CLEAN ENERGY MINISTERIAL

Accelerating the Transition to Clean Energy Technologies

Spanish contribution to the Clean Energy Ministerial (CEM)

Towards Sustainable Energy For All in West Africa. Paving the way through renewable energy and energy efficiency

High Level Energy Forum

29th – 31st October 2012, Accra (Ghana)

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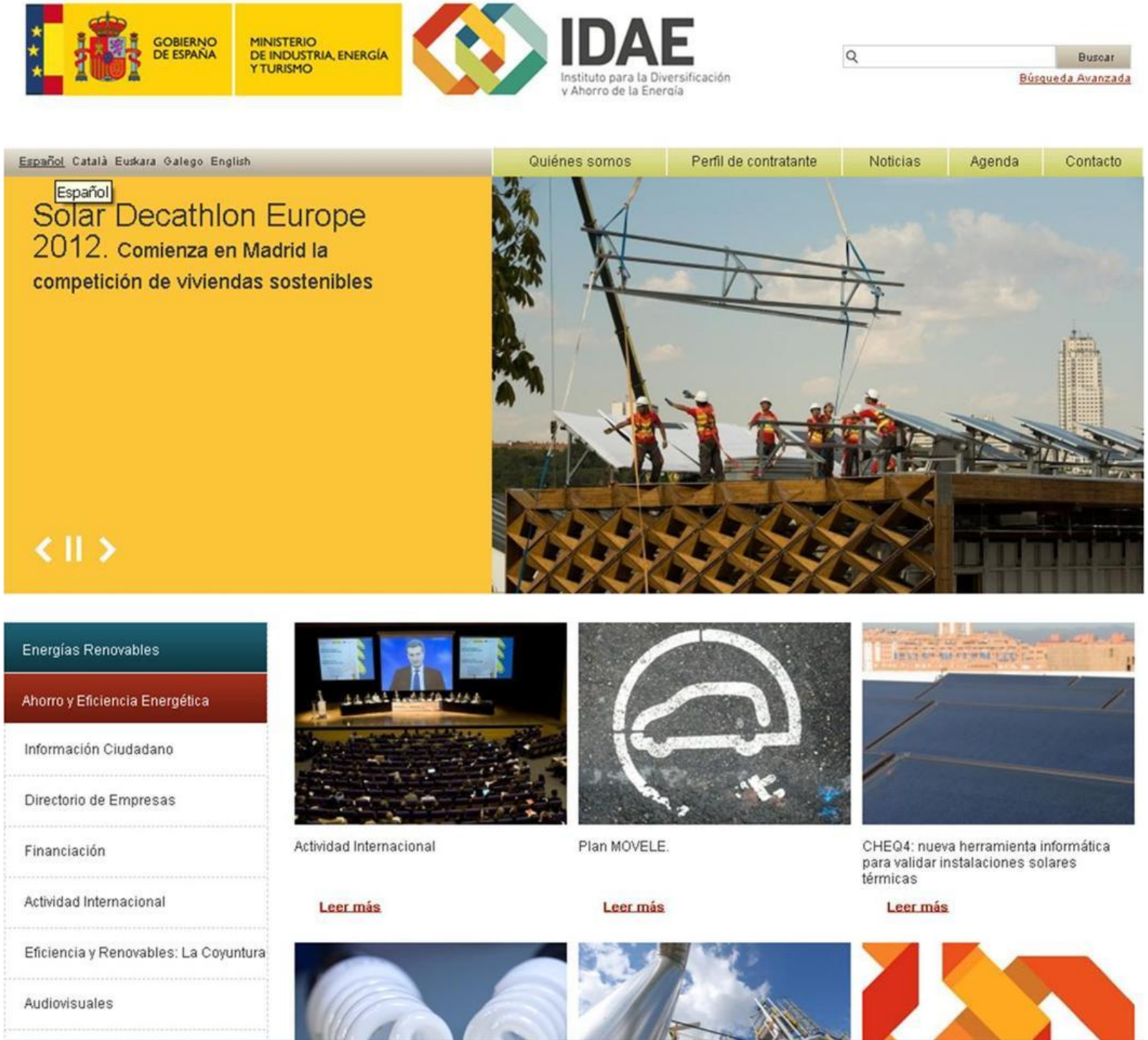
1. **What is IDAE?**
2. Renewable energy promotion in Spain
3. Clean Energy Ministerial
   - The Multilateral Solar and Wind Working Group
     - Global Solar and Wind Atlas
     - Capacity Building activities
     - The Economic Value of Renewable Energy Deployment



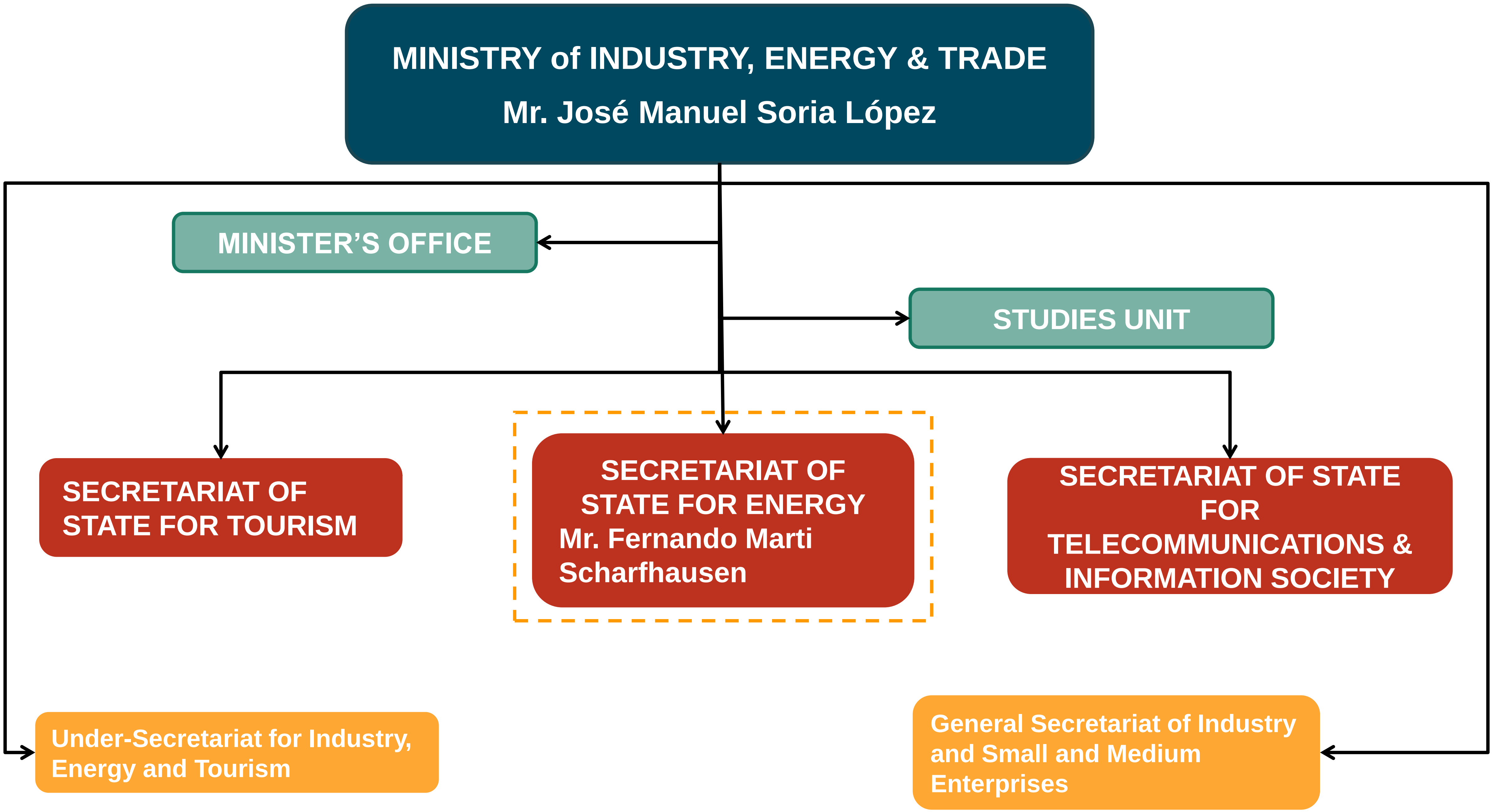
http://www.idae.es

What is IDAE?

The Institute for the Diversification and Saving of Energy (IDAE) is a public business entity reporting to the Ministry of Industry, Energy and Tourism through the State Secretariat for Energy

Mission

- Promote energy efficiency and the rational use of energy in Spain
- Promote the diversification of energy sources and the increasing use of renewable energies
- Foster these activities through technical consultancy and innovative projects


MINISTRY of INDUSTRY, ENERGY & TRADE
Mr. José Manuel Soria López
MINISTER’S OFFICE
STUDIES UNIT
SECRETARIAT OF STATE FOR TOURISM
SECRETARIAT OF STATE FOR ENERGY Mr. Fernando Marti Scharfhausen
SECRETARIAT OF STATE FOR TELECOMMUNICATIONS & INFORMATION SOCIETY
Under-Secretariat for Industry, Energy and Tourism
General Secretariat of Industry and Small and Medium Enterprises

Activities

- Development, implementation and monitoring of national renewables and energy efficiency plans
- Technical consultancy to the public administration
- Technical and financial support for renewables and energy efficiency projects
- Actions to introduce new and more efficient technologies and for deploying mature technologies into the Spanish market
- Training, information and raising awareness activities
- Participation in EU programmes and activities and in international institutions and networks
- Dissemination of Spanish technologies abroad and capture of international information of interest to Spanish companies

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Why promoting renewable energy in Spain?

- High external energy dependency:
  - Around 80 % primary energy dependency
  - 99.5% oil dependence
  - 97.1% gas dependence

→ RES are key elements to reduce energy dependence

- Spain's renewable resources provide great potential for the generation of energy
- RES promotion responds to economic, social and environmental strategy

- Renewable energy and energy efficiency are key to the three main challenges of the Spanish (European) energy policy

•The climate and energy package is a set of binding legislation which aims to ensure the EU meets its ambitious climate and energy targets for 2020 (20-20-20 targets):

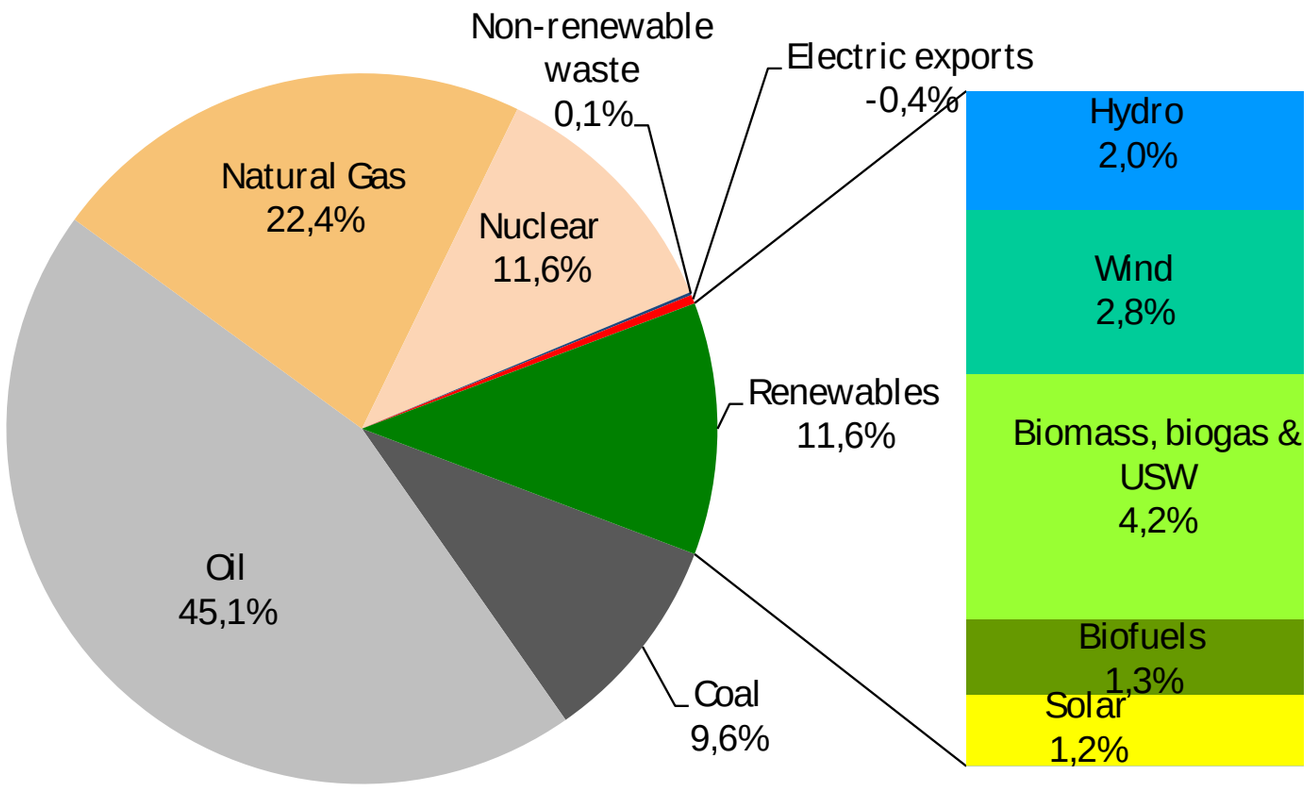
- A 20% reduction in EU greenhouse gas emissions from 1990 levels
- 20% improvement in the EU's energy efficiency.
- Raising the share of EU energy consumption produced from renewable resources to 20% (Directive 2009/28/EC)
  - **Spanish objective: 20 % RES final energy consumption; 10% in transport**

Renewable energy promotion in Spain

- Law 82/1980 on energy conservation was the start of the development of RES & EE in Spain.
  - Almeria Solar Platform (PSA)opened in 1981
- Implementing renewable energy policies in Spain has been supported by:
  - Early promotion of RE, including binding objectives established through adequate energy planning
  - Comprehensive legislation, economic regulatory framework and financing support schemes, acting as a lever for investments
  - Technical regulatory framework (e.g. give RE priority of access to the electrical grid)
  - Long-term transmission network planning and comprehensive coordination between the various administrations that has led to significant technological development (e.g.CECRE)
  - Adequate investment in research and development activities (private and public)
  - Development of a mature industrial sector
  - Close institutional cooperation
  - Development of capacity building programs
- Spain has become world leader in renewables (production, promotion and industry), especially since 2005 with the National Renewable Energies Plan 2005- 2010 and the Action Plan to improve energy efficiency.

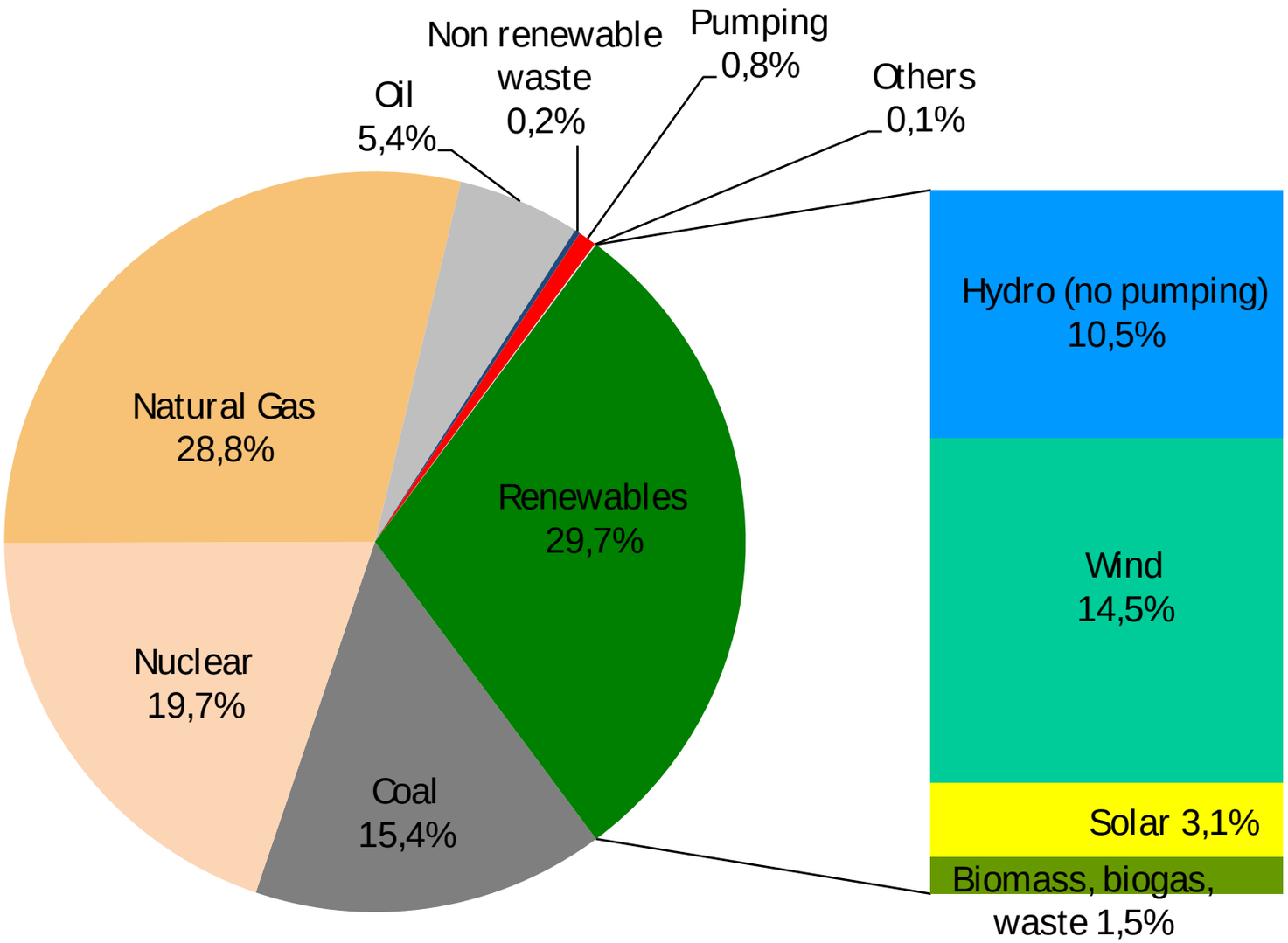
Where are we?

Primary Energy Consumption in 2011



- **Total** primary energy consumption: **129,340 ktoe** (-0,6% compared with 2010)
- **RES** consumption: **14,962 ktoe** (11,6%, as in 2010)

Where are we? Electricity production in 2011



- Total electricity production: **292,051 GWh (-3.6% compared with 2010)**
- **RES production: 86,600 GWh**
- **RES contribution: 29.7 % (32.1% in 2010)**
- **2011 has been a specially dry and less windy year (hydro production below historic average)**

ENERGY INTENSITY

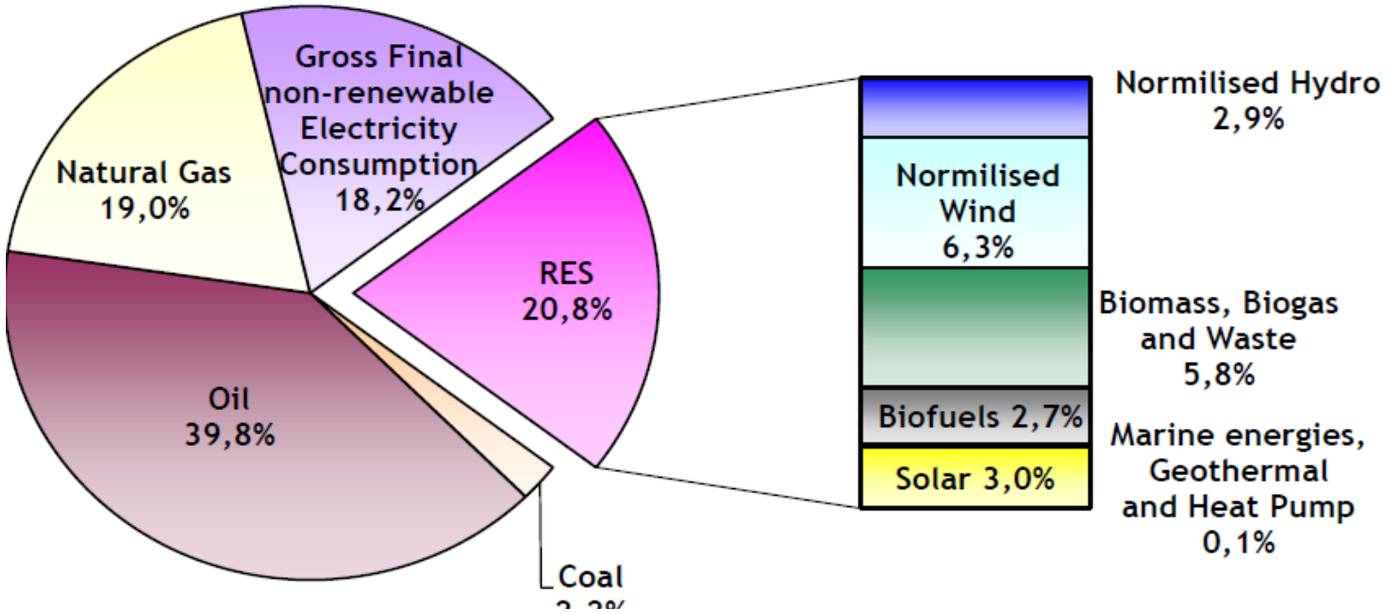
- **Variation in primary energy intensity (2011/2010) ~ -1,3 %**
- **Variation in final energy intensity (2011/2010) ~ -5,1 %**
- **Decreasing energy consumption and increasing energy efficiency**

Where do we want to be? Renewable Energies 2020

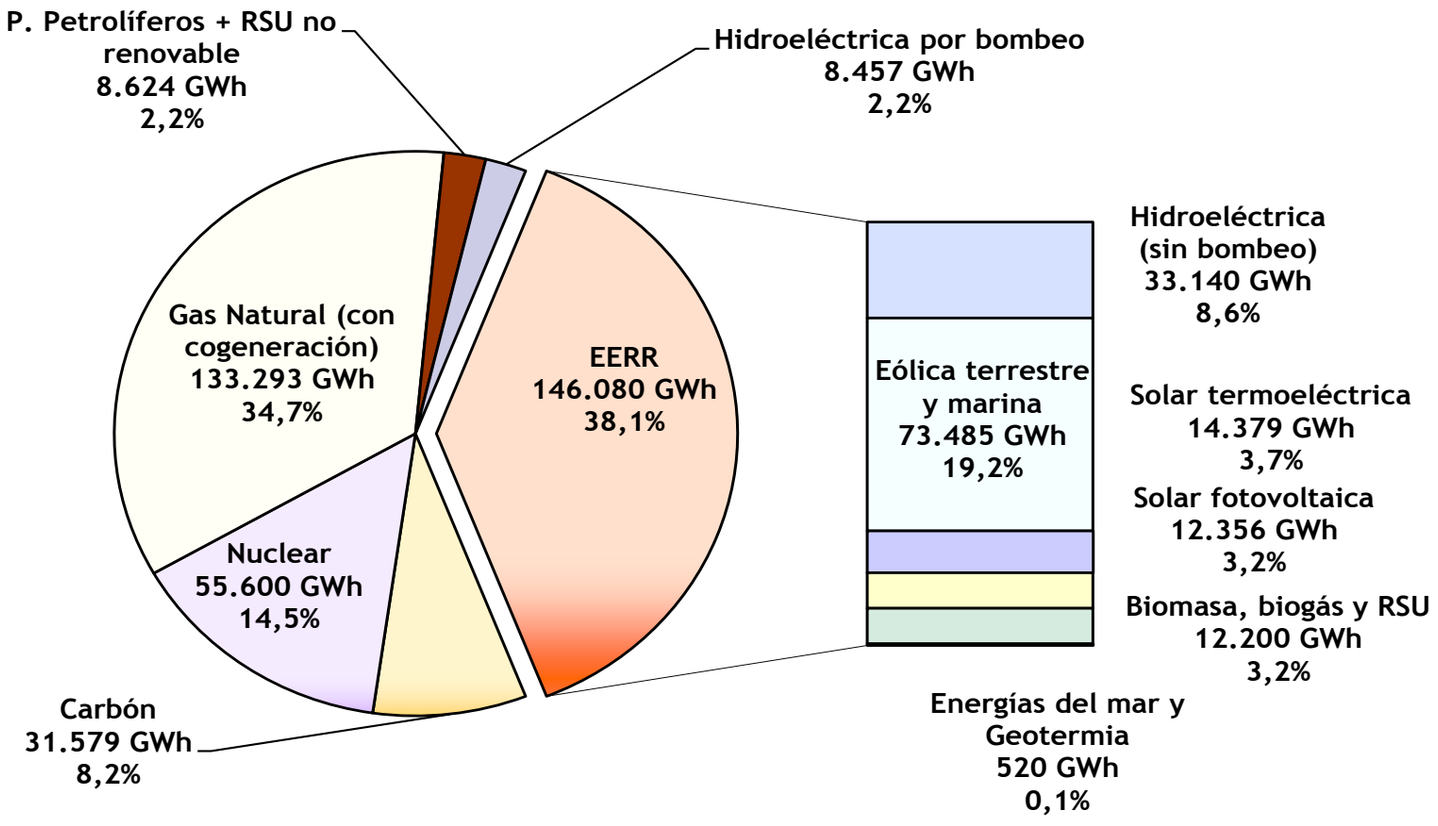
Gross Final Energy Consumption in 2020

Objectives 2020

- 20,8 % RES share in gross final energy consumption
- 11,3 % RES share in final consumption of energy in transport
- 38,1 % Renewable electricity share in gross electricity consumption



Electricity Generation in 2020



Spanish leadership in Renewable Energy

2nd largest **wind energy capacity** in **Europe** and **4th** largest **worldwide (21,520 MW)***

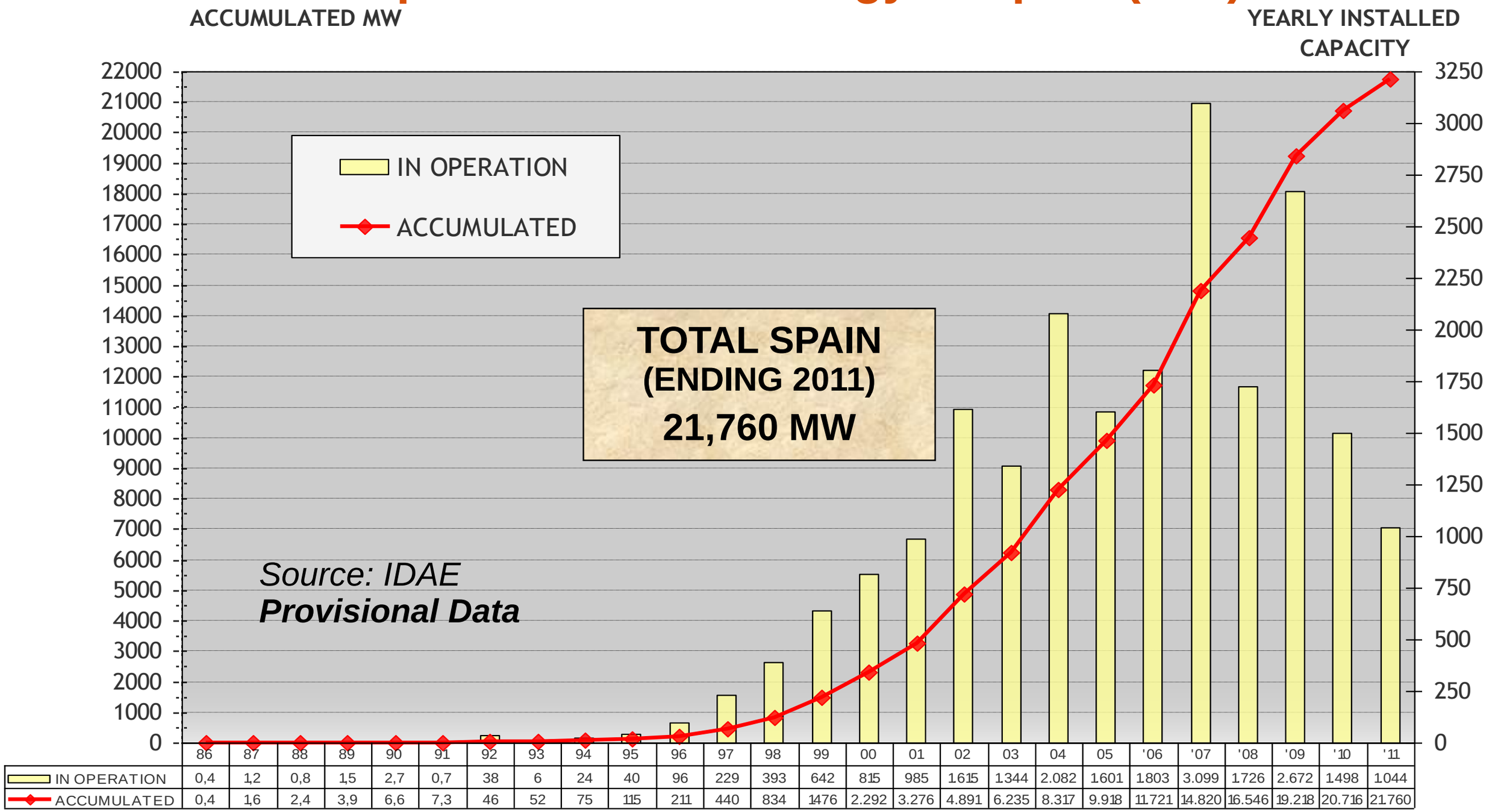
1st Solar Thermoelectricity producer in the **world (1,149 MW)**

2nd largest **photovoltaic capacity** in **Europe** and in the **world (4,281 MW)***

3rd producer in **Europe** in **mini-hydro**

**** Installed capacity at the end of 2011 (MINETUR, IDAE)***

Development of Wind Energy in Spain (MW)



	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	'06	'07	'08	'09	'10	'11
IN OPERATION	0,4	1,2	0,8	1,5	2,7	0,7	38	6	24	40	96	229	393	642	815	985	1615	1344	2.082	1601	1803	3.099	1726	2.672	1498	1044
ACCUMULATED	0,4	1,6	2,4	3,9	6,6	7,3	46	52	75	115	211	440	834	1476	2.292	3.276	4.891	6.235	8.317	9.918	11.721	14.820	16.546	19.218	20.716	21760

Wind Energy in Spain

- 4th position worldwide, with 21,760 MW commissioned, ending 2011.
- Spanish technologists among the largest manufacturers.
- Last year 2011 wind power met ≈14.6% (Renewables ≈33%) of total electricity demand in Spain ≈ 43,700 GWh.
- Legal framework: Feed-in Tariffs System, with premium prices, recognising environmental benefits.
- Current target for wind-power in Spain: 35,750 MW (year 2020).
  - Renewable Energy Plan 2011-2020: 35,000 MW onshore + 750 MW offshore
- It mainly requires overcoming current technical challenges for integration of large amounts of wind power (and others) in a scenery of increasing weight in the generation mix.
- Offshore wind: Own national barriers. Legal framework ruled…

Key elements for wind energy success in Spain

- ✓ Existence of significant **wind resources**.

- ✓ **Regulatory framework** for electricity generated (Feed-in tariffs system; reasonable return on investment).

- ✓ **Regional support**: planning, administrative procedures.

- ✓ **Technological maturity**. Creation of a strong industrial sector.

- ✓ Creation of the **Control Centre of Renewable Energies** (CECRE, Red Eléctrica).

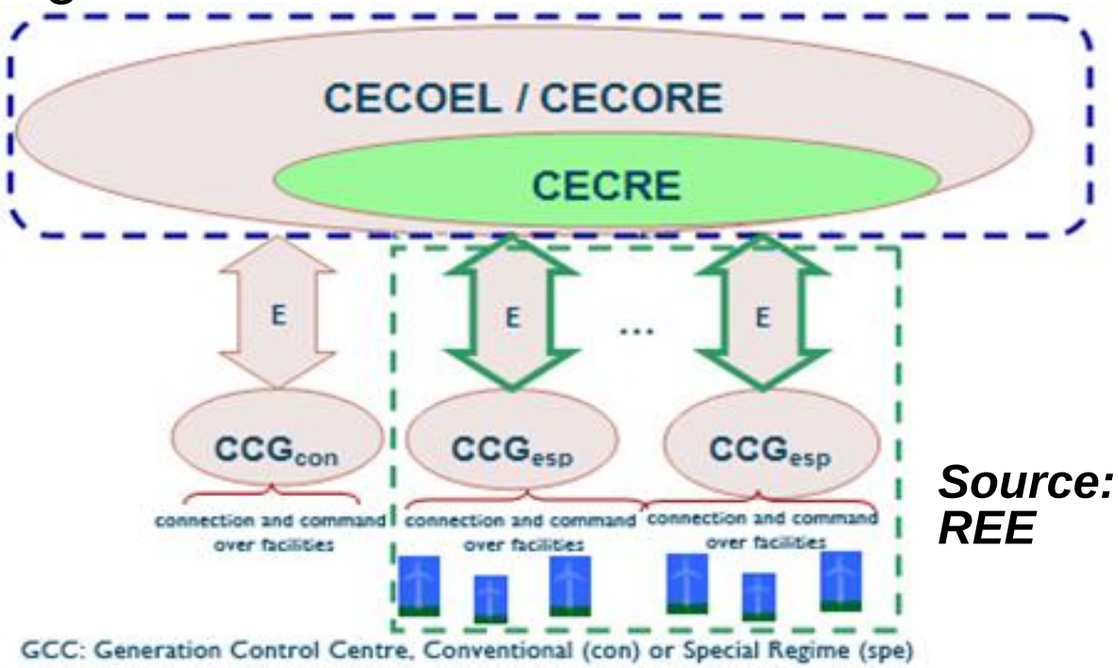
Control Centre of Renewable Energies (*CECRE, Red Eléctrica*)

CECRE is the first RES control centre in the world

- **Goal**: To allow the maximum amount of wind energy production to be integrated into de power system under secure conditions.

- Sole interlocutor <u>in real time</u> between CEOEL and each one of the authorised generation control centres, to which the wind farms are connected.

- Knowing at all times their conditions and variables of operation, and issuing the necessary instructions concerning to production conditions, in order to manage the quality of the electricity supplied to the grid.



Source: REE

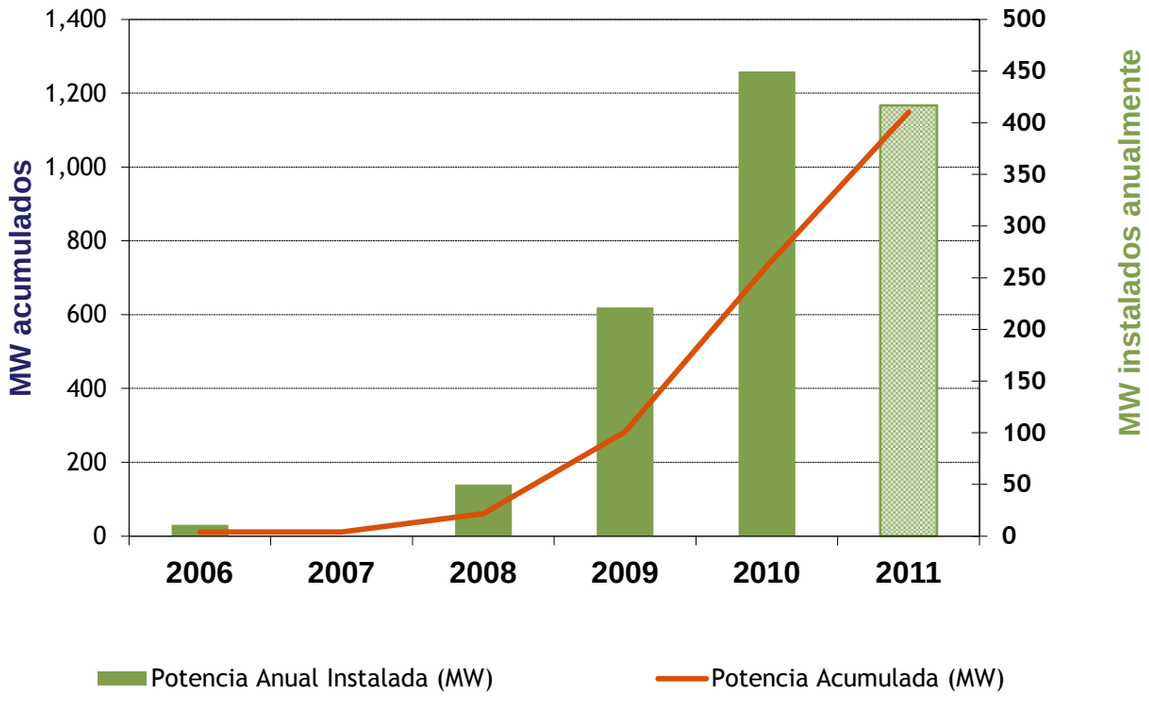
Solar Thermal Electricity

Capacity
- Accumulated 2011: **1,149 MW**
- Increase (2011/10): **416.7 MW**

Coverage
- Net electricity demand: **0.6%**
- Primary energy demand: **0.6%**

Production/capacity 1.89 GWh/MW

Annual installed capacity



Fuente: BDFER/IDAE

Business and technological advances

- Investments: 11,600 M€ up to December 2013.
- Spanish technology exported worldwide
- Technological developments:

✓ Plants in operation using the 4 technologies (tower, CCP, Fresnel, dish)

✓ First commercial plant in the world with central tower molten salt receiver

✓ 2010: **28,350 employment** (9,346 direct)

Challeges

- Production costs reduction: technological development
- Increase manageability: storage and hybridation
- Worldwide leadership
- International expansion

Solar Thermal Electricity – Spanish industry

PROMOTERS	
ABENGOA	EUFER
ACS-COBRA	FCC
ACCIONA	FLORIDA POWER & LIGHT
AGNI	GRUPO HERNANDO
ALBIASA	IBERDROLA
ARIES	IBEREÓLICA SOLAR
CAPITAL ENERGY	PROSOLAR
ENDESA	SAMCA
ENERSTAR	SENER
ENHOL	SOLAR MILLENNIUM
EPURON	VALORIZA

COMPONENTS
ABENGOA
ALBIASA
ASTURFEITO
CRISTALERÍA ESPAÑOLA
FLABEG
RIOGLASS SOLAR ABENGOA
SCHOTT ESPAÑA
SENER
SIEMENS

Solar Thermal Electricity – last projects

GEMASOLAR

Town	Fuentes de Andalucía
Province	Sevilla
Power (MW)	17

Technology	Tower
Storage	Molten Salt (15 h)
Plant surface	185 ha
Components	SENER 110 m^2

Startup	2011
PROMOTER	**TORRESOL**

The first TOWER plant **in commercial** exploitation **in the** world with storage (molten salt)

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     - **Capacity Building activities**
     - **The Economic Value of Renewable Energy Deployment**

Clean Energy Ministerial (CEM)

- The CEM is a high-level global forum to promote policies and programs that advance clean energy technology, focused on three global climate and energy policy goals:
  - Improve energy efficiency worldwide
  - Enhance clean energy supply
  - Expand clean energy access
- CEM3 London, April 2012
- CEM4 Delhi, April 2013

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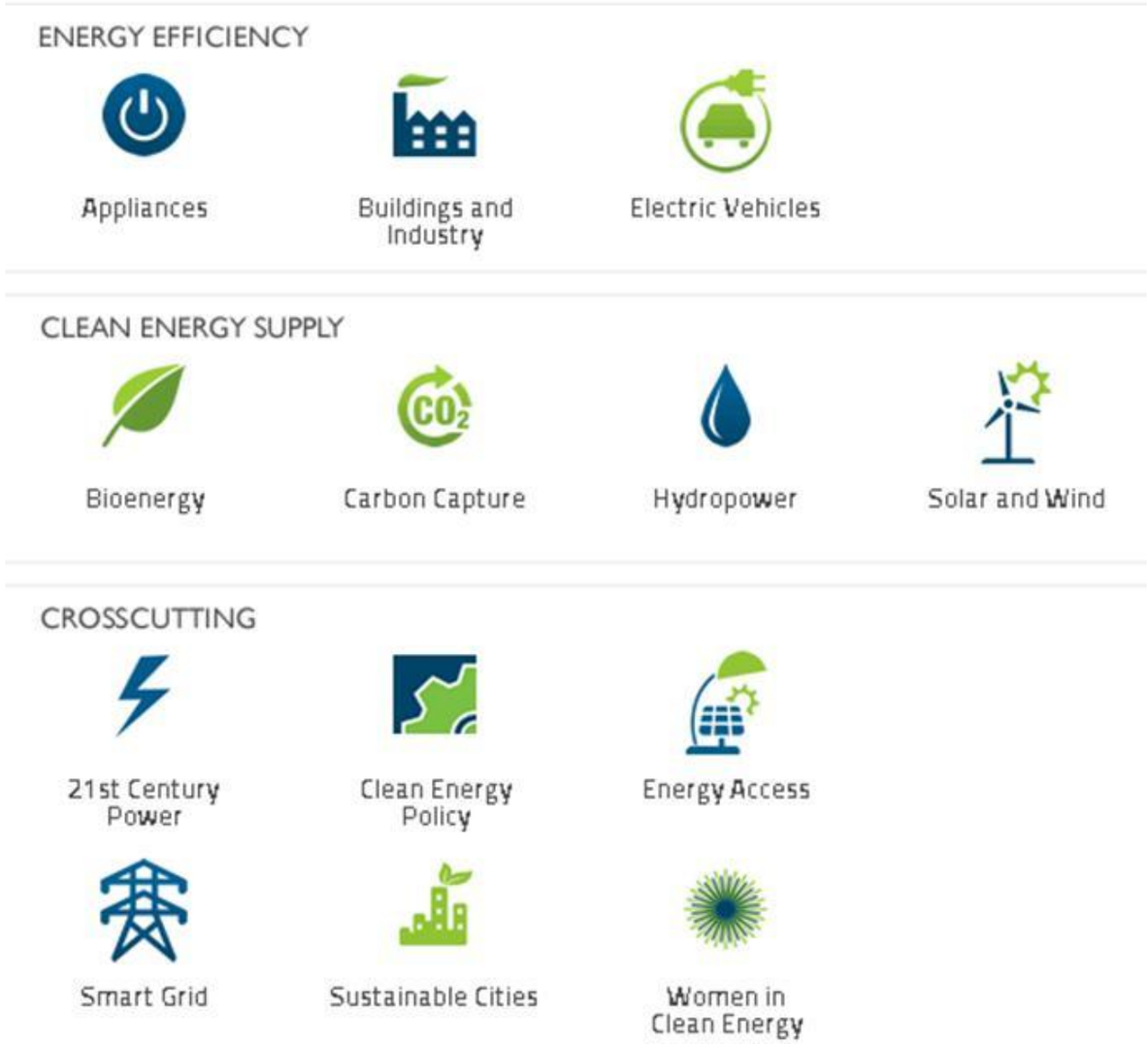
- Spain, Germany and Denmark are the leading countries of The Multilateral Solar and Wind Working Group (MSWWG)



MSWWG: Areas of activity

- A Global Solar and Wind Atlas
- A Long-term Strategy on Joint Capacity Building

New activity:

- The economic value of renewable energy deployment

Working Group Meetings

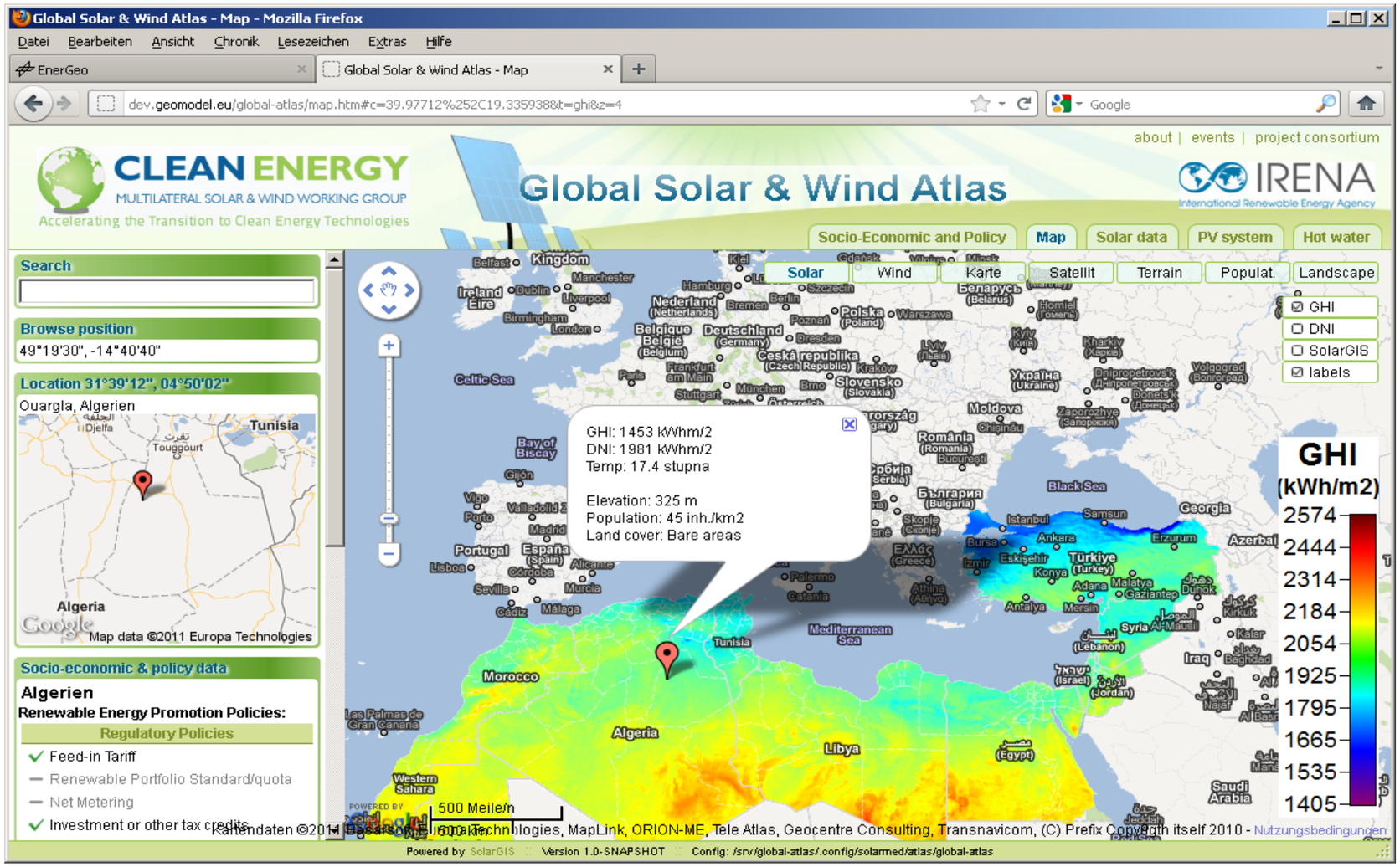
Bonn, June 2010; Madrid, November 2010; Copenhagen, May 2011; Berlin, November 2011; Madrid July 2012

Expert Meetings throughout 2011 on Capacity Building in Madrid, and on the Global Solar and Wind Atlas in Stuttgart (DLR), Geneva (WMO/IRENA), Colorado (NREL/IRENA) and Abu Dhabi (IRENA)

Next Working Group Meeting: Copenhagen December 2011

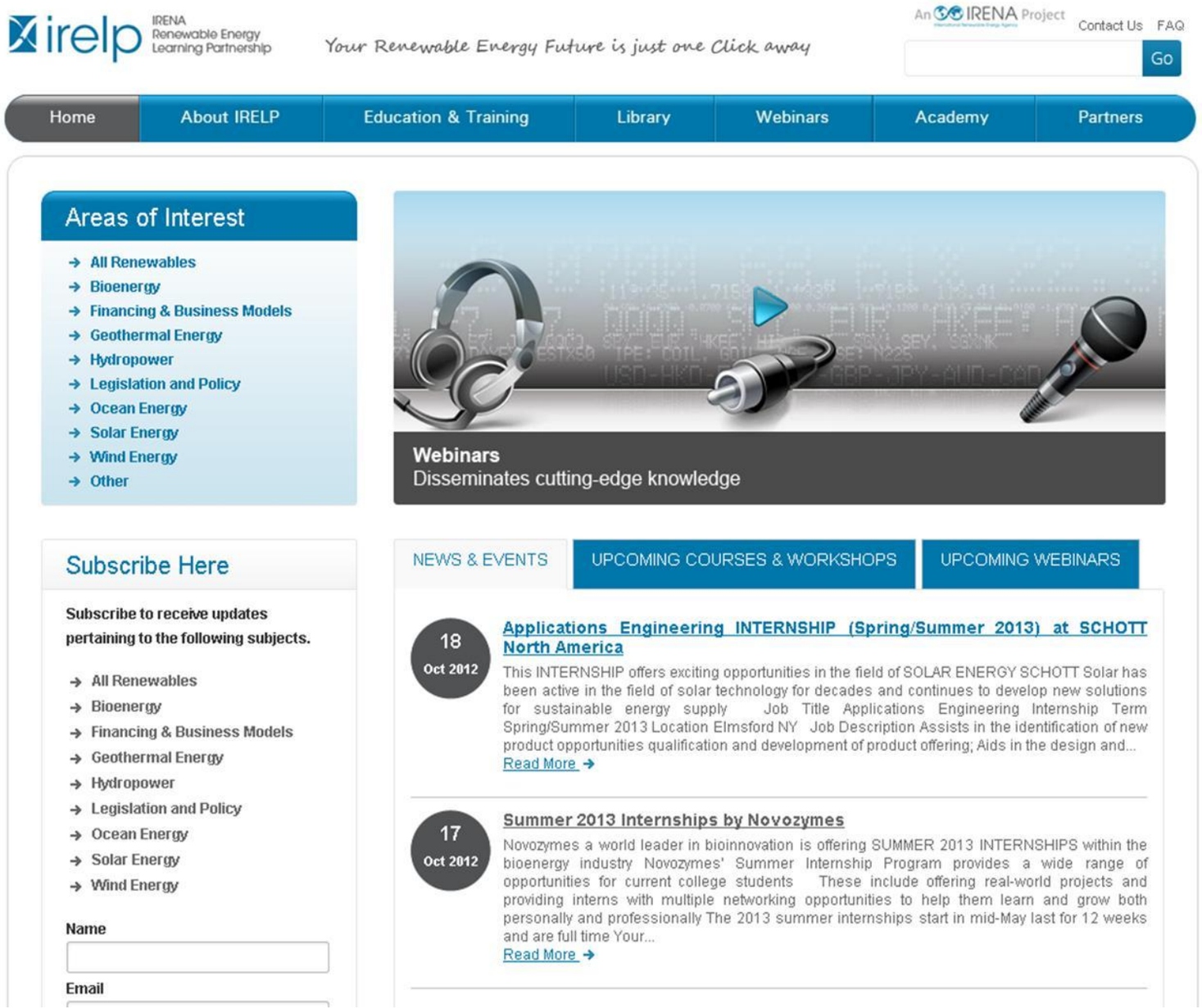
1. Global Solar and Wind Atlas

- First prototype of the Global Atlas for Solar and Wind Energy presented in CEM3 in London
- 12 participating governments confirmed their interest to further contribute to the global atlas (Australia, Denmark, France, Germany, India, Mexico, Norway, South Africa, Spain, the United Arab Emirates, the United Kingdom, and the United States)
- **To be launched in January 2013, during IRENA's Third General Assembly**



2. Capacity Building: IRENA Renewable Energy Learning Partnership

- Launched at the CEM3 in London
- A worldwide web-based repertoire of education and training activities on renewables
- Implementation by IRENA in collaboration REEEP, CIEMAT E+Co and NREL (IDAE support)



2. Capacity Building: Train-the-Trainers

- Concept developed for online and face-to-face seminars
- Concepts ready for implementation
  - face-to-face concept used in ongoing projects in Costa Rica and Mexico (RENAC)
  - scholarships for Online Master‘s program (IDAE-EOI)

2. Capacity Building: Capacity Development Needs Diagnostics for Renewable Energy (CaDRE)

- CaDRE Handbook &Toolbox presented during CEM3 in London
- Based on existing methodologies and tools
- Easy to use:

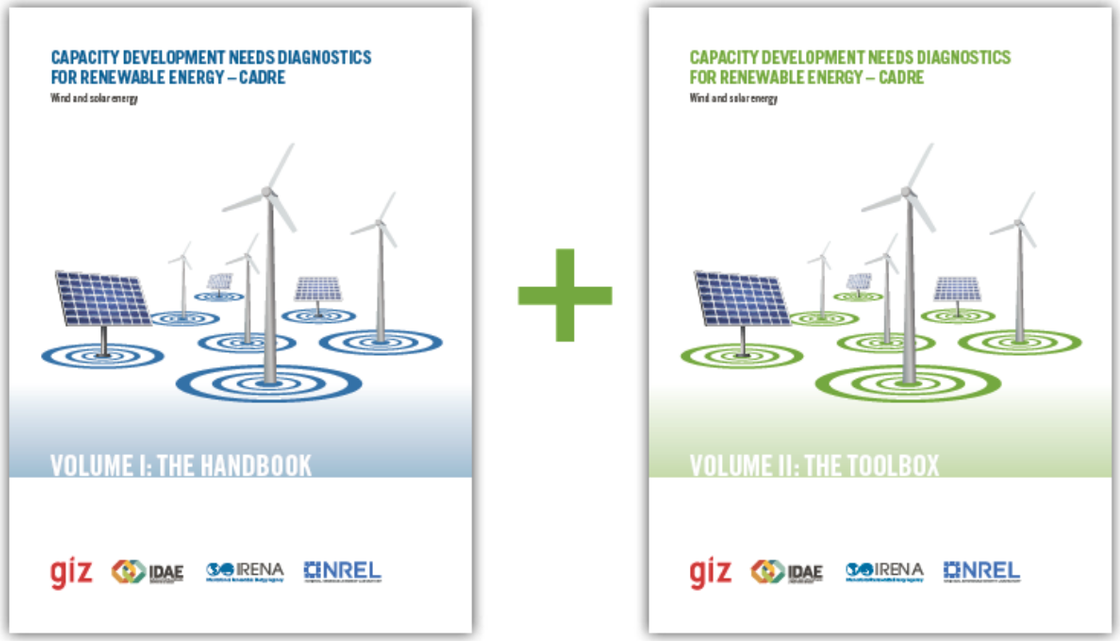
Modules describing the stages and tasks necessary to achieve the desired results.

Task sequences which are explained briefly and include a reference to supportive tools, checklists and likely results. The task sequences do not need to be followed in a strict, linear timeline but should be understood as an iterative process. Activities can be carried out in parallel, rather than one by one.

A detailed description of each task outlined in the sequence. Practical checklists and references to tools available in the CaDRE *Toolbox* support the completion of each task.

Checklists that help to understand the tasks in more detail and provide guidance through the diagnostic process.

Tools that give practical support for collecting and analysing data and/or visualising results. The tools are compiled in the CaDRE *Toolbox*.



http://www.cabincem.org/docs/CaDRE_Toolbox_web.pdf
http://www.cabincem.org/docs/CaDRE_Handbook_web.pdf

2. Capacity Building Institutions Network (CABIN)

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Accelerating the Transition to Clean Energy Technologies

English / Español

CABIN – CAPACITY BUILDING INSTITUTIONS NETWORK

Multilateral Working Group on Wind and Solar Technologies (MWGWS)

- CABIN
- About CEM
- CABIN Members
- Pilot projects
- Atlas
- Documents
- News and Events
- Contact

CABIN

During the 3rd Workshop of the **MWGWS** held in Copenhagen on the 19th of May 2011 it was presented the proposal to develop the idea of creating a formal network of technical experts on capacity building to link relevant capacity building institutions of different countries in order to coordinate and induce systematic capacity building actions:

Capacity Building Institutions Network – CABIN

CABIN aims to achieve long and medium term objectives (e.g. expertise development, networking). But during its set-up and initial phase it will concentrate on enhance communication and network creating through collaborative web-site for internal and external use of the involved capacity building institutions.

Improving the working methods and tools with a systematic approach, would bring efficiency, better communication and easier coordination among all the actors. **CABIN** is designed as an open and flexible on-line network for all the participants. Participating and joining the network will be done under voluntary basis.

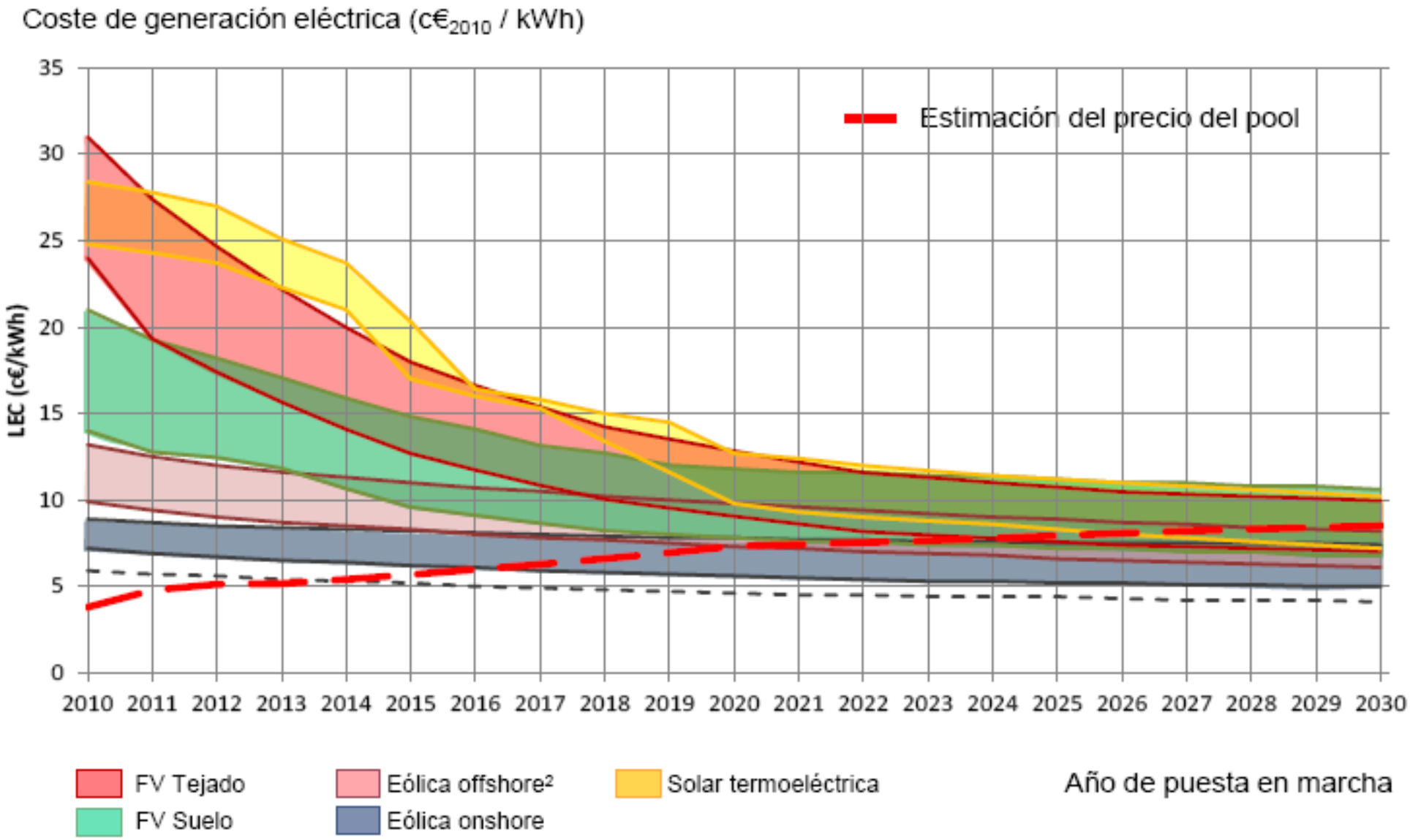
www.cabincem.org | cabincem@idae.es

3. The Economic Value of Renewable Energy Deployment

- New activity to be presented in CEM4 in Delhi
- Motivation: the renewable energy sector‘s contribution to value added within the economy

- Berlin Meeting Nov 2011: Presentation of Input Paper and initial feedback from interested parties
- Lead and Coordination: IRENA International Renewable Energy Agency
- Partners:

Electricity Generation Costs Study: PV, CSP and Wind Energy



Caracterización de los rangos en el coste de generación

Fotovoltaica de tejado y suelo

- Rango de variación en función de la tecnología
- Límite superior: tecnología de Thin Film
- Límite inferior: tecnología cristalina

Solar termoeléctrica[1]

- Rango de variación en función de la tecnología: cilindro parabólico y torre
- Límite superior: tecnología de torre hasta ~2015 y de cilindro parabólico en adelante
- Límite inferior: tecnología de cilindro parabólico hasta ~2015 y de cilindro en adelante

Eólico onshore

- Rango de variación para instalaciones de 50 MW en función de la intensidad de viento
- Límite superior: zonas de viento moderado (~2.000 horas)
- Límite inferior: zonas de viento medio (~2.400 horas en 2010)
- Punteado: zonas de viento intenso (~2.900 horas en 2010)

Eólico offshore

- Rango de variación para instalaciones de 150 MW en función de la distancia a la costa
- Límite superior: 100 km de distancia a la costa
- Límite inferior: 50 km de distancia a la costa

1. Torre: escala de tamaño de 20MW a 40 MW en 2015 y a 50MW en 2018. En 2020 se desarrolla una tecnología disruptiva; cilindro parabólico: Escala de 50MW a 100MW en 2016 y a 200MW en 2020; la torre supera en costes al cilindro parabólico a partir de 2015 si se apoya suficientemente 2. Profundidad <40 m
Nota: las plantas termoeléctricas tienen un ciclo de construcción de 2-3 año: los costes de plantas puestas en marcha en 2012 están definidos por costes actuales

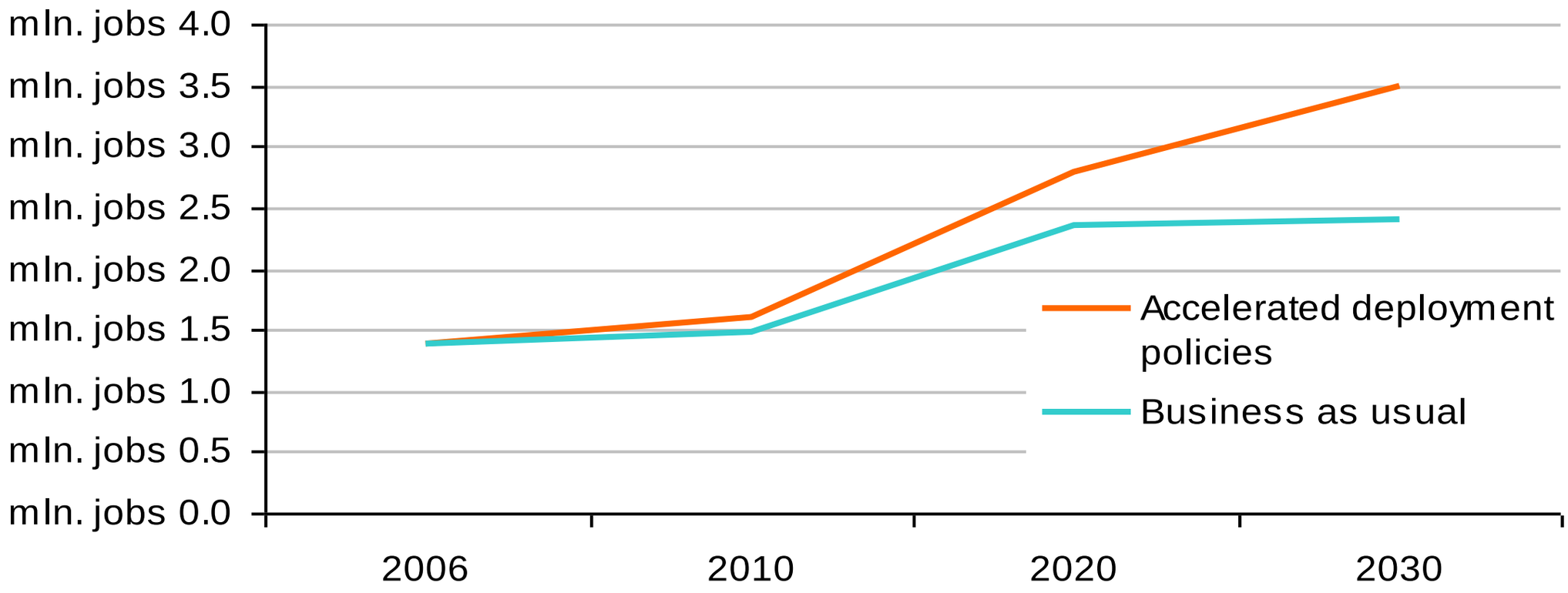
REP Economic Balance

PER 2011-2020: BALANCE ECONÓMICO DE EFECTOS DIRECTOS			
BENEFICIOS (millones de euros)		**COSTES (millones de euros)**	
Menor importación de gas natural	17.412	968	Subvenciones
Menor importación de gasóleo	7.125	77	Costes de financiación
Ahorros por reducción de consumo de gasolina	981	67	Otros gastos
Ahorros por reducción de emisiones de CO2	3.567	23.235	Prima equivalente régimen especial
		191	Sistema de incentivos al calor renovable
		99	Menor recaudación IH (*)
TOTAL	29.085	24.637	TOTAL

(*): Menor recaudación en impuesto de hidrocarburos correspondiente a biocarburantes. Partida que proviene del PER anterior y finaliza en 2013.

PER 2011-2020: Otros beneficios a considerar	
Creación acumulada de riqueza (incrementos de contribución al PIB) durante 2011-2020 (millones de €)	33.607
Estimación de empleo total vinculado a las energías renovables en 2020	287.513
Reequilibrio balanza de pagos: Exportación de tecnología	

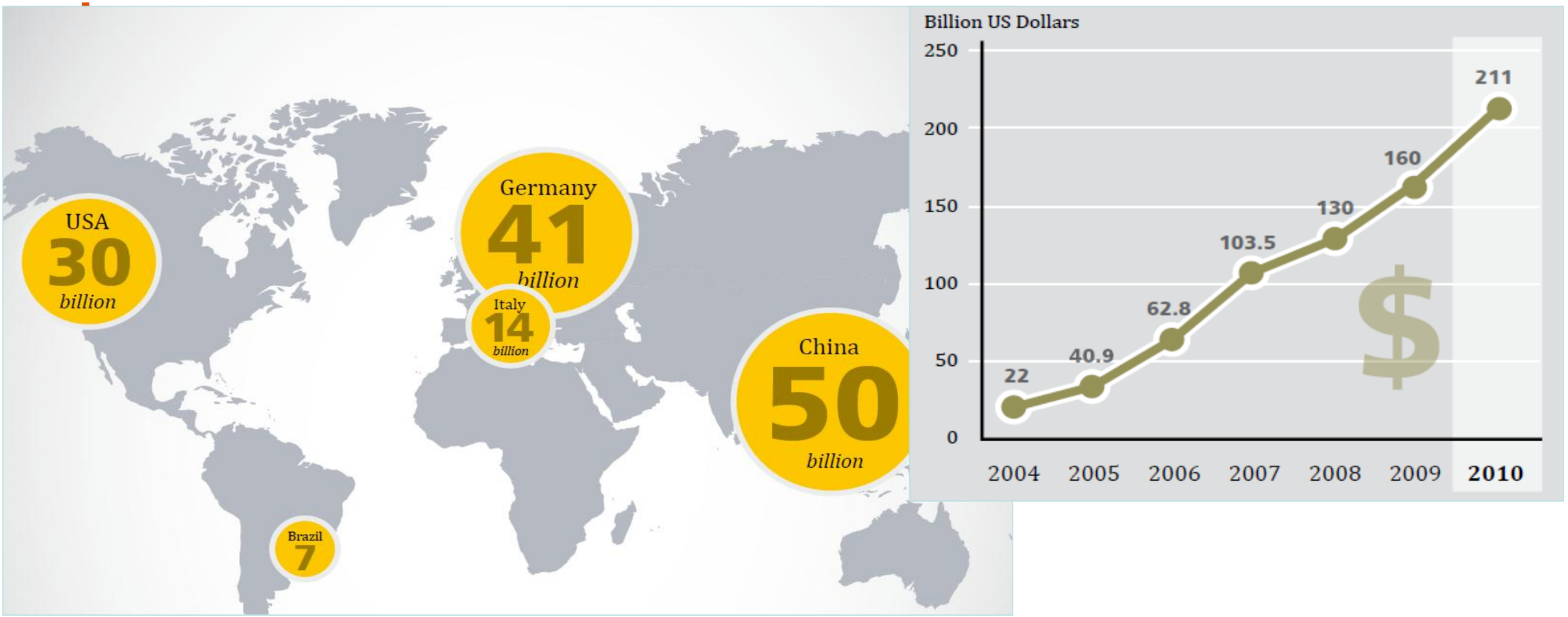
The renewable energy industry offers good job prospects



Achieving the 2020 renewable energy target will deliver 2.8 million jobs in total.

Source: European Commission

International chalenge to ensure the future energy needs



Source : REN 21 – Renewables Global Status Report

In 2010, more than 211.000 millon $ investments in REs (32% increase)

Thanks for your attention

Merci pour votre attention

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