
9. ANNEX C. THE SECTOR (Part in English)

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.

9.1 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.

9.1.1 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.

9.1.2 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%):€738.5 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 Development1", 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.

9.1.3 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 energy²: 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

9.1.4 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.

9.1.5 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.

9.2 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.

9.2.1 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.

9.2.2 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 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.

9.3 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.

9.3.1 OPERATIONS 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.

9.3.2 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.

9.4 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.

9.4.1 TRAJECTORY

There are still some systems use of renewable energy sources that have not reached one sufficient technological level to compete on cost, performance and reliability with the conventional energy alternatives. On the other hand, biomass energy, wind power and the small hydro are able to compete in the market of decentralized facilities. For his part, solar thermal technology has reached a level of maturity that makes it a viable option, both technically and economically. Finally, the electricity generated from photovoltaic solar energy can be competitive with the produced with other conventional power stations due to its long and established career.

9.4.2 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.

9.4.3 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.

9.4.4 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.

9.4.5 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.

9.4.6 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.

9.4.7 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.

9.5 MARKET ANALYSIS

9.5.1 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

9.5.2 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.

9.5.3 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 Thermoelectric 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 CO₂. In 2014 when 61 plants are operational, they will prevent the emission of 3.4 million tonnes of CO₂.

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.

9.5.4 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.

9.6 DESCRIPTION OF TECHNOLOGIES

The sector is divided into different technologies depending on the resource that is used for energy. In this way, it can be differentiated between: there is an important conceptual error that usually fall when it comes to renewable energy.

For starters it is believed that when he speaks of obtaining this type of energy there is also talk that the entire process of obtaining is renewable, when in reality it is not so. What is renewable is the source of energy not how to get it, since to build capture devices use energy and materials from fossil fuels and non-renewable resources.

In addition sins think that being renewable are ecological, when in fact they are two different things. Be renewable means green and be eco-friendly doesn't mean that it is renewable. I.e. There are renewable energy sources that are non-polluting, but also any that are polluting. Renewable energy sources can be divided into two categories: non pollutant or clean and contaminants. Among the first:

- Wind: wind power.
- The rivers and streams of fresh water: hydraulic power.
- The seas and oceans: tidal power.
- The heat of the Earth: geothermal energy.
- Waves: wave energy.
- The Sun: solar power.

Polluting energies are obtained from organic matter or biomass, and can be used directly as fuel).