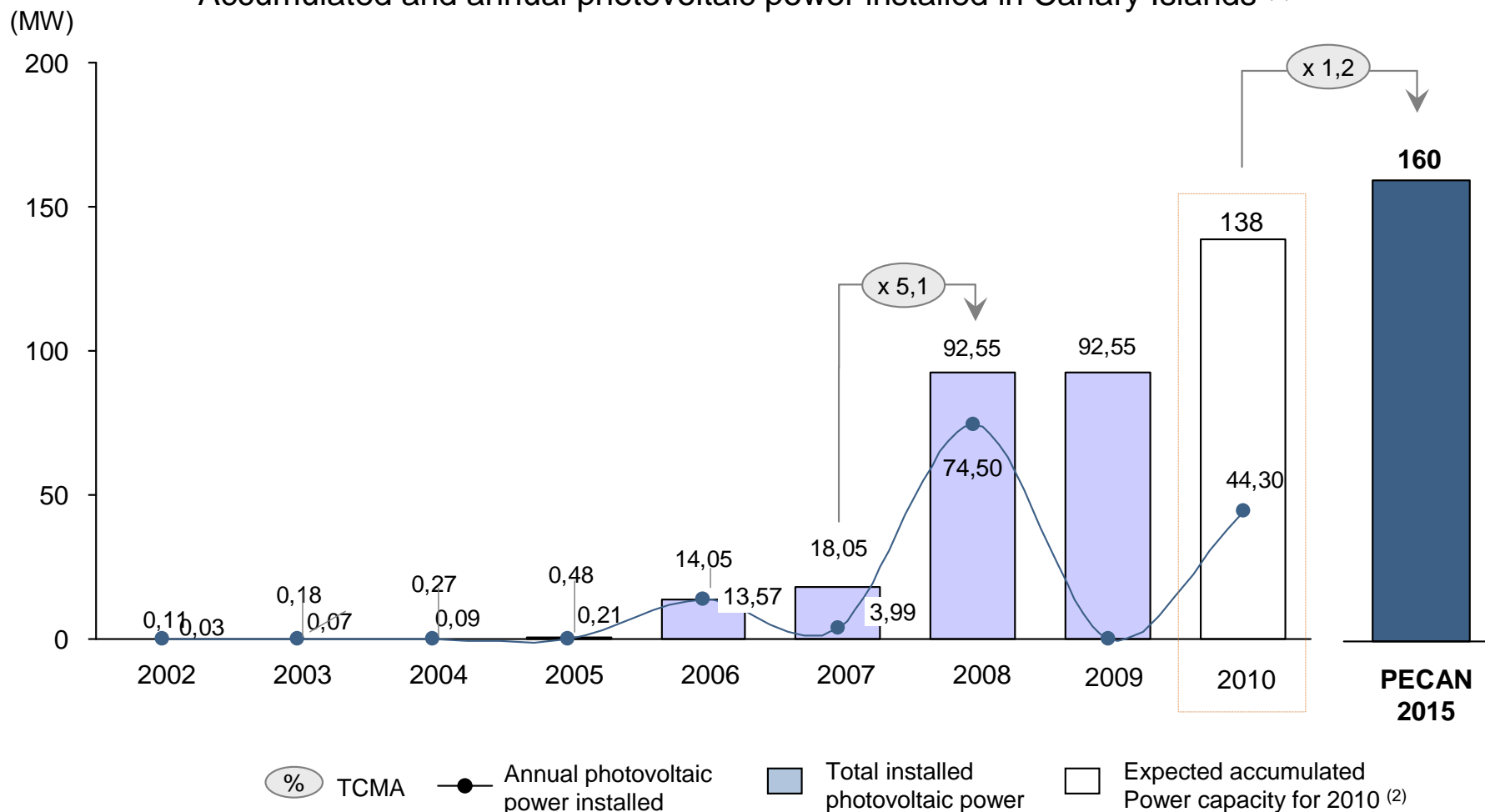
2) Additionally, PECAN set 109 MW of power objective to be shared by Tidal power, CST power and Biogas facilities in 2015

3) The Spanish Renewable Energy Plan, PER 2005-2010, establishes a 25MW power objective for CST Power in Canary Islands

Source: "PECAN 2006-2015" Canary Islands Department of Energy; Idom analysis

**The Canary Islands photovoltaic market has grown exponentially over last recent years**  
**The market needs to increase x1,5 times its capacity to meet the solar PV PECAN objectives**

Accumulated and annual photovoltaic power installed in Canary Islands (1)

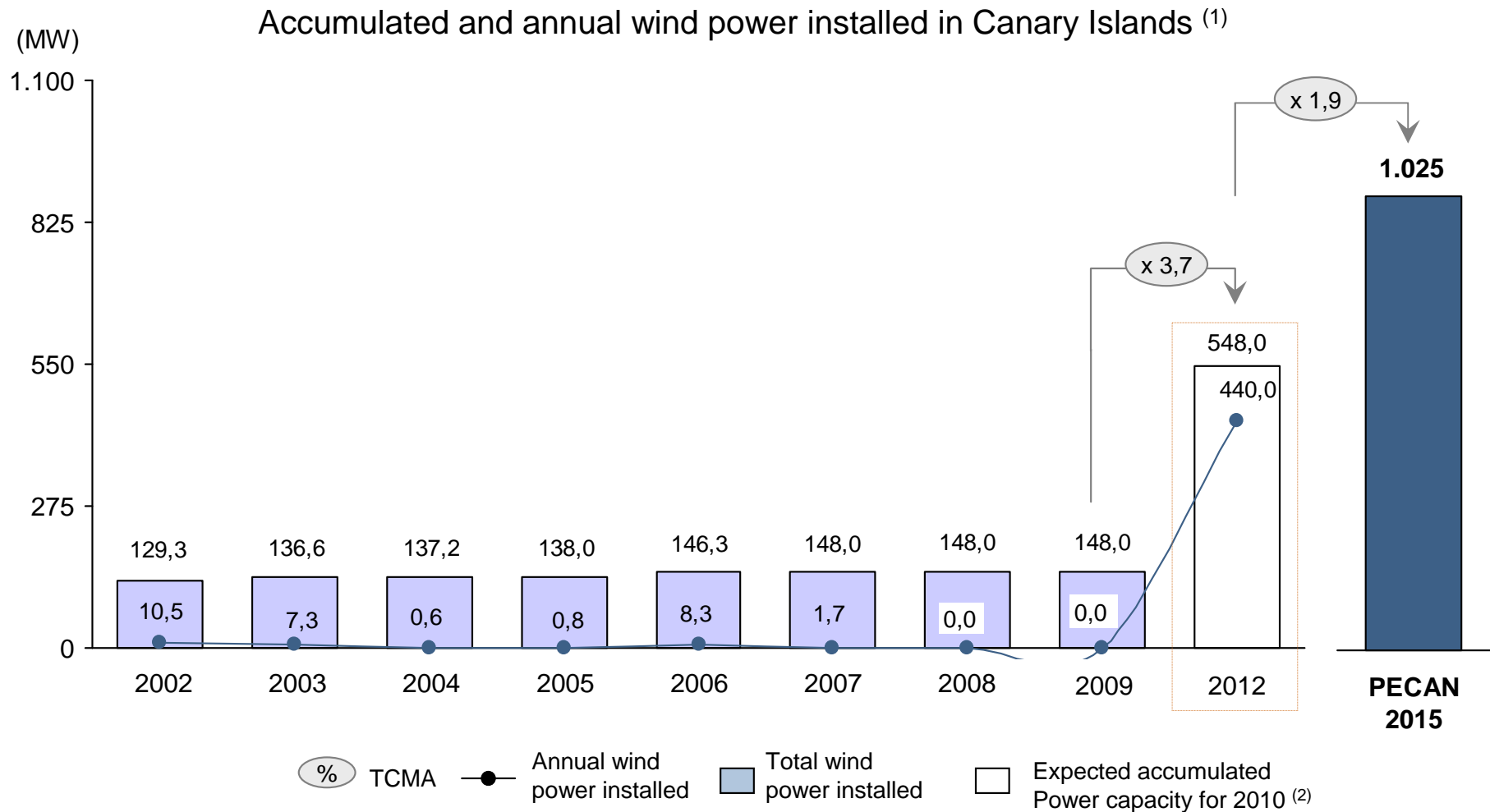


Note: 1) Grid connected

2) The annual installed capacity has been estimated from the Pre-assignment Register information regulated by RD 1578/2008

Source: CNE, Monthly energy sales in special regimen report, October 2009; "Pre-assignment Register" Ministry of Industry 2009; Idom analysis

**The Canary Islands wind power market has grown moderately over last recent years**  
**The market needs to increase x1,9 times its capacity to meet PECAN solar Wind objectives**



Note: 1) Grid connected

2) The 440 MW to be installed over 2010-2011 have been assigned by public procurement system according to Canary Islands regulation (RD

3) It is expected that the Regional Government will announce another open public procurement around 2011-2012 in order to allocated the remaining 477 MW amongst potential tenders

Source: CNE, Monthly energy sales in special regimen report, October 2009; Ministry of Industry 2009; Idom analysis

**There are a wide range of investment opportunities to invest in the renewable sector**  
 Innovative solutions, such as floating wind farms, might have a high potential in the future

**Technologies in commercial stage**

**Technologies in demonstration stage**



**Onshore wind power**

**PV facilities in greenhouses**

**Hydro-wind power station**

**Wave power**

**Stirling**

**Floating offshore wind power**

**Description**

- Onshore Wind power is the conversion of wind energy into electricity by using wind turbines on land

- It allows the modules' integration without subtracting land to farming
- The greenhouse allows the direct solar irradiation
- Possibility to exploit all the available space

- This is the combination of wind farm and a hydro power station
- Two water reservoirs at different height levels
- Wind farms can supply electricity directly to grid or to the pumping system

- Wave power is the transport of energy by ocean surface waves, and the capture of that energy to generate electricity

- A Stirling solar dish, consists of a stand-alone parabolic reflector that concentrates light onto a receiver positioned at the reflector's focal point
- The reflector tracks the Sun along two axes

- A floating wind turbine is an offshore wind turbine mounted on a floating structure that allows the turbine to generate electricity in water depths where bottom-mounted towers are not feasible motion due to wave action

**Advantages**

- Proven technology
- An expected power capacity of 477 MW to be tendered before 2015
- Massive wind resources
- Attractive feed in tariff

- Proven technology
- Large surface of greenhouses available
- Proven technology
- Solar resources
- Attractive feed in tariff

- Massive wind resources
- Support from local and national administration
- Possibility to storage excess of electricity production from renewable facilities

- Wave resources
- Availability of large sea areas for developing offshore farms

- Solar resources
- Higher efficiency of converting sunlight into electricity than PV systems
- Profitable small scale facilities

- Availability of large sea areas for developing offshore wind farms
- Massive wind resources
- Attractive feed-in tariff
- Support from local administration

**Limitations**

- Lack of space for large scale facilities
- Long administrative proceeding process

- Lack of space for large scale facilities

- Intensive in CAPEX
- Required public funds

- Long administrative proceeding process
- Few commercial experiences

- Lack of space for large scale facilities

- Lack of knowledge among wind farm developers
- Long administrative proceeding process

**Potential growth**



## Promoting energy self-sufficiency on El Hierro (designated as a UNESCO biosphere reserve in 2002), through the implementation of a Hydro-wind power station

### Hydro-wind project . El Hierro island



Spain has declared that El Hierro, one of the smallest of Spain's Canary Islands, will soon be completely carbon neutral. The island, with a population of around 10,000, will be powered by a combination of wind and hydroelectric power.

Idom has taken part of this project carrying out the following activities:

- Detailed engineering of the project project
- Construction project
- Purchase management
- Work Management

Project details:

- Client: Gorona del Viento
- Project budget: 55.000.000 €
- Dates: January 2008 / ongoing

- Wind farm consists of 5 wind turbines of 2.300 kW each, 11.5 MW of total power
- Hydroelectric plant, 9.9 MW of installed capacity

**Floating wind technologies are divided into three principle systems and has previously been tested within the marine and offshore oil industries**

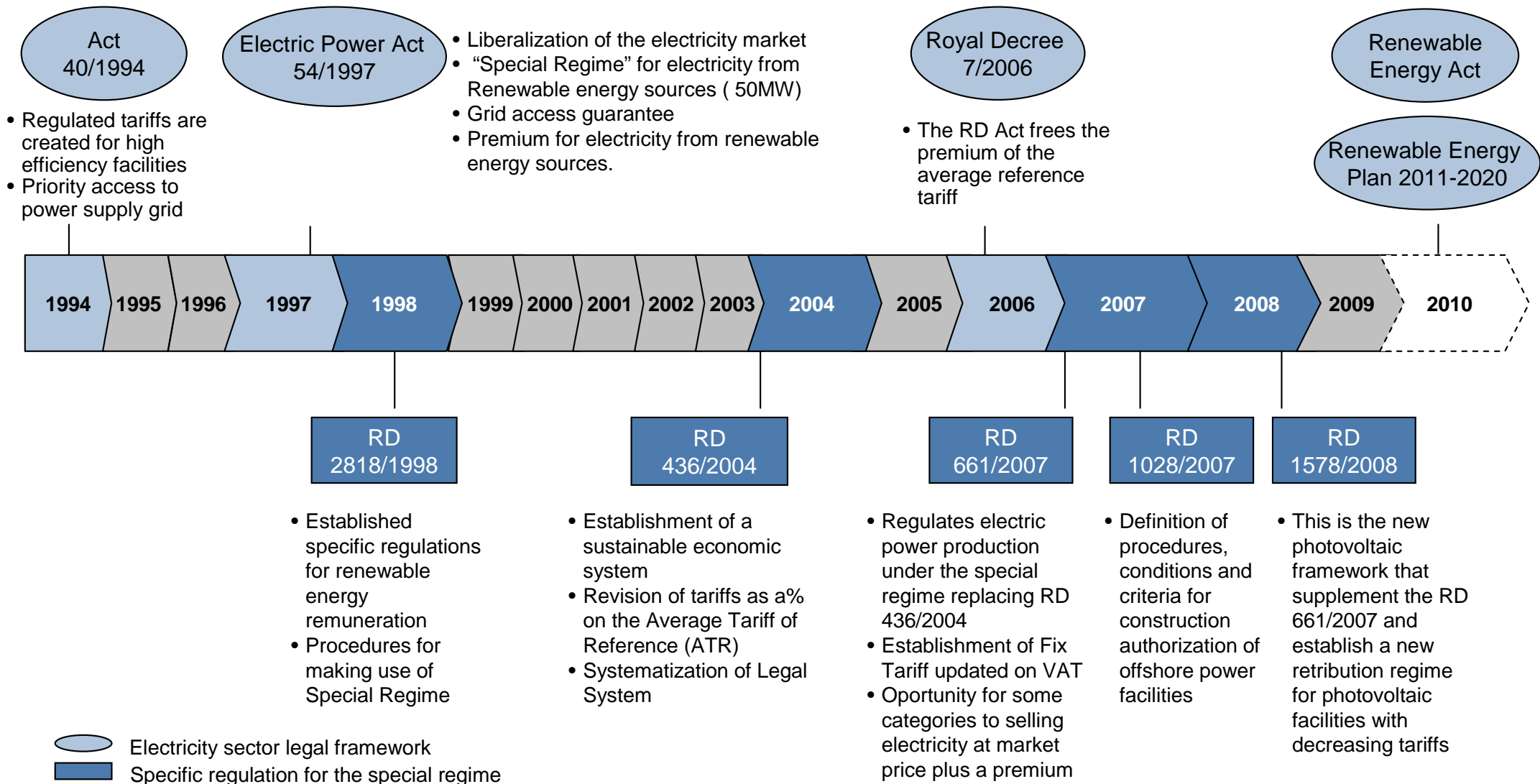


	Buoyancy stabilized	Mooring leg stabilized	Ballast stabilized
<b>Description</b>	<ul style="list-style-type: none"> <li>• Platforms achieving stability through use of distributed buoyancy, taking advantage of weighted water plane area for righting moment</li> <li>• Tri-floater supports wind turbine by three cylindrical buoyant columns.</li> <li>• Columns are connected in tripod structure using steel beams</li> </ul>	<ul style="list-style-type: none"> <li>• Floating turbine is attached to foundation on seabed with mooring line</li> <li>• Platforms achieve stability through use of distributed buoyancy, taking advantage of weighted water plane area for righting moment</li> </ul>	<ul style="list-style-type: none"> <li>• "Spar-buoys" platforms achieve stability using ballast weights hung below central buoyancy tank moving center-of-mass as low as possible</li> <li>• Ballast weights create righting moment, high inertial resistance to pitch and roll</li> <li>• Elongated shape serves to minimize heave motion due to wave action</li> </ul>
<b>Depth range</b>	> 40 m	> 80 m	> 100 m
<b>Turbine</b>	3-5 MW	5-10 MW	2,3 MW
<b>Strengths</b>	<ul style="list-style-type: none"> <li>• Greater choice of sites, countries</li> <li>• Half-scale prototype installed in 2008 (Blue-H)</li> </ul>	<ul style="list-style-type: none"> <li>• Greater choice of sites &amp; countries</li> <li>• Reduction of platform costs</li> <li>• Greater flexibility of construction &amp; installation procedures</li> <li>• Low steel weight</li> <li>• Easier removal/ decommissioning</li> <li>• Prototype (SWAY): ready to start construction at the end of this year</li> </ul>	<ul style="list-style-type: none"> <li>• Greater choice of sites &amp; countries</li> <li>• Reduction of platform costs</li> <li>• Prototype (Hywind) already deployed and operational from September 2009</li> </ul>
<b>Challenges</b>	<ul style="list-style-type: none"> <li>• Needs large quantities of steel</li> <li>• Mooring costs</li> <li>• Electrical infrastructure design, in particular the flexible cable</li> <li>• Installation and O&amp;M procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Electrical infrastructure design, in particular the flexible cable</li> <li>• Full scale prototype testing</li> </ul>	<ul style="list-style-type: none"> <li>• Electrical infrastructure design, in particular the flexible cable</li> <li>• Construction, installation and O&amp;M procedures</li> </ul>

Source: European Wind Energy Association EWEA,

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# Spain has been seeking an economic and regulatory framework to establish an steady penetration of renewable energy facilities



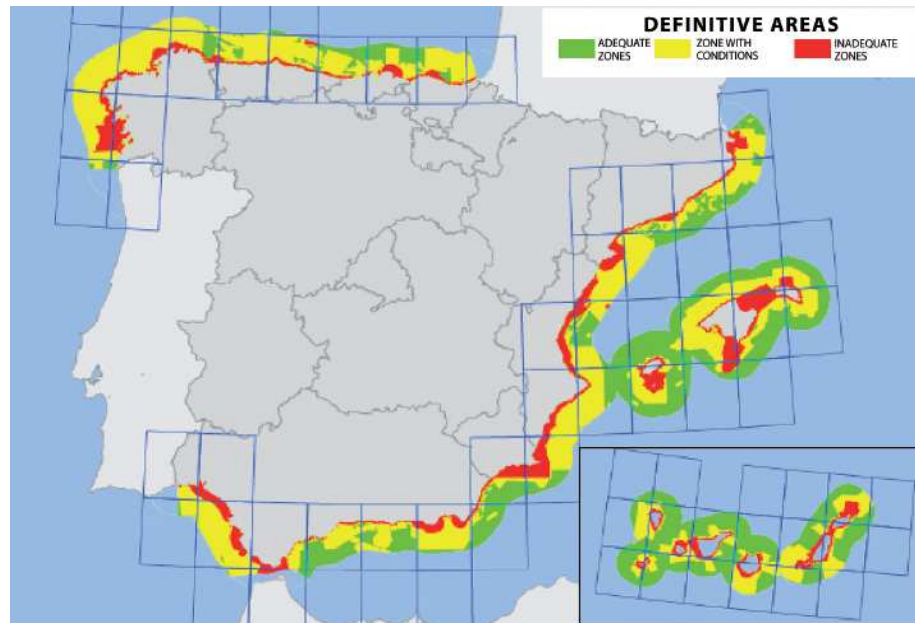
## The Spanish legal framework is focused on giving the developer the right to sell all electricity generated and obtain a reasonable return on investment

Key regulation	Main aspects
<p>1 <b>Electric Power Act 54/1997</b></p>	<ul style="list-style-type: none"> <li>• “Special Regime” for electricity from Renewable energy sources ( 50MW)</li> <li>• Grid access guarantee</li> <li>• Premium for electricity from renewable energy sources.</li> </ul>
<p>2 <b>Renewable Energies Plan (PER 2005-2010)</b></p>	<ul style="list-style-type: none"> <li>• General RREE objectives. By 2010, Renewable Energy Sources should account for:               <ul style="list-style-type: none"> <li>– 12,1% of total energy consumption</li> <li>– 30,3% of electricity production</li> <li>– Biofuels will represent 5,83% of diesel and petrol consumption in the transport sector</li> </ul> </li> <li>• Total investment over PER period: 23.598,64 MME</li> </ul>
<p>3 <b>Royal Decree 661/2007</b></p>	<ul style="list-style-type: none"> <li>• Premium system guaranteed</li> <li>• Distributor obliged to buy electricity from renewable energy sources.</li> <li>• Incentives for participation in the electricity market</li> <li>• No retro-active benefits for past investments</li> </ul>
<p>4 <b>Royal Decree 1578/2008</b></p>	<ul style="list-style-type: none"> <li>• This is the new photovoltaic framework that supplement the RD 661/2007 and establish a new retribution regime for photovoltaic facilities with decreasing tariffs</li> <li>• Classification of new facilities into two types, either located on roof spaces (Type I) or on the ground ( Type II)</li> <li>• Registration in the Pre-assignment Register: in order to qualify for the tariff, projects must have been pre-assigned in the quarterly registration allocation</li> <li>• Construction: Once a project has been pre-assigned, it is allowed a period of 12 months for construction.</li> <li>• No retro-active benefits for past investments</li> </ul>
<p>5 <b>Royal Decree 1028/2007</b></p>	<ul style="list-style-type: none"> <li>• Definition the procedures, conditions and criteria for construction authorization of offshore power facilities</li> <li>• RD 1028/2007 establishes a system of maximum premiums through a competitive procedure which involves several developers</li> <li>• The maximum premium is governed by Royal Decree 661/2007, mentioned above</li> </ul>

## The Royal Decree 1028/2007, has already defined the most suitable zones to install offshore wind facilities

The authorization procedure includes undertaking technical research and investigation

### Offshore wind power areas and authorization procedures



### Remarks on Royal Decree 1028/2007

- Royal Decree 1028/07 rules all procedures, conditions and criteria to acquire the authorisation and administrative dealership to create offshore wind farms in Spain.
- The Ministry of Environment along with the Coast General Direction, are the institutions in charge of providing authorisation and dealership to install offshore wind farms the Spanish coasts and seas
- Offshore wind farms will have to have a minimum installed capacity greater than 50 MW, installation of 10 MW will be permitted as an experimental project
- The procedure to obtain offshore wind farm emplacement authorisation in Spain includes undertaking technical research and investigation in the envisaged area
- In case several offshore wind farm promoters demand a specific area at the Spanish coast, a concurrency procedure will be launched to designate the desired area

	Developer	General Directorate for Energy Policy and Mines (DGPEM)			Developer	DGPEM	
Procedures	<ul style="list-style-type: none"> <li>• Expression of interest in site</li> </ul>	<ul style="list-style-type: none"> <li>• Site pre-screening</li> <li>• Evaluation of environmental/tourism/fishing/shipping impact/ grid connection</li> </ul>	<ul style="list-style-type: none"> <li>• Site tender</li> </ul>	<ul style="list-style-type: none"> <li>• Coordinate application</li> <li>• Review with governmental agencies</li> </ul>	<ul style="list-style-type: none"> <li>• Lease agreement</li> </ul>	<ul style="list-style-type: none"> <li>• Project planning</li> <li>• Feasibility studies</li> </ul>	<ul style="list-style-type: none"> <li>• Administrative Authorization and construction permit</li> </ul>
Period	4 months	8 months	24 months	24 months			

- 
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**The profitability of the project is 10-12% (18-20% for the investor)**

The estimated investment for a 20MW wind farm is approximately 26 million EUR

### Investment details and profit and loss account for 20MW wind farm

Investment required			Profit and Loss Account		
Item	EUR/MW	Mio/EUR		EUR/MW	Mio EUR
<b>Aerogenerators</b>	<b>962.000</b>	<b>19,24</b>	<b>Sales</b>	<b>255.000</b>	<b>5,1</b>
<b>Civil works</b>	<b>117.000</b>	<b>2,34</b>	<b>Variable Costs</b>	<b>30.000</b>	<b>0,6</b>
<b>Power equipment and grid connection</b>	<b>156.000</b>	<b>3,12</b>	Operation and maintenance Costs	30.000	0,6
<b>Other</b>	<b>65.000</b>	<b>1,3</b>	<b>Fix Costs</b>	<b>27.000</b>	<b>0,5</b>
<b>Total Investment</b>	<b>1.300.000</b>	<b>26,00</b>	Land rental	4.000	0,08
			Insurances and taxes	7.000	0,14
			Administrative costs	6.000	0,12
			Management costs	10.000	0,20
			<b>EBITDA</b>	<b>198.000</b>	<b>3,96</b>
			EBITDA/Sales	78%	-

- Aerogenerator Power (per unit) : 1.250MW
  - Rotor diameter: 65m
  - Height to hub. 60m
- Energy sales on regulated tariff (RD 661/07): ~76 cent/kWh
  - Regulated tariff (first 20 years): 73 EUR/kWh
- Operation and Maintenance costs : ~18 cent/kWh
- Number of working hours per year : ~3.500
- Estimated useful life: 20 years

**Project IRR = 10-12%**  
**Investor IRR = 18-20%**

Nota: Civil Works include: land adaptation, foundations, platform, etc.

Power equipment and grid connection include: transformers, substation, release line, grid connection royalties and grid access costs

Others include: other investments, materials, control systems, meteorological towers and intangible investments (licences, permits, administration costs, land management, etc)

Hypothesis included: income annual increase 2%, operation and maintenance costs annual increase 3%, residual value of the facility in year 25: zero. IRR calculation based on EBITDA. Leverage 80%. ZEC tax regime considered

Source: IDAE, AEE, Idom analysis

**The profitability of the project is 9-10% (15%-16% for the investor)**

The estimated investment for a 50MW CST farm is approximately 278 million EUR

**Investment details and profit and loss account for 50MW Thermo electrical Power**

Investment required			Profit and Loss Account		
Item	EUR/MW	Mio/EUR		EUR/MW	Mio EUR
Solar Field	3.392.000	169,6	Sales	1.150.200	57,5
Heat Transfer System	888.000	44,4	Variable Costs	158.000	7,9
Thermal Energy Storage	446.000	22,3	Operation & Maintenance Cost	158.000	7,9
Power Block	600.000	30	Fix Cost	180.100	9,0
Transmission Line	100.000	5	Insurance	3.500	0,17
Project Development and Engineering	210.000	10,5	Land rental	12.600	0,63
			Management costs	6.000	0,3
<b>Total Investment</b>	<b>5.636.000</b>	<b>281,8</b>	<b>EBITDA</b>	<b>812.100</b>	<b>40,6</b>
			EBITDA/Sales	71%	-

- Thermal Power: 55 MW
- Energy sales on regulated tariff (RD 661/07): ~27 cent/kWh
- Operation and Maintenance costs : ~6,7 cent/kWh
- Number of working hours per year : ~3.500
- Estimated useful life: 25 years

**Project IRR = 9-10%**  
**Investor IRR = 15-16%**

Nota: Civil Works include: land adaptation, foundations, platform, etc.  
 Power equipment and grid connection include: transformers, substation, release line, grid connection royalties and grid access costs  
 Others include: other investments, materials, control systems, meteorological towers and intangible investments (licences, permits, administration costs, land management, etc)  
 Hypothesis included: income annual increase 2%, operation and maintenance costs annual increase 3%, residual value of the facility in year 25: zero. IRR calculation based on EBITDA. Leverage 80%. ZEC tax regime considered

Source: IDAE, ESTELA, Idom analysis

**The profitability of the project is 10-11% (17%-19% for the investor)**

The estimated investment for a 5MW PV farm is approximately 14,2 million EUR

**Investment details and profit and loss account for 5MW PV Solar Power**

Investment required			Profit and Loss Account		
Item	EUR/MW	Mio/EUR		EUR/MW	Mio EUR
PV panels	2.300.000	11,5	Sales	641.000	3,20
Power equipment and grid connection	425.000	2,1	Variable Costs	31.399	0,15
Civil Works	96.000	0,48	Operation and maintenance Costs	31.399	0,15
Other	33.000	0,16	Fix Costs	33.601	0,16
<b>Total Investment</b>	<b>2.854.000</b>	<b>14,2</b>	Land rental	4.287	0,21
			Insurances	18.131	0,9
			Security	3.728	0,18
			Management costs	7.455	0,37
			<b>EBITDA</b>	<b>576.000</b>	<b>2,89</b>
			EBITDA/Sales	90%	-

- Pannel : 190 watos
- Energy sales on regulated tariff (RD 1578/08): ~26,5 cent/kWh
- Operation and Maintenance costs : ~1,5 cent/kWh
- Number of working hours per year : ~2.200
- Estimated useful life: 25 years

**Project IRR = 10-11%**  
**Investor IRR = 17-19%**

Nota: Civil Works include: land adaptation, foundations, platform, etc.  
 Power equipment and grid connection include: transformers, substation, release line, grid connection royalties and grid access costs  
 Others include: other investments, materials, control systems, meteorological towers and intangible investments (licences, permits, administration costs, land management, etc)  
 Hypothesis included: income annual increase 2%, operation and maintenance costs annual increase 3%, residual value of the facility in year 25: zero. IRR calculation based on EBITDA. Leverage 80%. ZEC tax regime considered

Source: IDAE, ASIF, Idom analysis

- 
- A. Why invest in Renewable Energies in the Canary Islands?**
  - B. Renewable resources**
  - C. Technology and industrial development**
  - D. Legal framework**
  - E. Investment profitability**
  - F. What can Idom do for you?**
  - G. References**

## Idom has 24 offices around the world with a turnover of € 118 millions in 2005

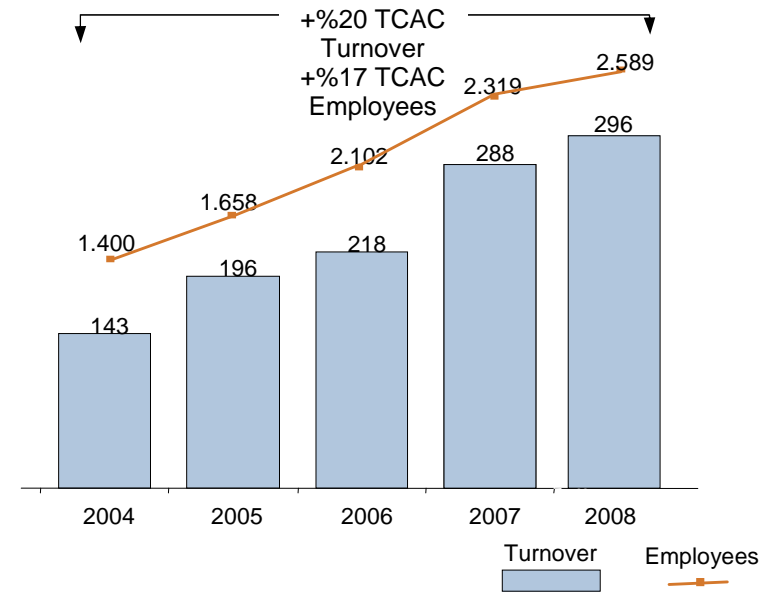
The company's turnover and staff have grown in a stable way during the last years

Offices



- Idom covers the whole Spain and has offices in Europe, Latin America and Africa

Annual Turnover (millions EUR)

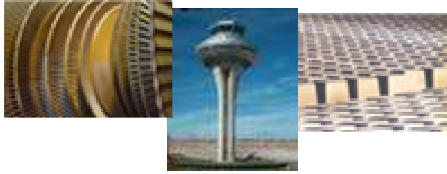


- Idom has a growing trend in the last year

Notes: The turnkey services (Seridom) have been not considered, being their turnover of € 78 millions in 2005 or the international turnover in professional services with a value of € 20 millions

\*Compound Annual Growth Rate

## Idom's activity involves different disciplines and activity areas



### Engineering

ANALYSIS AND ADVANCED DESIGN

ENERGY

CIVIL ENGINEERING

INDUSTRIAL ENGINEERING

ENVIRONMENTAL ENGINEERING

TELECOMMUNICATIONS

Idom covers most part of the technical areas of engineering. We offer a global project management, from the feasibility studies to the completion of the facilities



### Architecture

CONCEPT AND DEVELOPMENT

BUILDING ENGINEERING

URBAN DEVELOPMENT

The architecture area does not only include the conceptual stage of the project, but also its whole development



### Consulting

MANAGEMENT CONSULTING

INFRASTRUCTURES MANAGEMENT AND CONCESSION

INNOVATION

OPERATIONS AND LOGISTICS

INFORMATION SYSTEMS

CITY AND TERRITORY

TRANSPORT

Consulting Area supports companies and institutions in deciding and performing investments, as well as in the improvement of organisations



### Integrated Services

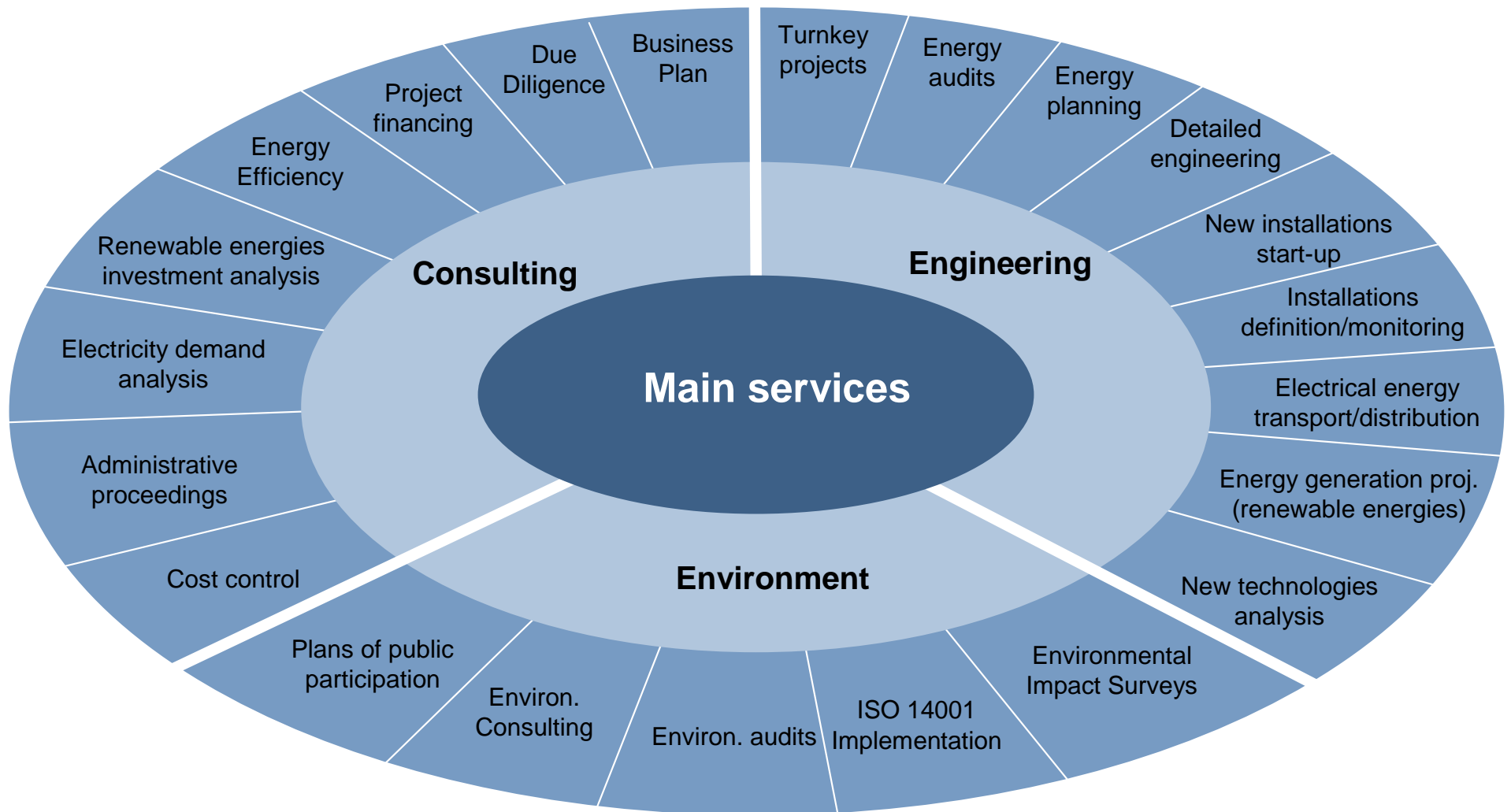
TURNKEY PROJECTS AND OTHER DISCIPLINES

PROJECT & CONSTRUCTION MANAGEMENT

Idom count on an area specialised in turnkey projects that gives integral solutions in industrial facilities, architecture, energy and environment

*What can Idom do for you?*

**Idom helps the client in making decisions about the renewable energy fields for the development of its activity, centring its services in three fields**



- 
- A. Why invest in Renewable Energies in the Canary Islands?**
  - B. Renewable resources**
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  - F. What can Idom do for you?**
  - G. References**

## Idom's references in Wind Energy (1/3)

Projects	Duration	Location	Assignment
<b>Grande Place et Pleugriffet Wind Farm (France)</b>	2008	France	<ul style="list-style-type: none"> <li>Detailed design of foundations for eleven wind turbines GAMESA G90 3MW</li> </ul>
<b>Sierra de Arcas and Sierra de Pedroso Wind Farms</b>	2008	Spain	<ul style="list-style-type: none"> <li>Detailed design of access roads, foundations and MV network for two wind farms with eleven and twelve wind turbines VESTAS V90 2 MW</li> </ul>
<b>Vientos de Alcalá and Loma de Lázaro Wind Farms</b>	2007-2008	Spain	<ul style="list-style-type: none"> <li>Wind farms with twenty nine (21+8) wind turbines ENERCON E.82 2 MW</li> </ul>
<b>La Castellana Wind Farm</b>	2007	Spain	<ul style="list-style-type: none"> <li>Wind farm with twenty three wind turbines ENERCON E.82 2 MW</li> </ul>
<b>Mauron Wind Farm (France)</b>	2007	France	<ul style="list-style-type: none"> <li>Detailed design of foundations for five wind turbines GAMESA G90 2MW</li> </ul>
<b>Ceará Wind Farms</b>	2007	Brazil	<ul style="list-style-type: none"> <li>Basic design of the civil and electrical works for three wind farms in Brazil, including four electrical substations and four overhead lines</li> </ul>
<b>La Nourais (France)</b>	2007	France	<ul style="list-style-type: none"> <li>Detailed design of foundations for five wind turbines GAMESA G80 2MW</li> </ul>
<b>Castil Tierra Wind Farm and Sierra Ministra Wind Farm</b>	2007	Spain	<ul style="list-style-type: none"> <li>Detailed design of foundations for twenty two wind turbines SUZLON S88 2,1 MW</li> </ul>
<b>“Stenay” Wind Farm (France)</b>	2007	France	<ul style="list-style-type: none"> <li>Detailed design of the foundations, access roads and electrical installation for a wind farm in France</li> </ul>
<b>“Karscino” Wind Farm (Poland)</b>	2007	Poland	<ul style="list-style-type: none"> <li>Detailed design of the foundations for a wind farm in Poland</li> </ul>

## Idom's references in Wind Energy (2/3)

Projects	Duration	Location	Assignment
"Hualpén" Wind Farm (Chile)	2007	Chile	<ul style="list-style-type: none"> <li>Detailed design of the foundations for a wind farm in Chile</li> </ul>
"Hualpén II" Wind Farm	2007	Chile	<ul style="list-style-type: none"> <li>Detailed design of the foundations and access tracks for a wind farm in Chile</li> </ul>
"Robres" Wind Farm	2005	Spain	<ul style="list-style-type: none"> <li>Construction management and on site supervision of the construction of the wind farm</li> </ul>
"Belchite" Wind Farm	2005	Belchite	<ul style="list-style-type: none"> <li>Construction management and on site supervision of the construction of the wind farm and the 220 kV overhead line</li> </ul>
"El Pedregoso" Wind Farm	2005	Spain	<ul style="list-style-type: none"> <li>Construction management and on site supervision of the construction of the wind farm</li> </ul>
"Alentisque" Wind Farm	2005	Spain	<ul style="list-style-type: none"> <li>Detailed design of the civil and electrical works of the wind farm</li> </ul>
"El Pino" Wind Farm	2005	Spain	Construction management and on site supervision of the construction of the wind farm
"Beausemblant" Wind Farm	2005	Spain	Detailed design of the foundations for the wind turbines in a wind farm in France
"Sotonera" Wind Farm	2005	Spain	Construction management and on site supervision of the construction of the wind farm

### Idom's references in Wind Energy (3/3)

Projects	Duration	Location	Assignment
"Hualpén" Wind Farm (Chile)	2007	Chile	<ul style="list-style-type: none"> <li>Detailed design of the foundations for a wind farm in Chile</li> </ul>
"Hualpén II" Wind Farm	2007	Chile	<ul style="list-style-type: none"> <li>Detailed design of the foundations and access tracks for a wind farm in Chile</li> </ul>
"Robres" Wind Farm	2005	Spain	<ul style="list-style-type: none"> <li>Construction management and on site supervision of the construction of the wind farm</li> </ul>
"Belchite" Wind Farm	2005	Belchite	<ul style="list-style-type: none"> <li>Construction management and on site supervision of the construction of the wind farm and the 220 kV overhead line</li> </ul>
"El Pedregoso" Wind Farm	2005	Spain	<ul style="list-style-type: none"> <li>Construction management and on site supervision of the construction of the wind farm</li> </ul>
"Alentisque" Wind Farm	2005	Spain	<ul style="list-style-type: none"> <li>Detailed design of the civil and electrical works of the wind farm</li> </ul>
"El Pino" Wind Farm	2005	Spain	Construction management and on site supervision of the construction of the wind farm
"Beausemblant" Wind Farm	2005	Spain	Detailed design of the foundations for the wind turbines in a wind farm in France
"Sotonera" Wind Farm	2005	Spain	Construction management and on site supervision of the construction of the wind farm

## Idom's references in offshore wind power and wave power projects (1/2)

Projects	Duration	Location	Assignment
<b>Project for zone reservation to be presented to the Spanish Ministry</b>	2008	<b>Spain</b>	<ul style="list-style-type: none"> <li>• Analysis of the wind farm location from wind resource point of view</li> <li>• Drawing of the shape proposed by the client (polygonal) in the wind suitable areas official map</li> <li>• Pre-design of electrical connection among wind aerogenerators, from the aerogenerators to the offshore Electrical Transformation Platform and from that to the coast.</li> <li>• Elaboration of preliminary project including environmental, batimetical and electricity evacuation possibilities aspects</li> <li>• Presentation the project to the Spanish Authorities</li> </ul>
<b>Consultancy and technical assistance for a project of electrical generation using the energy of the sea waves</b>	2009	<b>Spain</b>	<ul style="list-style-type: none"> <li>▪ Analysis of the project location</li> <li>▪ Feasibility study from technical and economical point of view</li> <li>▪ Technical assistance for basic project definition</li> </ul>
<b>Prospective study of marine wind energy in Andalusia (Spain)</b>	2007	<b>Spain</b>	<ul style="list-style-type: none"> <li>• Definition of key parameters for installation of wind farms in Andalusian coast</li> <li>• Definition of best practices in other Spanish and European Maritime Areas regarding wind farms installations</li> <li>• Environmental sensitive areas definition</li> <li>• Pre-study of land electrical evacuation possibilities</li> </ul>
<b>Preliminary projects (8 offshore wind farms) to be presented to the Spanish Administration for Offshore Wind Zone Reservation</b>	2007	<b>Spain</b>	<ul style="list-style-type: none"> <li>• Analysis of the wind farm location from wind resource point of view</li> <li>• Drawing of the shape proposed by the client (polygonal) in the wind suitable areas official map</li> <li>• Pre-design of electrical connection among wind aerogenerators, from the aerogenerators to the offshore Electrical Transformation Platform and from that to the coast</li> <li>• Elaboration of preliminary project including environmental, batimetical and electricity evacuation possibilities aspects</li> <li>• Presentation the project to the Spanish Authorities</li> </ul>

## Idom's references in offshore wind power and wave power projects (2/2)

Projects	Duration	Location	Assignment
Pre-design of foundations for offshore wind generators	2007	Spain	<ul style="list-style-type: none"> <li>• Selection of 3 types of marine soil from a geotechnical point of view</li> <li>• Calculation of the different forces due to the waves, tides, wind, etc.</li> <li>• Modelization of the strengths supported by the mast of the aerogenerator</li> <li>• Pre-design of the necessary basement in each case (type of soil)</li> </ul>
Technical Assistance for offshore zone reservation	2009	Spain	<ul style="list-style-type: none"> <li>▪ Supervision of Preliminary project to be presented to the Spanish Administration for Offshore Wind Zone Reservation</li> <li>▪ Feasibility Study for 36 different locations of offshore wind farms along the Spanish coast</li> <li>▪ Investigation of the land electrical evacuation in the most interesting projects</li> <li>▪ Investigation of the feasibility of the offshore wind farms taking as reference the official Spanish exclusion map for that installations</li> </ul>
Prospective study of marine wind energy in Andalusia (Spain)	2007	Spain	<ul style="list-style-type: none"> <li>• Definition of key parameters for installation of wind farms in Andalusian coast</li> <li>• Definition of best practices in other Spanish and European Maritime Areas regarding wind farms installations</li> <li>• Environmental sensitive areas definition</li> <li>• Pre-study of land electrical evacuation possibilities</li> </ul>
Preliminary projects (8 offshore wind farms) to be presented to the Spanish Administration for Offshore Wind Zone Reservation	2007	Spain	<ul style="list-style-type: none"> <li>• Analysis of the wind farm location from wind resource point of view</li> <li>• Drawing of the shape proposed by the client (polygonal) in the wind suitable areas official map</li> <li>• Pre-design of electrical connection among wind aerogenerators, from the aerogenerators to the offshore Electrical Transformation Platform and from that to the coast</li> <li>• Elaboration of preliminary project including environmental, bathymetrical and electricity evacuation possibilities aspects</li> <li>• Presentation the project to the Spanish Authorities</li> </ul>
Test of power aerogenerators	2008	Spain	<ul style="list-style-type: none"> <li>• Design of test procedures and result interpretation of test carried out over aerogenerators</li> </ul>
Economic evaluation	2008	Spain	<ul style="list-style-type: none"> <li>• Economic evaluation and estimation of the necessities for testing the aerogenerators</li> </ul>

## Idom's references in Solar Energy/Projects (1/2)

Projects	Duration	Location	Assignment
150 MW ISCC power plant in Hassi R'Mel (Algeria)	2007	Algeria	<ul style="list-style-type: none"> <li>Preliminary basic design of the power plant, Main equipment definition, Layout optimization; Technical specifications for project start up and implementation</li> </ul>
11 MW CSP plant Sanlúcar la Mayor (Seville. Spain)	2005 - to date	Spain	<ul style="list-style-type: none"> <li>Detailed engineering of the plant: The power plant, based on tower and flat heliostat technology, consists of a field of 624 heliostats that reflect the sun's radiant energy towards to a 114 m tower that incorporates a solar receptor located on its upper level. The receptor transforms the radiation concentrated into its centre into thermal energy, generating saturated steam (250°C and 40 bar). This steam is fed into a steam condensation turbine that generates electrical power.</li> </ul>
450 MW ISCC power plant Ain Beni Mathar (Morocco)	2007 - to date	Morocco	<ul style="list-style-type: none"> <li>Basic design of the power plant Integration and detail design of the power plant</li> </ul>
4 x 49,9 MW solar thermoelectricity plants	2007 - to date	Spain	<ul style="list-style-type: none"> <li>Design optimization and Viability Study, Basic design of one CSP plant, Technical assistance to the authorization process, Electrical Detail Engineering for Solar Collectors , Instrumentation and control detail Engineering for Solar Collectors</li> </ul>
50 MW thermosolar plant Sanlúcar la Mayor (Seville. Spain)	2007 - to date	Spain	<ul style="list-style-type: none"> <li>Basic engineering of new 50 MW Concentrated Solar Power Plant in Seville, using the parabolic through solar collectors technology.</li> </ul>
5 MW photovoltaic plant Bajadoz (Spain)	2007	Spain	<ul style="list-style-type: none"> <li>EPC supply, including basic engineering, detail engineering, purchase management and construction supervision and management</li> </ul>
15 MW photovoltaic plant	2007	Spain	Owner's engineering, technical assistance for the authorization procedures for the "La Alconera" photovoltaic plant
10 MW photovoltaic plant	2006	Spain	Engineering services and technical assistance for the authorization procedures for the Extremasol photovoltaic plant

## Idom's references in Solar Energy/Projects (2/2)

Projects	Duration	Location	Assignment
100 kW photovoltaic plant	2007	Spain	<ul style="list-style-type: none"> <li>Detail design of the electrical installation of a new photovoltaic plant in the logistic centre of TRANSPORTES OCHOA</li> </ul>
99.2 kW photovoltaic plant	2004	Spain	<ul style="list-style-type: none"> <li>Detail design of the new photovoltaic installation in the FC Barcelona football stadium</li> </ul>
46 kW, 37kW, 22 kW, 22 kW photovoltaic plants	2004	Spain	<ul style="list-style-type: none"> <li>Detail design of the new photovoltaic facilities in 4 police stations</li> </ul>
10 kW photovoltaic plant	1999-2002	Spain	<ul style="list-style-type: none"> <li>Detail design of the energy system of ParcBit, with a cogeneration unit, district heating/cooling, a high temperature solar facility and a photovoltaic installation</li> </ul>

## Idom's References Hydro-power (1/2)

Projects	Duration	Location	Assignment
Hydro-eolic Power Station El Hierro	2007-to date	Spain	<ul style="list-style-type: none"> <li>Electrical System, Protection and Control System fo a mini hidraulic facility and eolic plant in "El Hierro" island. The hydropower facility is aimed to cover the electrcity demand of the island with renewable energy sources. Net Studies in PSS/E. Design of the system operation.</li> </ul>
Analysis of Girabolhos hydraulicuse	2008	Portugal	<ul style="list-style-type: none"> <li>IDOM has undertaken the project for ENDESA Girabolhos Hydroelectric use. The use is mainly formed by two dams built in the river Mondego: a first reservoir with a vault of double curvature and 95 meters height over bedrock and a second reservoir counting with a 56 m height above foundations enabling the provision of a primary reversible facility of 334 MW total installed capacity (CHR Girabolhos</li> </ul>
Study of supply and energy generation of Ebro river transfer facilities	2003	Spain	<ul style="list-style-type: none"> <li>• 9 hydropower facilities. Installed capacity: 104 MW. Annual energy production: 475 GWh</li> <li>• Feasibility studies. Determination of power specifications and energy facilities</li> <li>• Analysis of equipment, pumps, turbines, engines, alternators and transformers</li> <li>• Relations with electricity utilities: REE, Iberdrola and Endesa</li> <li>• Analysis of engagements and evacuation routes 400, 220 and 132 kV</li> <li>• Economic and financial study. Determination of expenditures and income by supply and electricity generation</li> </ul>
Drafting of the construction project of Ebro weir in Zaragoza and the elaboration of the basic project of Hydroelectric power station	2006	Spain	<ul style="list-style-type: none"> <li>Drafting of the construction project of Ebro weir in Zaragoza and the elaboration of the basic project of Hydroelectric plant</li> </ul>
Feasibility study of the reversible hydroelctric power station in Gran Canaria	2006	Spain	<ul style="list-style-type: none"> <li>Technical and economical feasibility study of the facility</li> </ul>

## Idom's other references

Projects	Duration	Location	Assignment
<b>Technical Assistance for the allocations of investments in renewable energy projects - Spain</b>	2007-2011	<b>Spain</b>	<ul style="list-style-type: none"> <li>• IDOM is performing the role of technical advisor to the investment society carrying out the following tasks:               <ul style="list-style-type: none"> <li>• Ensuring a pipeline of eligible investment renewable energy projects: identifying projects, marketing the investment funds, liaising and negotiating with owners.</li> <li>• Feasibility assessment, Due Diligence reports and calculation of incentive payments in order to evaluate selected projects as potential investments.</li> <li>• Assistance in supplying all information required by financial institutions and advisors in charge of the necessary Due Diligence for the financial agreements of selected projects</li> <li>• Construction and start-up supervision to validate compliance of negotiated project conditions for the selected projects.</li> </ul> </li> </ul>
<b>Environmental Feasibility and Energy Strategy for desalination plants in the Mediterranean coast - Spain</b>	2005 – 2008	<b>Spain</b>	<ul style="list-style-type: none"> <li>• Power demand assessment</li> <li>• Global study of power production scenarios</li> <li>• Economic and financial feasibility study of the alternatives considered</li> <li>• Technical feasibility of the alternatives considered</li> <li>• Prepare procurement documentation, and the terms of reference for the projects approved</li> <li>• Power supply financial analysis</li> </ul>
<b>Consultancy Services Package for the 800MW Combined Cycle Power Plant in Zierbena - Spain</b>	2001 – 2007	<b>Spain</b>	<ul style="list-style-type: none"> <li>• The 800 MW Combined Cycle Power Plant (CCPP) is located at Bilbao harbour. Based on a “2x1” configuration, with two gas turbines of the latest generation, two natural-cycle recovery boilers (HRSG) with three pressure levels and one twin-section steam turbine, the total investment amounts to 391 Million EUR.</li> </ul>
<b>Engineering Services for the 1135 MW Combined Cycle Power Plant in Tamazunchale - Mexico</b>	2004 – 2007	<b>Spain</b>	<ul style="list-style-type: none"> <li>• The 1135 MW Combined Cycle Power Plant is in Tamazunchale, State of San Luis de Potosí (Mexico). The CTCC is based on two modules with 2x1 configuration. Each module is composed by two gas turbines, one steam turbine (all of them manufactured by GE) and two HRSG (manufactured by Deltak)</li> </ul>

## Idom's other references

Projects	Duration	Location	Assignment
<b>Timisoara Municipal District Heating Company Corporate Development - Romania</b>	2007 - 2008	<b>Romania</b>	<ul style="list-style-type: none"> <li>▪ The Tirgu Mures District heating service is managed by the Regia Autonoma Energomur. The EBRD agreed with the municipality of Timisoara tendering for technical assistance to develop and implement a Corporate Development programme, the recently created company fully owned by the Municipality operating distribution of the district heating. The specific responsibility of IDOM in this project was to: <ul style="list-style-type: none"> <li>• Financial performance improvement</li> <li>• Operational Performance Improvement</li> <li>• Institutional development, Corporate business plan</li> </ul> </li> </ul>
<b>Maintenance procedures and protection system assessment in the Canary Islands - Spain</b>	2006	<b>Spain</b>	<ul style="list-style-type: none"> <li>▪ Assessment of the current situation related with maintenance procedures and protection system of Canary Islands power facilities.: <ul style="list-style-type: none"> <li>• Power generation facilities</li> <li>• Power distribution facilities</li> <li>• Human resources</li> <li>• Energy efficiency analysis</li> <li>• Needs assessment of the existing facilities</li> </ul> </li> </ul>
<b>Capacity building for the SME support structure and alignment of policy and actions to the SME charter and acquis communitaire</b>	2007 - 2009	<b>Croatia</b>	<ul style="list-style-type: none"> <li>▪ The overall objective of the europeaid project is to meet EU standards and facilitate the efficient SME development in Croatia as required by Chapter 20, Enterprise and Industry of the Acquis and the European Charter for Small Enterprises. Type of services provided: Institutional development, Policy analysis for public administration in charge of SME development, Training preparation and delivery</li> </ul>
<b>Monitoring and Assessment of National Restructuring Plans (NPRs) and Individual Business Plans in Romania, Bulgaria, Croatia and Turkey</b>	2005 - ongoing	<b>Romania, Bulgaria, Croatia, Turkey</b>	<p>The assignment for Idom is to assess the National Restructuring and Individual Plans that Croatia and Turkey have to present and to monitor their application (some of the items to control are production capacities, granted state aids scheme and financial support tools as well as investment in new capacities) in the four countries, affecting private and public steel companies. Idom has also to make recommendations in order to ensure the application of the restructuring programmes for each country.</p>

08028 BARCELONA  
Gran Vía Carlos III, 97, bajos  
Tlf. + 34 93 409 22 22  
Fax. + 34 93 411 12 03

48014 BILBAO  
Avda. Lehendakari Aguirre, 3  
T/ 94.479.76.00  
F/ 94.476.18.04

18012 GRANADA  
Avda. Constitución ,20-2º-mod. 202  
Edificio Pirámide  
T/ 958.20.58.98  
F/ 958.29.59.48

35002 LAS PALMAS DE GRAN CANARIA  
Viera y Clavijo, 30-1º  
T/ 928.43.19.50  
F/ 928.36.31.68

28003 MADRID  
C/ José Abascal, 4 - 1º  
T/ 91.444.11.50  
F/ 91.447.31.87

30004 MURCIA  
C/ Polo de Medina, 2 , 1ª planta, oficina A  
T/ 968.21.22.29  
F/ 968.21.22.31

07003 PALMA DE MALLORCA  
Avda. Conde Sallet, 11-4º  
T/ 971.42.56.70  
F/ 971.71.93.45

31003 PAMPLONA  
Navarro Villoslada, 16-bajo  
T/ 948.23.50.73  
F/ 948.23.82.61

20016 SAN SEBASTIAN  
Paseo de los olmos, 14  
T/ 943.40.06.02  
F/ 943.39.08.45

15703 SANTIAGO DE COMPOSTELA  
Avda. de Lugo, 151-153  
T/ 981.55.43.91  
F/ 981.58.34.17

41927 SEVILLA  
Exposición, 14 - 1º  
T/ 95.560.05.28  
F/ 95.560.04.88

46002 VALENCIA  
C/ Barcas, 2 - 5º  
T/ 96.353.02.80  
F/ 96. 352.44.51

01008 VITORIA  
C/ Pintor Adrian Aldecoa, 1  
T/ 945.14.39.78  
F/ 945.14.02.54

50012 ZARAGOZA  
C/ Argualas, 3  
T/ 976.56.15.36  
F/ 976.56.86.56

1040 Bruselas - BELGICA  
Rue de Treves, 49  
T/ +322.230.59.50  
F/ +322.230.70.35

Sao Paulo - BRASIL  
Alfredo Egidio de Souza Aranha, 75  
Jardins Santo Antonio  
T/ +55.11.56.42.12.43  
F/ +55.11.56.42.12.27

20000 Casablanca - MARRUECOS  
62 angle Boulevard d' Anfa/Bd.  
Moulay Youssef  
Forum Abdelaziz. 10 ème étage  
T/ +212.22.29.37.71  
F/ +212.22.29.37.79

6500 México (D.F.) - MEXICO  
Av. Paseo de la Reforma, 389-19  
Colonia Cuahatemoc  
T/ +52.55.52.08.46.49  
F/ +52.55.52.08.43.58

1750-018 Lisboa - PORTUGAL  
Rua Amilcar Cabral, 17B  
(Quinta do Lambert)  
T/ +351.21.754.87.00  
F/ +351.21.754.87.99

London E1 8JP - REINO UNIDO  
20 Dock Street  
T/ +44.20. 7360 7505  
F/ +44.20. 7360.7501

1 Bucarest - RUMANIA  
Calea Dorobanti nº 10, ap4  
T/ +40.21.212.20.01  
F/ +40.21.231.13.34

2001 Valencia - VENEZUELA  
Vargas, 102-47, Edificio Vargas  
T/ +58.241.857.64.68  
F/ +58.241.857.16.91

AEC ENGINEERING  
5540 Falmputh Street, Suite 300  
23230 VA - RICHMOND (EE.UU.)  
T/+1 00.804.2823811

AEC ENGINEERING  
400 First Avenue North, Suite 400  
55401 MINNESOTA - MINNEAPOLIS (EE.UU.)  
T/ +1 00.612.3328905



 idom