

Barcelona Treball

# Renewable energies

**Sector Report 2013**

With the collaboration of:  
Leitat Technological Center

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# The 10 keys to understanding the sector

**The commitment to the renewable energies sector contributes to a reduction in the reliance on foreign energy sources thanks to the use of local resources, providing new opportunities for companies and professionals in the field.**

## The sector

The renewable energy sector focuses its activities on the exploitation of inexhaustible resources which respect the environment. Power supply is essential to the maintenance of current levels of economic and social activity. Based on this, the main objective of the sector and its activities is to gradually replace traditional energy sources by renewable ones. There are two main aspects in this sector; on the one hand, the implementation and start-up of new plants and on the other hand, their maintenance and related operations.

## Main areas of activity

This sector includes various technologies, the nature of which depends on the kind of renewable resource used in order to obtain energy. It is thus possible to differentiate between solar power (photovoltaic, thermal and thermo-electric), biomass (biofuels, biogas and urban waste), marine energy (tidal power and waves), wind energy and mini-wind energy, hydropower and mini-hydropower and, lastly, geothermal power. As regards the activities carried out, and taking 2007 as a reference, the majority of companies operated in the implementation of new plants that year (52.4%), followed by plant maintenance operations (21.6%), equipment sales (14.7%) and, lastly, energy production (13%). Although this distribution is equally valid at this moment in time, there seems to be a growing trend towards a reduction in installation activities in favour of maintenance activities. Furthermore, equipment sales and energy production levels continue to be low, although they are expected to experience further growth in the long term.

## Trends

In 2011 energy from renewable sources generated 33% of total electricity, three points lower than last year but 3% above the target set in the Renewable Energies Plan 2005-2011. Especially significant are wind energy and hydropower which generated 15% and 11.7% of the total respectively, nearly 83.7% of all renewable electricity production, with wind consolidating its position as the primary source of renewable energy ahead of hydropower.

Other more recent technologies such as biomass are starting to show a competitive edge and technologies which are more emerging in nature still, such as tidal power, have excellent future perspectives both on a business and occupational level.

## Economic importance

The total contribution (direct and indirect) of renewable energies in Spain's GDP was approximately €10.283,3 million in 2009 (0,98%):€7338.5 million are from direct contribution and €2.961,4 from indirect contribution. This represents a

real growth of 56,7% over 2005. As stated in the study "Green jobs for a Sustainable Development"<sup>1</sup>, there are currently 3.091 Spanish companies: manufacturing components, assembly, installation and maintenance of equipment, heating and air conditioning, prototype design and generation energy from renewable sources. Even so, this sector is still in its developmental stages, which is causing some technologies to present low expectations in terms of profitability or in the long term. This is reflected in a slowdown in the amount of investments made by companies as they wait for profitability levels to improve.

## Employment

The continuous development of renewable energy has a direct impact on the ability to create jobs. According to forecasts of the Spanish government until 2020 (included in Renewable Energy Plan 2011-2020), the sector could generate 124.625 direct employment opportunities statewide. According to the study "Green jobs for a Sustainable Development", is estimated that Spain had, by 2010, about 148.000 jobs related to renewable energy<sup>2</sup>: 88.209 were direct and 60.185 indirect. Regarding the whole green economy employment is estimated at approximately 500.000 jobs (which accounted for 2,2% of the Spanish occupation in 2010). In 2010, according to a study by the Workers' Commissions (CCOO), renewable energy directly employed 6.164 people in Catalonia, that is a slight decrease compared to 2008, when there was 6.338 people employed in the sector

## Professional profiles most in demand

The majority of jobs in this sector require highly qualified professional profiles, where the value of specific training is a determining factor, especially with regard to the start-up of new plants. In-company training is a key factor in the adaptation of both theoretical and practical knowledge to specific needs. Professionals within this sector must have at least three years' experience and specific knowledge to carry out tasks and functions in such a specialised sector. Further aspects such as a command of the English language and willingness to travel constitute key aspects which are coupled with the geographic mobility required for most occupations in this sector.

## Occupations most in demand

Occupations most in demand are linked to the start-up of new plants. The professional profiles required must be highly qualified in the areas of project planning, feasibility studies and execution. In addition, there is a significant increase in the demand for plant maintenance and operation staff in already built plants. There is a need for technical staff with more general training but also some specific knowledge, for instance about medium and low-voltage grids.

## Future scenarios

Out of the total primary energy consumed in Spain in 2011, 11,5% comes from renewable energy sources and the trend is increasing this figure, in 2004 represented 6,5%. This puts Spain on track to reach the target set by the European Union to achieve that 20% of final energy consumption has to be from renewable sources by 2020. This requires that regulatory frameworks are defined correctly and that the government boost aid plans to meet predictions on energy. Government is currently working on the legal aspects and improvements in incentives across almost all renewable technologies, although the sector feels the final implementation of these changes is taking too long, which in turn constitutes an obstacle to its development.

## Weaknesses

The lack of efforts being made in terms of R&D and in the manufacture of own, domestic-made materials, inadequate legislation and the lengthy nature of administrative processes all give rise to a context which impairs the speedy development of renewable energies. In addition, the policy of economic aids in Spain with action such as, for example, the Royal Decree-Law 1/2012 which provides the suspension of payment proceedings and suspension of earmarking financial incentives for new facilities production of electricity from cogeneration, renewable energy sources and waste, adversely affect the development of the sector in the short term. It is a measure aimed at controlling excess electricity tariff deficit that the sector suffers from Spain and the strong and rapid growth experienced by technologies including wind, solar and the thermal. There also appears to be a lack of specific training and experience for staff. The sector suffers from a fairly reduced communication capacity and efforts made towards disseminating information are inadequate, which likewise constitutes a problem for the development of these energies.

## Opportunities

The new Sustainable Economy Act 2/2011 is a great opportunity to increase renewable energy production in Spain, given that it sets minimum targets for renewable energy by 2020 and the approval of renewable energy plans making it possible to reach these targets. It is for this reason that the Renewable Energies Plan (PER) 2011-2020 is currently being drafted. In 2012 has just opened a second Renewable Energy Plan (PER) for 2011-2020, which defines objectives and future energy scenarios based on the provisions of Directive 2009/28/EC concerning promoting the use of energy from renewable sources. Thus, the PER 2011-2020 sets objectives for Spain: 20% reduction of greenhouse

<sup>1</sup> Green jobs for a Sustainable Development. The Spanish case. SustainLabour study, in collaboration with the Biodiversity Foundation. 2012.

<sup>2</sup> Jobs associated with production, distribution, operation and maintenance of energy from renewable sources: wind, solar, aerothermic, geothermal, hydrothermal and ocean, hydropower, biomass, landfill gas and gas treatment plants.



gases, 20% improvement in energy efficiency, and increased to 20% of gross consumption of energy produced by renewable sources. And the goal, the share of energy from renewable sources should be 16,6% in 2015 and 20,8% in 2020.

# 01 Introduction to the sector

Renewable energies raise the challenge of a new energy plan, envisioned not only from an environmental point of view but also from the standpoint of a change in economic model.

This sector focuses its activities on the exploitation of the renewable resources nature has to offer in order to obtain power and assign it to various uses, such as public lighting, heating systems, water supply and grid sales.

The companies operating in this sector carry out a wide range of activities which include project development, the building of power plants and their subsequent maintenance, the manufacturing of components, product sales, feasibility studies and technical support services.

Furthermore, these activities create a major need for professionals fitting specific profiles, with particular emphasis on project engineering in the case of the start-up of new plants and the control of production and operations in the case of already built plants.

# 02

## Main areas of activity

This sector is split into different technologies, depending on the resources used to generate power. It is thus possible to differentiate between:

### Solar power

This is based on the use of energy produced by the sun and its radiation. There are three sub-categories within the solar power subsector:

- Photovoltaic solar power: absorbs sunlight and converts it directly into electric power. The main activities which define this technology are the installation of photovoltaic panels, the manufacturing of cells and modules, batteries and power equipment, plant maintenance and the control of low and medium-voltage grids.
- Solar thermal power: the uptake of solar power to convert it into heat. This technology encompasses the installation of collection plants, the implementation of hot-water producing home equipment, power supply to heating and refrigeration systems, energy production and equipment sales.
- Thermo-electric solar power: the use of solar radiation to heat a liquid in order to produce steam. This subsector comprises the manufacturing and implementation of collectors as well as plant construction and maintenance.

### Energy from biomass

This is the production of energy from organic matter originating from crops, forests and livestock farming. The most common applications are recovery systems, resource treatment equipment, domestic heating equipment, biogas production plants, biofuels, consulting services, process engineering and fitting companies. Further biomass-related technologies include:

- Biofuels: these are fuels of biological origin, the most developed to date being bioethanol and biodiesel which are an alternative to benzene and gasoil respectively. This technology includes agricultural organic matter collection, the supervision of thermo-chemical processes and biofuel production, amongst other things.
- Solid urban residues: these include waste recovery and recycling, grinding equipment, automated cleaning systems, by-product separation equipment, composting equipment, energy collection systems and purification equipment.

### Wind power

This involves the use of wind power through wind generators. Wind power technology encompasses the manufacturing of wind generators (multipliers, propeller blades, towers, generators, transformers, frames), regulation and control equipment, hydraulic equipment, meteorological tools, fitting companies, operation and maintenance, medium-voltage line control, grid sales, consultancy services and engineering.

### Hydropower

Hydropower is produced through the power of water. This area includes the manufacturing of components (turbines, flood gates, valves), generators and transformers, electrical and regulation equipment, crane bridges, equipment fitting companies, plant operation and maintenance, civil and other kinds of engineering.

### Marine energy

This makes use of natural phenomena such as the tide and waves to produce energy. The emerging nature of these sources means that there are hardly any power production plants in existence to date. The main areas of activity revolve around project engineering and pilot plant start-up.

### Geothermal energy

Energy produced by extracting heat from inside the earth. The main areas this source involves are the installation of water and steam extraction equipment, drilling control, the manufacture of heat-pumps and equipment maintenance.

Aside from these areas which are directly related to type of energy source, this sector can also be classified according to its professional profiles and the type of tasks they do. It is thus possible to differentiate between the following:

**Building and installation activities**

Those are the positions required for the good initial execution of the power plant. This area includes all of the tasks involved from the design of the facilities to project execution and the installation of equipment, through to plant commissioning. It includes design and project engineers, salespeople with technical training, project execution coordinators, experts in purchase negotiation and equipment assemblers.

**Operation and maintenance**

These occupations are linked to the daily running and maintenance of an already built plant and plant operation tasks. The main tasks involved are preventative and predictive maintenance, equipment repair and operations on electricity grids. This area includes electrical and electronic engineers, instrumentation specialists and energy or component production managers.

**Strategic development activities**

These positions enhance power plant management, whether by carrying out functions, improving processes, establishing new guidelines and models, R&D, etc. These are long-term actions to ensure the ongoing improvement of the business and its infrastructure as a whole. Tasks carried out by these professionals include the continuous search for new business opportunities, analysis of domestic and international markets and the optimisation of distribution networks. The positions involved include specialist engineers in R&D and energy efficiency.

# 03

## Sector trends

**In Spain, renewable energy has displaced gas (a fossil fuel) for the first time as a raw material for electricity generation.**

### Main source for electricity generation

Renewable energies have already displaced gas (a fossil fuel) as raw material for electricity generation (2011). This, together with the recent measures adopted by both the EU and Spanish government, suggests that within a decade renewable energy could produce almost all the electricity used in Spain.

### Track record

There are still a few renewable energy use systems which have failed to reach a technology level sufficient to allow them to compete with traditional power alternatives in terms of cost, reliability and performance. However, energy from biomass, wind energy and mini-hydropower are fit to compete in the market for decentralised facilities. Equally, solar thermal technology has reached a degree of maturity which makes it into a viable technical and economic option. Lastly, electricity generated by photovoltaic solar energy can compete with that produced by traditional power plants thanks to its extensive and solid track record.

### Awareness

The application of these energy sources should never be indiscriminate but rather take into consideration a comprehensive awareness in order to avoid the social rejection of their implementation. Thus work is being done towards obtaining social acceptance through, for instance, the optimal location of devices within the urban and architectural context. Furthermore, emphasis is being placed on the externalities of energy consumption and promoting the use of renewable energies and energy efficiency practices, as laid out in the Renewable Energy Plan 2005-2010 for Spain and the Renewable Energy Plan 2006-2015 in Catalonia.

### Mindset

It is widely believed that there is a certain convenience in the use of traditional energies and consequently there is little or no urgency to develop advanced technologies in the field of renewable energies. This does not actually reflect reality since if there should be a massive increase in the use of fossil fuels, in addition to the dramatic impact this would have on the environment, prices would also become vulnerable and potentially unaffordable for some regions, which would in turn lead to an economic collapse.

### Business network

Spain has satisfactorily developed wind energy and solar photovoltaic power and is in fact currently one of the top ranking countries in terms of the production and distribution of components. In Catalonia, the sectors featuring the highest number of businesses are those which operate in the fields of solar thermal energy, photovoltaic solar energy and wind energy. Conversely, those with fewest are geothermal energy (due to the scarcity of resources) and marine energy (due to the fact that its development is still in its early stages). Greater efforts should be made to develop hydropower energy applications and the multiple uses of biomass, seeing as the developmental pace in those sectors is slow bearing in mind the potential they have to offer. As regards corporate activity, most business are focusing on project development, the implementation of facilities and the provision of technical support services.

### Spain in the current European and global context

Spain is the second world power in terms of installed wind power and manufactures almost a quarter of all wind turbines worldwide. It is also the third ranking country in the production of photovoltaic solar power modules. In the EU, it is the leading producer of bioethanol and in terms of installed power it ranks second for photovoltaic solar power and third for hydropower. In all the remaining energies (biomass and biogas, solar thermal and biodiesel) it occupies the fourth or fifth position.

### Installations context

The promotion of the sector currently relies on projects for the construction of new power plants. The same is not the case for building and domestic installations which, owing to a lack of funding, promotion and information, are taking longer to become established. The pace of implementation of those independent facilities is slow and the locations involved either rural or in isolated developments, where traditional energy sources are scarce. As regards urban

agglomerations, there is a lack in public support for their introduction, with the exception of photovoltaic technology which is already the subject of municipal bylaws regarding the minimum requisites for this type of facility.

### **Innovation and technology**

The local nature of renewable energies (Catalonia and Spain have lots of sun and quite a lot of wind, both renewable energy sources) has enabled Spain to promote the development of its own technologies. In Catalonia, the Institute for Energy Research of Catalonia (IREC) is working on the development of technologies which would allow companies to implement innovative solutions. Some of the most typical innovations are in the fields of micro-generation, biofuels from alternative crops and advanced materials for energy applications.

Furthermore, there are other schemes such as the Energy Park, a physical research and innovation facility in which universities, companies and government are participating. Sponsored by the Government of Catalonia and the Ministry of Industry, Energy and Tourism and the Ministry of Education, Culture and Sports, the Energy Park is one of the most consolidated initiatives to date and is to host educational centres, laboratories, R&D activities and companies operating in the sector.

### **Biomass and Bioenergy: an alternative future?**

Biomass is the renewable energy source with the greatest potential for growth. Both global and national, biomass is renewable source of energy that is used in terms of primary energy and final energy. The current contribution of biomass is about 10% of total world energy production.

However, in Catalonia and Spain have detected a certain delay compared to other neighbouring countries of the EU in terms of energy production from biomass. In a comparative international context, in 2010 Spain was in the sixth position in production of solid biomass, the eighth in gross output per capita (production of primary energy from biomass). These data contrast with the existence of abundant primary resources in Spain for biomass: agricultural and forest residues, and energy crops. These resources could be profit more efficiently and can involve a much higher energy production as current values.

The main uses of biomass are related to heating, cooling and hot water production for domestic, as well as generating heat for industrial processes and power generation.

From the point of view of employment, according to a study made by the Institute of Trade Union Work, Environment and Health (ISTAS)<sup>3</sup> biomass is the renewable energy source that will generate more employment in Spain until 2020. In this sense, increased biomass production will make appear new career opportunities for professionals from sectors such as agriculture, energy, transport, and especially the environment. In general, the biomass generates qualified jobs or highly qualified in many cases, in the field of engineering, chemistry or environmental sciences.

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<sup>3</sup> Renewable energies and generation of employment in Spain: present and future.

# 04

## The sector in figures

### Economic data

- The total contribution (direct and indirect) of renewable energies to Spain's GDP was approximately €10.283,3 million in 2009 (0,98%)<sup>4</sup>, which corresponds to €7.338,5 million in direct contribution and €2.961,4 million in indirect contribution. This is a real growth of 56,7% over 2005. The green economy (renewable energy, sustainable transport, sustainable construction, waste management and sustainable basic industry) accounted for 2,5% of Spanish GDP (€25.000 million).
- According to the Quarterly Bulletin Juncture Energy from the Ministry of Industry, Energy and Tourism for the first quarter of 2011, the fine<sup>5</sup> energy consumption coming from renewable energy has increased steadily since 2006 (54,2%). The final energy consumption coming from renewable represented 6,6% of total final energy consumption (coal, gas derived from coal, oil wells, gas and electricity). Until July 2012, the final energy consumption coming from renewable represented 6,5% of total consumption.
- In 2011, of all energy from renewable, 36,5% came from biomass, 27,8 from wind power, 20% from hydropower, 9,6% from biofuels, 6,1% from solar power, and 0,1% from geothermal energy<sup>6</sup>.
- With regard to primary energy consumption in 2011, 11,5% of total consumption in Spain comes from renewable energy. In 2004, renewable energy covered only a 6,3% share. The distribution of total contribution of renewable to primary energy production is: 3,9% from biomass (thermal and electrical), 2,8% from wind, 2% from energy hydro, 1,3% from biofuels, 1,2% from solar energy, 0,2% from biogas, 0,1% from solid waste and 0,01% from geothermal energy<sup>7</sup>.
- The contribution of renewable energy in gross final consumption of electricity has increased from 18,5% in 2004 to 33% in 2011, 30% higher than in 2009 and above 3% the target set in Renewable Energy Plan 2005-2011<sup>8</sup>. Especially significant are wind energy and hydropower which generated 15% and 11.7% of the total respectively, nearly 83.7% of all renewable electricity production, with wind consolidating its position as the primary source of renewable energy ahead of hydropower.
- Renewables have risen from 0.39% in 2004 to 4.99% in 2010 in transport sector.
- According to the study of the environmental sector in Spain in 2011, 33,1% of companies linked to the environment belong to the sector of renewable energy. The same study shows that renewable energy companies have increased their turnover during 2005-2009 in a 113%, being the activity that has recorded higher growth between all the environmental sector.
- 80.5% of the companies involved in renewable energy in Spain are independent and not part of any business group or any Spanish or European multinational.
- During the period 2005-2010 the bulk of Catalan companies involved in renewable energy remained stable even though strong growth had been predicted for them.
- As for total renewable energy consumed in Catalonia in 2008, mention should be made of the importance of hydropower at 41.4% which is becoming one of the best established technologies in the region. It is followed by recoverable waste which accounts for 18.1% and biofuels with 13.7%, relatively high percentage figures bearing in mind how recently these technologies have been developed. Wind energy accounts for 5.8% of the total energy consumed, a moderate proportion considering its extensive track record and the potential it has to offer. Solar energy is the last in line with 2.9%, which is most probably due to its elevated cost compared with that of other energy sources. This results in an undervaluation of this type of energy although it is actually one of those with greatest potential, especially in this country.
- As regards the end-use of renewable energy, 39.9% goes to the transport sector for applications such as vehicles and fuels while 31.6% goes to industry to operate machinery. Independent energy generation from

<sup>4</sup> Green jobs for a Sustainable Development. The Spanish case. SustainLabour study, in collaboration with the Biodiversity Foundation. 2012.

<sup>5</sup> We define final energy as the energy used at the point of consumption, such as electricity or heat in the oven we use at home. Primary energy is contained in the fuel, before moving to the final energy transformation processes.

<sup>6</sup> Institute for Diversification and Saving of Energy (IDEA). 2011.

<sup>7</sup> IDAE. Monthly evolution of primary energy consumption in Spain. 2011.

<sup>8</sup> Study by the Environmental Foundation Forum. 2011.

private and domestic facilities, which represents electrical self-sufficiency independent of the grid, comes next at 14.6%. The services sector consumes 10.9% for public lighting and other areas of application and lastly the primary sector accounts for 3.5% of consumption for irrigation and other automated processes.

- In general terms, energy produced by solar facilities in Barcelona has experienced major growth of 35.7% compared with 2007. Whilst solar thermal energy production is increasing owing to the regulatory framework established by the municipal Solar Thermal Bylaw in Barcelona and the national Technical Building Code (CTE), photovoltaic solar energy basically comes from facilities developed by the City Council. There were 72 thermal and photovoltaic solar facilities in operation in municipal buildings in 2009.

### Employment data

- According to the study *Green jobs for a Sustainable Development in 2010*<sup>9</sup> is estimated that Spain had about 148.000 jobs related to renewable energy<sup>10</sup>, of which 88.209 were direct and 60.185 indirect jobs. Regarding the whole green economy employment is estimated at approximately 500.000 jobs (which accounted for 2,2% of the Spanish occupation in 2010).
- Since 1998, when there were only 3.522 jobs related to renewable energy, employment in this sector in Spain has increased by 3.005%, or equivalent to an annual average of 37% between in 1998 and 2009.
- 37,6% of these jobs, approximately, 150.000 were from equipment manufacturing activities, 18,3% in project development services, 16,9% in construction and installation, 12% in operations and maintenance, 10% in marketing and sales teams, and 4,5% in R&D.
- In construction, installation and dismantling phases are where there is a higher rate of temporary employment because this stage, in the generation of renewable energy, is short. Moreover, in the early stages of project development services, and operation and maintenance (30% of employment in the sector) is where there are the most stable jobs (mostly people 25 to 30 years), but also where there is less creation of new jobs.
- As stated in the study *Green jobs for a Sustainable Development*, there are currently about 3.091 Spanish companies manufacturing components, assembly, installation and maintenance of equipment, heating and air conditioning, and prototype design, and generation energy from renewable sources. It also highlights that 72% of companies operates in the field of solar photovoltaic, and 63% in solar energy (is usual that companies in renewable energy develop activities in more than one specialty field at the same time).
- The majority of companies in the renewable energy sector are SMEs: 75%, companies with between 2 and 50 employees. However, a small group of companies focus the majority of sector employment (2% of companies with more than 100 employees employ 54% of all people employed in the sector) . Thus, SMEs with 1 worker, or 2 to 50, employ 37% of the people employed in the sector.
- Wind power provides the largest number of jobs, direct and indirect, and employ 55.172 people (37,2% of employment in the sector), followed by solar energy with 28.350 jobs (19,1%). The rest is distributed in solar thermal power plants with 14.954 jobs (10,1%), biomass electricity 13.961 (9,4%), biomass for thermal applications with 11.394 (7,7%), energy solar thermal with 9.798 (6,6%), and common activities 6.989 (4,7%), waste incineration with 2.052 (1,4%), biofuels with 1.952 (1,3%), and the hydraulic small hydro sites with 1.563 (1,1%), biogas electric 1.345 jobs (0,9%), geothermal with 577 (0,4%), sea energy with 112 (0,1%), biogas for thermal use with 111 (0,1%), and finally solid waste (MSW) and industrial with a contribution of 73 jobs (0,1% of employment).
- According to CCOO and ISTAS, there is a very important difference in the participation of men and women in the renewable energy sector. Males account for 73,4% of total employed people and 26,6% for women.
- According to the same source, the most common model contract is indefinite (83,7%) and the average annual wage is 32.817, 52% higher than the average salary in Spain and 37% higher than the average salary of industry. It is, again, a sector with a high level of productivity.
- According to the study *Renewable Energy and Employment in Catalonia* by trade union Comissions Obreres (CCOO) in 2010, renewable energies in Catalonia provided direct jobs for 6,164 people and total employment in the sector came to 10,015 people..
- In 2010 fewer than 20% of people employed in the sector in Catalonia were women while in the industrial sector, which has always had a low proportion of women, the average female employment rate was 30%.
- The renewable energy sector is a young one; the average age of the companies which make it up is around 20 and one out of every three was set up after 2000. This youthfulness which characterises the sector makes

<sup>9</sup> Green jobs for a Sustainable Development. The Spanish case. SustainLabour study, in collaboration with the Biodiversity Foundation. 2012.

<sup>10</sup> Jobs associated with production, distribution, operation and maintenance of energy from renewable sources: wind, solar, aerothermic, geothermal, hydrothermal and ocean, hydropower, biomass, landfill gas and gas treatment plants.



it appealing both to the business community and workers.

- The renewable energy employment market has a low rate of temporary work at about 18%. It also enjoys great stability as it features a high proportion of indefinite term contracts (82% indefinite term contracts and 18% temporary, training and work-placement contracts).
- This sector has already stabilised in terms of jobs in building and installing new plants. Positions involving plant operation and maintenance came to the fore in 2010 although they do require higher qualification levels. A year or two ago, employment was distributed in a highly uneven manner (90% in installation and 10% in maintenance), although this distribution has now changed and stands at about 50% for each type.

Sources. Latest data available: Protermosolar (Spanish Thermoelectric Solar Industry Association); Renewable Energies Plan 2005-2010; *Renewable Energy and Employment in Catalonia* by the CCOO; Institute for Energy Diversification and Saving (IDAE); National Institute of Statistics (INE), Idescat; Green jobs for a Sustainable Development. The Spanish case. SustainLabour study, in collaboration with the Biodiversity Foundation. 2012; Study by the Environmental Foundation Forum. 2011.

# 05

## Professional profiles most in demand

### Most highly qualified professional profiles

The most highly qualified professionals tend to operate in the construction and installation of plants and infrastructures.

#### Training profile

The most common profile is that of a professional with higher education in engineering or a degree. The specialities most in demand are in branches such as industry and telecommunications, although civil, systems and precision engineering are also widespread depending on the subsector. Occasionally and in order to constitute multidisciplinary teams there is some demand for degrees in physics, environmental science and business administration.

Much importance is given to specialised training in every subsector and value placed on knowledge of the resources used in each technology, i.e. understanding the performance of a particular resource in a number of different situations, measuring its scope and potential, maximising its exploitation, etc. In some cases, another potential advantage is a degree of familiarity with the legislation and regulatory framework of each subsector. Lastly, advanced knowledge of specialised software such as AutoCAD is also required, as well as a good command of and experience in database management.

Major profiles in this block include design and project engineers, salespeople with technical training, project execution coordinators, purchase negotiation experts and equipment assemblers.

#### Skills profile

Internationalisation entails the need for staff with language skills. A good command of English is essential, although other languages such as French are also often required.

The geographic dispersion of facilities means that a willingness to travel is indispensable. In many cases human capital is moved from one facility to another according to the needs of the market so professionals must be available to travel to other locations, whether nationally or abroad.

A high level of experience is required which can never be less than three years. In addition, this experience must be as specific to the sector as possible and staff are often required to have fulfilled highly specific duties and functions.

Special emphasis is placed on team-leading, team-coordination and communication skills. Professionals are required with experience in project management, especially facility design, measuring and budgeting.

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#### Examples of jobs in the web Barcelona Treball directory

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- ✓ [Sales engineer in the photovoltaic sector](#)
  - ✓ [Photovoltaic solar energy R&D engineer](#)
  - ✓ [Specialist engineer in hydropower and hydrology](#)
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## Less qualified professional profiles

The positions requiring lower qualifications are those involving the daily operation and maintenance of already built plants. This group can however be split into two types of profile; one more highly qualified with regard to energy production and another less qualified, devoted to equipment maintenance duties.

### Training profile

In this case, the majority of professionals are foundation degree engineers specialised in electricity and electronics, although there is a slight demand for staff with vocational training to cover the lower ranks. The specialities most in demand are once again technical in kind, with electrics and electronics the most common and, occasionally, precision engineering.

Specific training is not usually considered essential, but it is definitely valued. Any subsector involved in electric power generation also has a need for medium and low-voltage specialists, meaning that any professionals whose basic training does not include this field should receive specialised training in the relevant area.

The most highly qualified profiles within this group are in energy production. In these cases, requirements include knowledge of production control processes, continuous improvement, total quality and ERP systems, amongst other things. An understanding of energy efficiency processes is also highly valued to optimise the correlation between energy consumed and end production.

Profiles in this group include facility operations technicians, industrial planning and energy production control managers and instrumentation technicians.

### Skills profile

These professionals are characterised by their versatility; in many cases they may be transferred from one plant or subsector to another, meaning that they must be highly adaptable, fast to adjust to new work conditions and be constantly alert to the staff demands of the market.

As regards professional experience, requirements are lower than for the profiles described previously. In this case, the requirement is for minimum experience of one to two years, without the need for specific experience in any particular subsector, a more generic profile being preferable. This probably stems from the fact that businesses tend to prefer for their staff to undergo in-house training. In cases where more specific training is required, this tends to involve electric grid control and instrumentation.

One of the skills worth highlighting here is a predisposition for teamwork. The nature of the tasks involved entails the need for a good rapport between members of staff and the ability to come to an agreement with many others in different departments or hierarchical levels.

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#### Examples of jobs in the web Barcelona Treball directory

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- ✓ [Higher technician in energy efficiency](#)
  - ✓ [Methanisation installation technician](#)
  - ✓ [Photovoltaic solar energy installation and maintenance technician](#)
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# 06

## Future scenarios

### Weaknesses

- The renewable energy sector is characterised by an asymmetrical evolution in the implementation of the different technologies, meaning that some are already consolidated, whereas others are still in their emerging stages. As regards the latter, there is a need for more infrastructures, as most of the equipment used is still in its developmental stages. Conversely, in the case of more established technologies there appears to be a lack of land available to house new facilities and signs of equipment becoming obsolete due to the fast-changing technology and lack of adjustment to this evolution.
- There is still a lack of Spanish companies in the Spanish economic network. This has two consequences; firstly, delays in meeting energy objectives, and secondly, a lack of Spanish-made materials, with supplies coming from abroad and therefore being dearer. This leads to a greater reticence to invest and for new companies to enter the sector.
- Investment in some of the technologies in this sector give a slow return on investment, and in some cases profitability expectations can be low and long-term. It is true that the cost of renewable energies is 35-40% higher than that of traditional energies in the initial developmental stages, but renewable energies have the potential to compete if developed in an optimal manner. The development of technologies for generating renewable energy is subject to the availability of investors and the promotion of R&D and innovation. The scarcity of the latter is threatening the progress of the sector. In fact, in some areas there is a degree of stagnation due to lack of innovation effort, few projects being undertaken and the limited number of new facilities which also means less maintenance work for them.
- The communication capacity of the sector is fairly restricted and efforts made to circulate information are inadequate. There are also frequent delays in the commissioning of new production plants, which means information often arrives late and is incomplete.
- Further weaknesses inherent in the sector include the dispersion and alternation of resources, high investment and operation costs, the inevitable inertia towards fossil fuels, the lack of official approval of facilities and assemblers, the variability of the premium scheme and deficiencies in the distribution network.

### Threats

- There is a large degree of uncertainty regarding the future progress of this sector, seeing as it is subject to multiple factors. These include the availability of optimal locations, the future maintenance of premiums associated with renewable energy production, the approach to be adopted by common European policies, technological development and potential large-scale use.
- Renewable energies are subject to the risk of a change in policies which may create conditions unfavourable to their progress, such as a stricter regulatory frameworks or cuts in premium schemes. Renewable energies are also subject to the future approaches taken to climate change and which may have an adverse effect on the sector's progress. These effects include possible changes in the use and exploitation of renewable resources, an uneven promotion of the various technologies of this sector, limitations on installed power, a reduction in the number of new projects or a drop in their profitability.
- The enactment of Royal Decree-Law 1/2012 provides the suspension of payment proceedings and suspension of earmarking financial incentives for new installations producing electricity from cogeneration sources renewable energy and waste which entail a slowing in the short term that will affect the creation and maintenance of jobs. The study Green jobs for a Sustainable Development, based on data from the Photovoltaic Industry Association (ASIF), indicating that this action can lead to the destruction of 10.000 jobs in the sector of renewable energies in Spain.
- Most renewable technologies lack clear legislation which has a negative effect on the progress of the sector. Governmental support is sometimes inadequate in areas such as grants, incentive schemes for private individuals and financial innovation premiums. Permit and licence application processes can be excessively lengthy, which may create obstacles to the performance of sector activities.
- Emphasis must be placed on the training of professionals working in renewable energy. Although the majority of the staff employed are highly qualified, the intake of professionals with a qualitatively superior training is

still insufficient.

- The sector's competitiveness may diminish as a result of various factors. First of all, there is uncertainty in a number of subsectors with regard to quantifying the resource to be exploited in terms of quantity and frequency. Secondly, the price of components is often unknown due to the parallel demands of other sectors operating with the same resources. Thirdly, the emergence of further competition as a result of the potential alternative uses of a particular resource has to be taken into consideration.

### Strengths

- Renewable energies are the green sector of the economy that has grown in the last decade, in 2010 accounted for almost 1% of Spain's GDP.
- Renewable energy sources are free, inexhaustible and environmentally friendly. Promoting this kind of energy has beneficial effects for the planet as well as generating a positive social perception and reduced reliance on foreign energy sources.
- The resources this sector operates with have a wide range of advantages. There is a large quantity of them and they can be used to obtain a high quality product able to compete with fossil fuels. They also provide the possibility of manufacturing by-products, thus expanding the portfolio of products on offer.
- The technological maturity of some subsectors can be used as ground is gained on traditional energies. The most consolidated energies also have production and export potential, meaning that this energy sector may become more competitive. In lockstep, external relations entail that energy stocks are practically inexistent, as all of the production is sold and/or exported to third countries.
- Spain is a world leader in solar thermal energy since conditions in the country are very favourable for installing solar thermal plants (it has abundant sunshine and vast desert areas). In 2007 the PS10, the world's first commercial solar thermal tower power plant, came on stream in Sanlúcar la Mayor (Seville). There are currently 21 plants with a capacity of 852.4 MW and the construction of 40 more is planned, according to data from Protermosolar, the Spanish Thermolectric Solar Industry Association. When all these new plants are operational in 2014, Spain will become the world's leading producer of this 100% clean and renewable energy.
- The 21 solar thermal plants that are operating in Spain prevent the emission of 1,181,908 tonnes of CO<sub>2</sub>. In 2014 when 61 plants are operational, they will prevent the emission of 3.4 million tonnes of CO<sub>2</sub>.
- The consumption of biofuels incentives through favourable tax treatment, have led to a significant increase of its use.
- Working conditions in the renewable sector are, in general, better than the overall economy. Thus, the average salary is 52% higher than the Spanish average and 37% higher than the average wage in the industry. This is due in part to the fact that it is a sector with a profile of highly skilled workers with a high level of productivity.

### Opportunities

- This market is still a very young one, creating opportunities for companies and workers alike. Companies can find a privileged position amongst the top-ranking organisations operating in the sector, whereas for workers the sector generates employment in almost all the technologies it uses and the chance to carry out high value added and innovative tasks in areas such as project engineering or component manufacturing.
- Directive 2009/28/EC of the European Parliament and the Council of 23 April 2009 on the promotion of use of energy from renewable sources, sets binding minimum targets for the European Union. This directive sets as a goal: achieve a minimum 20% share of energy from renewable sources in gross final energy consumption in the European Union, and a minimum 10% share of energy from renewable sources energy consumption in the transport sector in each Member State by 2020.
- The Renewable Energy Plan (PER) for 2011-2020 sets objectives for Spain: 20% reduction of greenhouse gas emissions, 20% improvement in energy efficiency, and 20% increase of the gross consumption of energy produced from renewable sources. As a goal, the share of energy from renewable sources is 16,6% in 2015 and 20,8% in 2020.
- Spain is in a good position in Europe with regard to the use of some renewable energy (such as wind power) and its share is expected to rise in response to concerns regarding the exhaustion of fossil fuel reserves in

the long term. These positive forecasts should boost R&D activity.

- Spain is also in a strong position in terms of primary energy production from solid biomass (data from the EurObserv'ER 2011) and has a great potential in producing this renewable energy source given the the existence of abundant primary resources (agricultural and forest residues and energy crops).
- The construction of new infrastructures entails the need for new products and associated technical solutions; new facilities therefore simultaneously stimulate other economic activities. The profitability of facilities depends to a large extent on the subsector, but in some cases a return on investment can be achieved in the space of 7-10 years.
- The sun can provide all Spain's energy using 0.8% of the country's territory, since if all electricity generated in Spain in 2010 had been obtained from solar thermal power plants, 0.85% of the country would have been used (4,293 square kilometres), according to data from the Spanish Thermoelectric Solar Industry Association (Protermosolar). Even so, the 21 solar thermal plants already operating in Spain produced 2,482.25 GWh of clean electricity per year, equivalent to the consumption of 620,500 Spanish homes. In 2014 there are expected to be 61 plants in operation authorised by the Ministry of Industry, Energy and Tourism which will generate 7,298.25 GWh per year (enough to supply 1,824,562 homes). This trend is expected to continue growing in coming years.
- Renewable energy sources represent new business opportunities. Catalonia is in a leadership position in more mature markets such as hydropower, in terms of both consumption and installed capacity. However, some areas, as in the case of biomass (especially biofuels), are in a growth stage of development and offer an opportunity to invest and achieve a leadership position in the market. There are 12 plants in Spain that produce biodiesel and dozens of them are in the pipeline. The sector is thus being actively promoted due to its appeal: production is not efficiently meeting demand and there are no competitive barriers to entry.

# 07

## City projects

### The Barcelona Energy Agency

The Barcelona Energy Agency is a local public consortium which was set up in 2002 to advocate a local and territorial energy model based on the values of the culture of sustainability. It is the entity in charge of promoting renewable energy sources and energy efficiency in Barcelona and defining the city's energy strategies.

The Agency administers the Barcelona Energy, Climate Change and Air Quality Plan (PECQ) 2010-2020 which prioritises energy conservation, energy efficiency, the use and awareness of renewable energy and improving environmental quality in the city and replaces the Barcelona Energy Improvement Plan. This plan promotes far-reaching actions in using local, renewable resources and increasing energy efficiency, whilst also focusing on managing demand. The Barcelona PECQ is a multi-dimensional plan as it entails actions in various areas and is structured into two parallel programmes on different scales: the city programme, which refers to all general aspects of the city in terms of the management of the City Council and the behaviour and actions of its citizens, and the municipal programme, which addresses issues that are directly dependent on the City Council, including the Plan for Saving and Improving Energy Efficiency in Municipal Buildings (PEMEEM).

The priorities of the PECQ are measures proposed for the following sectors:

- Transport - in this sector the goal is to achieve a 33% saving with measures relating to modal shift, rational use of resources, fleet renewal, the Strategic Urban Mobility Plan, transport to work, air corridors, etc.
- Building - a 15.6% reduction is sought through measures relating to heating and lighting systems, high energy rating, and the household appliances trade-in plan.
- Industry - saving of 14% is expected due to the implementation of strategic projects in industry, energy management systems implementation, and support for energy audits.
- Agriculture and fishing – saving of 4.7% is forecast from improvements in the efficiency of irrigation facilities.

In tandem, with the signing of the Covenant of Mayors Barcelona has pledged to reduce municipal CO<sub>2</sub> emissions by 20% by 2020 through a Sustainable Local Energy Action Plan (PAES), which will be covered by the Energy, Climate Change and Air Quality Plan.

<http://www.barcelonaenergia.com>

### The Zona Franca Energy Generation Centre

Over the past few years, major town planning transformations in the city have included the provision of more efficient and less polluting energy supplies in its plans, in similar fashion to what was done with the Forum and 22@ areas, with a collective air-conditioning system which is now also being integrated into the new neighbourhoods of La Marina and the Zona Franca. The Energy Generation Centre of the Zona Franca - Gran Vía L'Hospitalet area combines various systems which make it unusually efficient: the utilisation of the residual cold from the gasification process carried out at the Port, the generation of hot and cold water to be distributed to private users for the first time through the district network, as well as the use of biomass originating from municipal parks and gardens.

This improvement in efficiency and energy savings will entail a significant reduction in greenhouse gas emissions. When the project is in service, the plant will produce 2.9 MWh of power per year, 56% of which will come from renewable or recycled fuels. It is estimated that the emissions thus avoided will amount to about 13,400 t CO<sub>2</sub> per year, which is equivalent to the annual quantity absorbed by a Mediterranean forest covering 15% of the territory occupied by the city of Barcelona. In addition, the generation of neighbourhood air conditioning will entail some very low nitrous oxide (NO<sub>x</sub>) and particle (PM10) emissions. The plant is sited on a 6,300 m<sup>2</sup> plot which was previously home to the former Zona Franca SEAT thermal plant and in addition to delivering services to the residential area of the La Marina neighbourhood and major users like Mercabarna, the halls being built at the Fira Gran Vía and the City Metropolitana facility in L'Hospitalet del Llobregat, it will also be able to cater for major potential customers such as Bellvitge Hospital, the Catalan Cancer Institute (Duran i Reynals Hospital) and the Hesperia Tower Hotel which in the future will be able to connect to the heating and cooling network. Building works began in the first quarter of 2010 and full capacity is planned to be achieved by 2019.

### **LIVE – Logistics Office for the Implementation of the Electric Vehicle (City Council - Endesa)**

Endesa and Barcelona City Council have set up the LIVE office which is to define the roadmap for the deployment of this type of vehicle in the city and implement the MOVELE project, funded by the Spanish Government in Barcelona, Madrid and Seville to promote electric vehicles. The national plan provides for Barcelona having a minimum of 191 electric vehicle charging points by 2011, 60 on the surface and another 131 in underground car parks. There are also plans to promote the use of electric vehicles in municipal services, roll out pilot projects in the 22@ district and set up service and demonstration facilities for the public.

<http://www.barcelonaenergia.com>

### **Iberian KIC-InnoEnergy Centre**

Barcelona is one of the cities chosen to house one of the centres of the European Network for Sustainable Energies, led by the Universitat Politècnica de Catalunya Barcelona Tech and ESADE, with the participation of businesses and research centres in Spain and Portugal. The strategic objective of this network is to attract national and international talent in order to train it in technological innovation and entrepreneurial culture to set up new businesses and draw up new patents. The Iberian Centre is to coordinate InnoEnergy projects in renewable energy research (wind, photovoltaic solar, thermo-electric and marine energy) and will also manage a macro-project on equipment and processes for energy efficiency in industry.

<http://www.upc.edu>    <http://www.esade.edu>

### **Environmental Forum Foundation**

The objective of the Environmental Forum Foundation is to create an exchange and partnership platform for businesses, government and the rest of society so as to jointly achieve a more sustainable development model than the one currently used. Its functions include:

- Building knowledge which enables sustainable development for companies and government.
- Driving actions which encourage environmental improvement and boost the environmental economic sector, as well as providing a meeting point for managers and experts.

<http://www.forumambiental.org>

### **La Fábrica del Sol/ Barcelona Sustainable Resource Centre**

La Fábrica del Sol (FdS) is a municipal environmental education facility which provides advisory and information services, an activity programme and a permanent exhibition on the topic of sustainability. The building was refurbished using bio-construction materials, eco-design criteria and environmental solutions such as solar thermal and photovoltaic panels, a biomass boiler and water utilisation systems. Its comprehensive architectural design connects the building with its setting as though it were a living organism. The entire FdS is a model of sustainability. La Fábrica del Sol offers the following services and resources:

- An advisory and information service to answer any query regarding the urban environment, sustainability and renewable energies and lend sustainability-related materials.
- A permanent exhibition featuring the refurbishment of the building, which in itself is an example of sustainable construction.
- A full programme of training, information and participation activities.
- An open space for groups wishing to contribute to projects and make use of the facilities.

<http://www.mcrit.com/crbs/recursos/quees/quees.htm>

### **Solar Thermal Bylaw**

The Barcelona City Council was a pioneer in the implementation of the Solar Thermal Bylaw in 2000, which regulated the integration of solar thermal capture systems to produce domestic hot water in new buildings and constructions in the city. Since 2003, the follow-up and management of the application of this Bylaw has been the responsibility of the Barcelona Energy Agency. 2006 saw the approval of an amended text of the Bylaw. The Barcelona regulatory framework, together with the national Technical Building Code (CTE), has promoted the implementation and use of alternative energies in newly built city homes. The new photovoltaic solar bylaw is currently in its approval stages and is to regulate the integration of photovoltaic solar facilities in new buildings and major refurbishments.

<http://www.bcn.cat/mediambient>

### Mediterranean Solar Plan

The secretariat of the Mediterranean Union, based in Barcelona, is in charge of the deployment of the Mediterranean Solar Plan, which aims to increase production by 20 GWh by 2020 through the use of solar power and, to a lesser extent, wind energy. This Plan aims to meet the challenges of working in partnership with countries on the southern coast of the Mediterranean to save energy, improve network interconnection, review the tax system and share know-how in order to strengthen the capacity of developing countries.

# 08

## Useful links

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### International organisations

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IRENA - International Renewable Energy Agency  
<http://www.irena.org>

EREC - European Renewable Energy Council  
<http://www.erec.org>

EREF - European Renewable Energies Federation  
<http://www.eref-europe.org>

European Association of Renewable Energies  
<http://www.eurosolar.org>

World Energy Efficiency Association  
<http://www.its.org/node/4096>

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### Spanish organisations

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APERCA - Associació de Professionals de les Energies Renovables de Catalunya (Association of Renewable Energy Professionals in Catalonia)  
<http://www.aperca.org>

APPA - Asociación de Productores de Energías Renovables (Association of Renewable Energy Producers)  
<http://www.appa.es>

ASENSA - Asociación Española de Empresas de Energía Solar y Alternativas (Spanish Association of Solar Power and Alternatives Companies)  
<http://www.asensa.org>

CIEMAT - Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (Centre for Energy, Environmental and Technological Research)  
<http://www.ciemat.es>

ICAEN - Institut Català d'Energia (Catalan Energy Institute)  
<http://www.gencat.cat/icaen>

IDAE - Instituto para la Diversificación y Ahorro de Energía (Institute for Energy Diversification and Saving)  
<http://www.idae.es/>

IREC - Institut de Recerca en Energia de Catalunya (Catalan Energy Research Institute)  
<http://www.irec.cat>

ISTAS - Instituto Sindical de Trabajo Ambiente y Salud (Union Institute for Environmental Work and Health)  
<http://www.istas.ccoo.es>

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### International events (fairs, conferences, etc.)

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Nuclear. Energy production and renewable energy. Shanghai, China.  
<http://www.nferias.com/nuclear/>

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Greenergy Expo

<http://www.greenergyexpo.eu>

BATIenergie. CONSTRUCTION and renewable energies. Paris, France

<http://www.nferias.com/batienergie/>

Americana. Waste treatment and renewable energy. Montreal, Canada

<http://www.nferias.com/americana/>

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### Spanish events (fairs, conferences, etc.)

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International Fair Expobioenergía

<http://www.expobioenergia.com>

Expoenergética

<http://www.expoenergetica.com>

3D virtual Water Fair, renewable energy and environment

<http://www.feriadelaagua.es>

Genera 2013. International Fair of Energy and the Environment

<http://www.ifema.es/ferias/genera/default.html>

Smart City Expo 2012 Barcelona

[http://www.portalferias.com/smart-city-expo-2012-barcelona\\_11405.htm](http://www.portalferias.com/smart-city-expo-2012-barcelona_11405.htm)

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### International themed portals

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AGORES. Information centre and Renewable Energy Portal of the European Union

<http://www.agores.org>

Energy Policy. UE

[http://europa.eu/pol/ener/index\\_es.htm](http://europa.eu/pol/ener/index_es.htm)

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### Spanish themed portals

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CENSOLAR - Centro de Estudios de la Energía Solar (Solar Power Research Centre)

<http://www.censolar.es>

CENER – Centro Nacional de Energías Renovables (National Centre for Renewable Energies)

<http://www.cener.com>

Newsletter devoted to the world of clean energies, energy savings and efficiency

<http://www.energias-renovables.com>

Sector portal on air-conditioning. Energy Savings Advice Section

<http://www.caloryfrio.com>

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