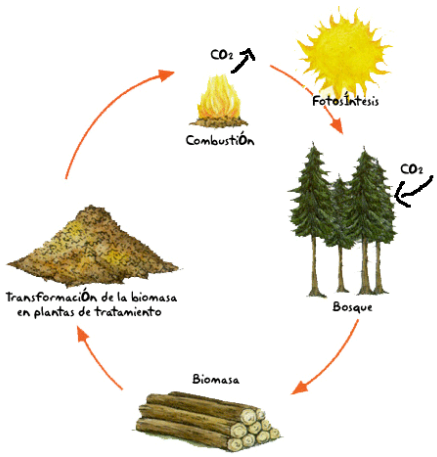
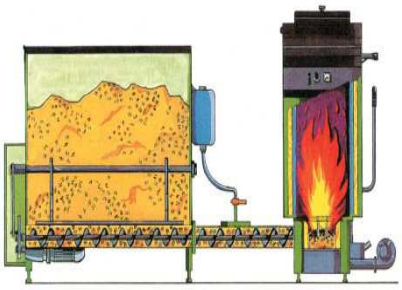
NEEDS AND CERTIFICATES IN THE BIOMASS SECTOR

BIOMASS EUVET.

2011-1-ES1-LEO05-35489





Programa de aprendizaje permanente LEONARDO DA VINCI
DG Educación y Cultura
APEE
CLUSTER de la Energía de Extremadura

INDEX

1. BRIEF INTRODUCTION: GENERAL SITUATION OF RENEWABLES ENERGIES IN THE COUNTRY OF ORIGIN

(Source: PER, CIEMAT and IDAE)

INTRODUCTION

Oil prices and the geographical distribution of energy reserves have shaped the energy options of developed countries for over three decades. More recently, environmental concerns, the intense growth of emerging countries and the ensuing inflationary effect on primary energy sources, along with the liberalization of Europe's energy sector, have been characterising the new frame of reference for devising energy policy. Within the scope of the European Union, the need to make coordinated progress in the liberalization of markets, the assurance of supply, the development of interconnection infrastructures and the reduction of polluting emissions along with other issues has become increasingly evident.

Energy policy in Spain has progressed along the time in harmony with other European countries, but at the same time it presents a specific response to main challenges that have traditionally characterized Spanish energy sector and which can be summarized as follows:

- Higher energy consumption per unit of gross domestic product. Spain consumes more energy than the average of European countries to produce the same unit of gross domestic product, even in comparison with those which have a similar industrial and productive structure and level of economic development.
This situation is due to a variety of factors and is not an irreversible situation but rather the effect of the accumulation of energy- intensive economic growth patterns. A concerted effort has been made in the area of energy savings and efficiency over the last several years to correct this trend, and that has put us on the path to convergence with the European mean in terms of energy intensity, a path on which we must continue over the next several years.
- High degree of energy dependency. The scant presence of primary fossil fuel deposits has historically determined a high rate of energy dependence for Spain. This greater dependence means added risk for production processes such as those related to ensuring energy supply or the volatility of international market prices.
- High levels of greenhouse gas emissions, mostly due to strong growth in electricity generation and the demand for transport over the last several decades.
In order to respond to these challenges, energy policy in Spain has developed around three axes: security of supply, enhancement of the competitiveness of our economy and guarantee of sustainable economic, social and environmental development.

The path followed by Spain and the majority of developed countries in tackling the

challenges identified is based on the development of strategies which simultaneously allow for progress along all three of the aforementioned axes. In Spain, energy policy has prioritized liberalization and the fostering of market transparency, the development of energy infrastructures and the promotion of renewable energies, savings and energy efficiency.

Promotion of energy savings and efficiency thanks to improvements in consumption patterns or production methods is a decisive instrument in that its net value is positive for society from the outset since it implies simply consuming less energy to produce the same. This has led to the adoption of firm savings and efficiency promotion policies which are producing significant results, and this is thanks to the approval of the 2005-2007 and 2008-2012 action plans and the 2008-2011 Activation Plan, which reinforces the preceding two. These efforts have led to a fall of over 13% in final energy intensity over the last five years with consistent reductions each year.

Lastly, the development of renewable energies is a priority for Spanish energy policy. Renewable energies have a number of positive effects on society at large including the sustainability of their sources, reduction in polluting emissions, technological change, the opportunity to advance towards more distributed forms of energy, reduction of energy dependence and the trade balance deficit and increase in rural employment and development.

Naturally, these advantages imply greater economic hardship, which tends to diminish over time thanks to shifts in technology over the span of the learning curves. Moreover, in some cases renewable technologies raise relevant issues regarding their predictability and manageability. Nevertheless, these last difficulties can be overcome thanks to headway made in system management, the use of storage techniques such as pumping or the development of renewable facilities with storage capabilities.

In general, the analyses conducted on the Spanish system indicate that the benefits of renewable energies are both high and stable. As already mentioned, higher costs are limited and tend to decrease over time. Comparisons show that overall future benefits exceed present costs by a wide margin and justify the regulatory framework supporting renewable energies.

In Spain, the regulatory framework governing electricity generation using renewable energies revolves around a mechanism known as the feed-in tariff whose operation is based on guaranteeing a price higher than that existing in the wholesale market for the technology employed. This cost increment is financed by electricity tariffs themselves.

Spanish government has acted to temporarily put a halt to awarding new feed-in tariff (FIT) contracts starting in January 2013. The change was passed as part of Royal Decree-Law (RDL 1/2012) in January 2012 and it will prevent proponents of new cogeneration, renewable energy and waste-to-energy plants from receiving contracts to sell their electricity to the grid, effectively putting the domestic RE industry on hold while the government drafts a new strategy for the electricity sector.

As expected, this move has triggered a storm of debate from many within the renewable energy industry, who argue that Spain is further undermining its credibility as a stable country in which to invest. The Spanish Renewable Foundation, a leading advocacy group, has warned that the move risks wiping out hundreds of thousands of direct and indirect jobs, along with tens of billions in existing and future investments.

The main driver behind this decision is addressing the country's electricity system deficit, which stands at over €24 Billion.

As the European Commission has pointed out, the results of the Spanish model are a success story in the design of policies to promote renewables. The main result is the volume reached by renewable electrical energy, which has attained a consolidated structural position of the first importance. In 2009, renewable technologies accounted for approximately 25% of total electricity generation. Furthermore, renewable energies accounted for 12.2% of the gross final consumption of energy in Spain.

Having completed this initial launching stage, we must now embark upon stage two, i.e. the consolidation and development of renewable energies. This new stage entails different elements, both in terms of structure and the role played by agents. Renewable energies are no longer a minority element in the system but rather one of its basic components, and both support policies and the role played by agents must adapt to this change.

The sustainable economy bill has incorporated some of the elements of the renewable energies support frameworks which need to be included in order to ensure the sustainability of their future growth. Briefly, these are:
- Stability, by guaranteeing a return on investment serving as an incentive for a volume of installation which is compatible with the targets laid down in the renewable energy plans.
- Flexibility, allowing for the swift incorporation of learning curves and technological enhancements into support frameworks.
- Progressive internalization of the costs shouldered by the energy system to guarantee the sufficiency and stability of supply.
- Prioritization in the incorporation of facilities which incorporate technological innovation, optimise production, transport and distribution efficiency, enhance energy system manageability and reduce greenhouse gas emissions.

It is fair to say that the 2005-2010 Renewable Energy Plan has been an undisputed success in that as it has not only transformed Spain's energy model as planned, but has also allowed for the development of an industry which has positioned itself as a leader in many segments of the value chain at international level.

As for the balance of production, most of the technologies of production have been falling over the previous year, with significant decreases in hydraulic (28%) and combined cycles (22%). By contrast, coal plants doubled compared to 2010 generation

and photovoltaic and thermal technologies had an increase of 26% and 193% respectively.

Demand Balance 2011

	Peninsular		Systems Mainland		Systems Total National	
	GWh	% 11/10	GWh	% 11/10	GWh	% 11/10
Hydro	27.650	-28,5	0	-	27.650	-28,5
Nuclear	57.670	-7,0	-	-	57.670	-7,0
Coal	43.426	96,5	3.002	-11,2	46.427	82,2
Fuel / gas(2)	0	-	7.491	-3,1	7.491	-21,6
Combined Cycle	50.619	-21,6	4.455	11,6	55.074	-19,7
Régimen ordinario	**179.364**	**-5,2**	**14.948**	**-1,0**	**194.311**	**-4,9**
Consums generation	-7.186	7,7	-857	-4,7	-8.043	6,2
Ordinary Regime	**92.352**	**1,6**	**1.091**	**13,3**	**93.443**	**1,7**
Hydro	5.155	-24,3	1	-	5.156	-24,3
Wind	41.661	-3,9	399	18,8	42.060	-3,7
PV	7.569	25,6	343	20,7	7.912	25,4
Solar thermoelectric	2.029	193,4	-	-	2.029	193,4
Thermal renowable	4.336	-13,0	304	-9,0	4.640	-12,7
Thermal non renewable	31.603	8,8	43	418,6	31.646	9,0
Net generation	**264.529**	**-3,2**	**15.182**	**0,1**	**279.711**	**-3,1**
Consumption pumping	-3.245	-27,2	-	-	-3.245	-27,2
Intercambios internac.(3)	-6.105	-26,7	-	-	-6.105	-26,7
Demand (b.c.)	**255.179**	**-2,1**	**15.182**	**0,1**	**270.361**	**-2,0**

Installed capacity to 31 December 2011

	System Peninsular		System Mainland		Systems Total National	
	MW	% 11/10	MW	% 11/10	MW	% 11/10
Hidro	17.537	0,0	1	0,0	17.538	0,0
Nuclear	7.777	0,0	-	-	7.777	0,0
Coal(1)	11.700	2,8	510	0,0	12.210	2,7
Fuel / gas	2.540	-11,2	2.885	0,8	5.425	-5,2
Combined Cycle	25.269	0,1	1.854	-0,5	27.123	0,1
Total Ordinary Regime	**64.824**	**0,1**	**5.250**	**0,2**	**70.074**	**0,1**
Hydro	2.036	0,1	0,5	0,0	2.036	0,1
Wind	20.733	5,1	148	0,0	20.881	5,0
PV	3.903	7,1	196	7,9	4.099	7,1
Solar thermoelectric	949	78,3	-	-	949	78,3
Thermal renewable	1.062	7,6	80	-31,0	1.142	3,5
Thermal non renewable	7.071	1,4	44	8,9	7.115	1,4
Total Special regime	**35.753**	**5,4**	**469**	**-3,7**	**36.221**	**5,3**
Total	**100.576**	**1,9**	**5.719**	**-0,1**	**106.295**	**1,8**

In 2020, the new Plan's degree of success should be measured against other parameters. The strategies being developed should provide a boost to research, development and innovation on renewable technologies, proceed further in the implementation of more mature technologies and incorporate other newer and less developed technologies at experimental level. However, the success of the policy to foster renewable energies over the coming years should be measured in terms of achievement of the established development objectives, and especially in terms of attaining these in a way compatible with the technical, economic and environmental sustainability of the energy system as a whole while fostering competition between technologies and their competitiveness with traditional sources, an aim which is ultimately the surest guarantee that a technology will remain stable over time as part of the energy mix. Specific indicators are defined to monitor all of this.

SPAIN PRODUCTION OF ELECTRICITY

At present, energy consumption, including transport, is the main source of emissions of greenhouse gases and acidifying pollutants. According to the European Environment Agency (EEA), the emission of these pollutants has been reduced significantly through the adoption of cleaner fuels and treatment of combustion gases. But if it does not diminish the role of fossil fuels in the energy mix, greenhouse gases that cause climate change is likely to increase. Higher energy efficiency and increased use of renewable energy will be part of the solution.
At national level, renewable energy represents a significant percentage of electricity generation. Within renewable energy, wind and hydropower is the principal, as we see in the following tables.

Electric Sector	**2005**		**2010**		**2015**		**2020**	
	Power (MW)	**Generat. (GWh)**	**Power (MW)**	**Generat. (GWh)**	**Power (MW)**	**Generat. (GWh)**	**Power (MW)**	**Generat. (GWh)**
Biomass	601	2.653	752	4.517	965	5.962	1.587	10.017
Wind	9.918	20.729	20.155	40.978	27.99	57.086	38.000	78.254
Geothermic	0	0	0	0	0	0	50	300
Hydro	18.377	34.802	18.687	34.617	20.04	36.732	22.362	39.593
Energy from the sea	0	0	0	0	0	0	100	220
Photovoltaic	60	41	4.021	6.417	5.918	9.872	8.367	14.316
Solar thermoelectric	0	0	632	1.144	3.048	7.913	5.079	15.353
Total	**28.956**	**58.225**	**44.247**	**87.673**	**57.977**	**117.565**	**75.545**	**158.053**

RENEWABLE ENERGY CONSUMPTION IN SPAIN

According to the Development Plan for Renewable Energy (2000-2010), the target for the year 2010 was 29.4% coverage of electricity demand from renewable sources, largely achieved target for that year reached 35%. As also noted in the chart relating to primary energy, there is a dependence on hydropower (wet years or so) to decrease with increasing the participation of other renewable in the graph demand coverage electrical.

Calculation table for the renewable energy contribution of each sector to final energy consumption													
	Unit	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Gross final RES consumption for heating and cooling	ktoe	3.550	3.764	3.811	3.879	4.009	4.181	4.404	4.651	4.926	5.189	5.477	5.654
Gross final RES electricity consumption	ktoe	4.624	7.227	7.610	8.133	8.593	9.080	9.545	10.002	10.662	11.288	12.007	12.903
Final RES consumption in transport	ktoe	366	1.802	1.833	1.927	1.950	2.477	2.695	3.004	3.209	3.416	3.624	3.885
Total RES consumption	ktoe	8.433	12.693	13.125	13.786	14.376	15.542	16.419	17.403	18.513	19.578	20.760	22.057
Transfer of RES to other Member States	ktoe	-	-	-	-	-	-	-	-	-	-	-	-
Transfer of RES from other Member States and 3rd countries	ktoe	-	-	-	-	-	-	-	-	-	-	-	-
RES consumption adjusted for target	ktoe	**8.433**	**12.693**	**13.125**	**13.786**	**14.376**	**15.542**	**16.419**	**17.403**	**18.513**	**19.578**	**20.760**	**22.057**

Estimation of total contribution (installed capacity) expected from each renewable energy technology in Spain to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity 2010-2020													
	Unit	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Hydropower	MW	18.220	18.687	19.869	19.909	19.949	19.999	20.049	22.109	22.169	22.229	22.289	22.362
Hydropower <1 MW	MW	239	242	244	247	249	251	253	256	259	262	265	268
Hydropower 1 MW - 10 MW	MW	1.534	1.603	1.640	1.665	1.703	1.731	1.764	1.796	1.828	1.855	1.882	1.917
Hydropower >10 MW	MW	16.447	16.842	17.985	17.997	17.997	18.017	18.032	20.057	20.082	20.112	20.142	20.177
Pumped storage hydropower	MW	2.727	2.546	3.700	3.700	3.700	3.700	3.700	5.700	5.700	5.700	5.700	5.700
Geothermal	MW	-	-	-	-	-	-	-	-	-	10	30	50
Solar	MW	60	4.653	5.877	6.949	7.693	8.300	8.966	9.700	10.508	11.394	12.371	13.445
Solar photovoltaic	MW	60	4.021	4.498	4.921	5.222	5.553	5.918	6.319	6.760	7.246	7.780	8.367
Concentrated solar power	MW	-	632	1.379	2.028	2.471	2.746	3.048	3.381	3.747	4.149	4.592	5.079
Tidal, wave and ocean energy	MW	-	-	-	-	-	-	-	10	30	50	75	100
Wind power	MW	9.918	20.155	21.855	23.555	24.986	26.466	27.997	29.778	31.708	33.639	35.819	38.000
Onshore wind	MW	9.918	20.155	21.855	23.555	24.986	26.416	27.847	29.278	30.708	32.139	33.569	35.000

Offshore wind	MW	-	-	-	-	-	50	150	500	1.000	1.500	2.250	3.000
Biomass	MW	601	752	771	803	844	897	965	1.048	1.149	1.265	1.410	1.587
Solid biomass	MW	449	596	604	624	653	692	745	810	887	972	1.073	1.187
Biogas	MW	152	156	167	179	191	205	220	238	262	293	337	400
Bioliquids	MW	-	-	-	-	-	-	-	-	-	-	-	-
Total	MW	**26.072**	**41.701**	**44.672**	**47.516**	**49.772**	**51.962**	**54.277**	**56.945**	**59.863**	**62.887**	**66.294**	**69.844**
Total CHP	MW	**177**	**246**	**250**	**254**	**266**	**287**	**310**	**335**	**359**	**385**	**403**	**423**

Spain as a whole has the target of generating 30% of its electricity needs from renewable energy sources by 2010, with half of that amount coming from wind power. In 2006, 20% of the total electricity demand was already produced with renewable energy sources, and in January 2009 the total electricity demand produced with renewable energy sources reached 34.8%.

Some regions of Spain lead Europe in the use of renewable energy technology and plan to reach 100% renewable energy generation in few years. Castilla y León and Galicia, in particular, are near this goal. In 2006 they fulfilled about 70% of their total electricity demand from renewable energy sources.

If nuclear power is also considered CO2 free, two autonomous communities in Spain have already managed to fulfill their total 2006 electricity demand "free" of CO2 emissions: Extremadura and Castilla-La Mancha.

In 2005 Spain became the first country in the world to require the installation of photovoltaic electricity generation in new buildings, and the second in the world (after Israel) to require the installation of solar hot water systems.

Today, renewable energy, in addition to respecting the environment is an important source of job creation. According to forecasts, the energy that will bring more jobs is the energy from biomass.

Speaking of national interest, the conclusions drawn in CONAMA10 relate primarily to issues such as employment. According to experts in forest biomass, produce the same energy from biomass or oil is 25% less for biomass investment and make 5 to 10 permanent jobs. Another significant finding compared with oil is that with a million tons of wood to replace oil generated 4,000 new jobs. Of these one is in the power plant and three in the management and acquisition of the resource at Mt.

In addition, biomass is a resource itself, not import, and besides wood are also agricultural energy crops: almond shell, hazelnut and olive pit, among others.

The biomass working group exposed a range of reasons and advantages of the use of forest biomass. Proper planning would allow the management and improvement of

many forest types now abandoned, and are at risk of fire, pests or other adversities. It also has an important social contribution, as a solution to job creation in rural areas and reducing dependence on fossil fuels and emissions of greenhouse gases.

Despite all these pluses, the industry recognizes a number of problems for commercial development. The main thing is that most of the forest area of Spain is in private hands and in many cases are small properties, making it difficult to manage. Moreover, while energy production is cheap, the technology is expensive and requires a different one for each type of biomass.

But maybe the point that puts the brakes on the market more is the general ignorance that exists in the domestic and low promoting chips and pellets. Thus, the industry claims the political and financial support required for the establishment of a market to develop biomass. It is considered that the development of energy crops in large measure to support agricultural and rural sector, but it takes a greater understanding of sustainability and guaranteed by the Administration.

RENEWABLE ENERGY CONTRIBUTIONS TO GROSS DOMESTIC PRODUCT OF SPAIN

The renewable sector's contribution to the Spanish economy has been estimated at around 0.67% of GDP and employing between about 120,000 and 200,000 people in 2008, being characterized by a large investment in research and development and high productivity.

Stresses the importance of wind energy, having covered in 2009 13.8% of electricity demand, making it the third country in the world in terms of installed capacity, behind Germany and the USA. States. However, it is the second in terms of the rate of penetration into the market (after Denmark). In addition, since 2009 is also the third largest source of electricity in the country.

Spain is among the top five countries investing in renewable energy in the international PV market and was the highest growth worldwide in 2007, so that in Spain are two of the three largest PV power plants on the planet.

In 2005 Spain became the first country to require the installation of solar panels in new buildings and the second in the world (after Israel) to require the installation of solar hot water systems.

According to reports from Greenpeace, solar energy could supply electricity demand seven times that would have the peninsula in 2050. In addition, all forecasts indicate that by mid 2010 will be cheaper electricity from solar panels located in Spain that you will pay the domestic consumer to buy electricity from the grid (overshooting of parity with electricity from fossil fuels).

Currently, Spain is a leading country of reference in the renewable energy sector on a worldwide level. Moreover, the importance of the renewable energy sector in the

Spanish GDP will increase in coming years, contributing with €18 billion in the year 2020. Taking into account that the contribution of the sector to the Spanish GDP in 2009 was around €10 billion, an increase of 75% at the end of the period included in the REP 2011-2020 is expected by the Spanish Government.

	2009			2020			
Contribution	Direct	Indirect	Total	Direct	Indirect	Total	Increase
to GDP (M€)	7.321,9	2.961,4	10.283,3	13.000	5.000	18.000	75%

Contribution of the renewable energy sector to the Spanish GDP. Source: Renewable Energy Plan 2011-2020

GRANTS AND SUBSIDIES FOR BIOMASS

It provides grants aimed at promoting actions aimed at the exploitation of renewable energy and energy efficiency. In this sense we can detail the following program:

1. "BIOMCASA" Program (NATIONAL)

Promotion of Biomass Building: Promotion of biomass as an energy source in ethical hot water systems, heating and cooling in buildings.

Objectives
• Expand the use of biomass as an energy source in buildings:

- In facilities adapted to different user needs.
- Offered with a full service energy.
- Ensuring compliance with applicable regulations
- Maximise energy efficiency.
- Guaranteeing the supply of biomass

• Quality Control: technical monitoring of the executing companies and facilities, ensuring correct operation and capabilities)
• Funding for new facilities
• Outreach and Advocacy Program: presence at conferences, congresses, fairs, disclosure agreements with professional associations, brochures ...)

2. Promotion of renewable energy for own use (REGIONAL, Extremadura)

a) Installations for the production of thermal energy for domestic, industrial or buildings using biomass fuel.

b) Production of thermal energy or electrical energy by harnessing the biogas produced by anaerobic digestion of biodegradable waste to electric power plants less than 350 kW.

c) Specific machinery for the treatment of biomass, for energy purposes, in the field to facilitate collection and transport so as to reduce the costs associated with transporting it.

d) Biofuels

3.Efficiency and energy savings actions from biomass (REGIONAL, Extremadura)

a) Renewal of equipment and facilities to reduce energy consumption Energy actions that achieve 20% annual reduction in energy consumption through actions in their conventional heating, cooling and domestic hot water production.

b) Feasibility studies for cogeneration.

c) Facilities thermal energy production, for domestic, industrial or buildings using biomass as fuel.

d) Energy audits conducted by independent

4. Grants and subsidies to investments made in curing tabacco plants using renewable energies (REGIONAL, Extremadura)

a) Application of scheme to create new plants curing collective of snuff, Virginia type, using renewable energy in the drying process or modernization of existing ones, provided that the process involves the reduction or elimination of the use of fossil fuels and their replacement by renewable energies.

2. CURRENT STATUS OF THE BIOMASS SECTOR. EMPLOYMENT OPPORTUNITIES

INTRODUCCTION

Biomass has the status of renewable energy as its energy content is derived from solar energy fixed by plants in the photosynthetic process. This energy is released by breaking the bonds of organic compounds in the combustion process, leading to end products carbon dioxide and water.
For this reason, the products from biomass used for energy purposes are called biofuels, may be, according to their physical state, solid biofuels, referring to those that are used primarily for thermal and electrical purposes ,and liquid biofuels for automotive.

TYPES OF BIOFUELS

Solid Biofuels

The most widespread use of such fuels are wood chips, sawdust, pellets and briquettes.

Liquid biofuels or biofuel

Are named to a series of bio-based products used as substitutes for fuel oil or additives for engines us.

Gaseous biofuels

Among the gaseous biofuels that can be obtained from biomass are the producer gas, biogas and hydrogen.

Producer gas
By subjecting the biomass within the gasifier at high temperatures (between 800 and 1,500 ° C) in the absence of oxygen, gaseous products originate, (N2, CO, H2, CH4 and CO2) in varying proportions. The fate of the producer gas is usually the production of heat by direct combustion in a burner or the generation of electricity using an engine or turbine.

Biogas
The digestion of biomass under anaerobic conditions gives rise to the so-called "biogas", at a rate of 300 l per kg of dry matter, with a calorific value of about 5,500 kcal/m3. The composition of biogas varies, but consists mainly of methane (55-65%) and CO2 (35-45%) and to a lesser extent, for nitrogen (0-3%), hydrogen (0-1%), oxygen (0-1%) and hydrogen sulfide (trace).

Natural biomass

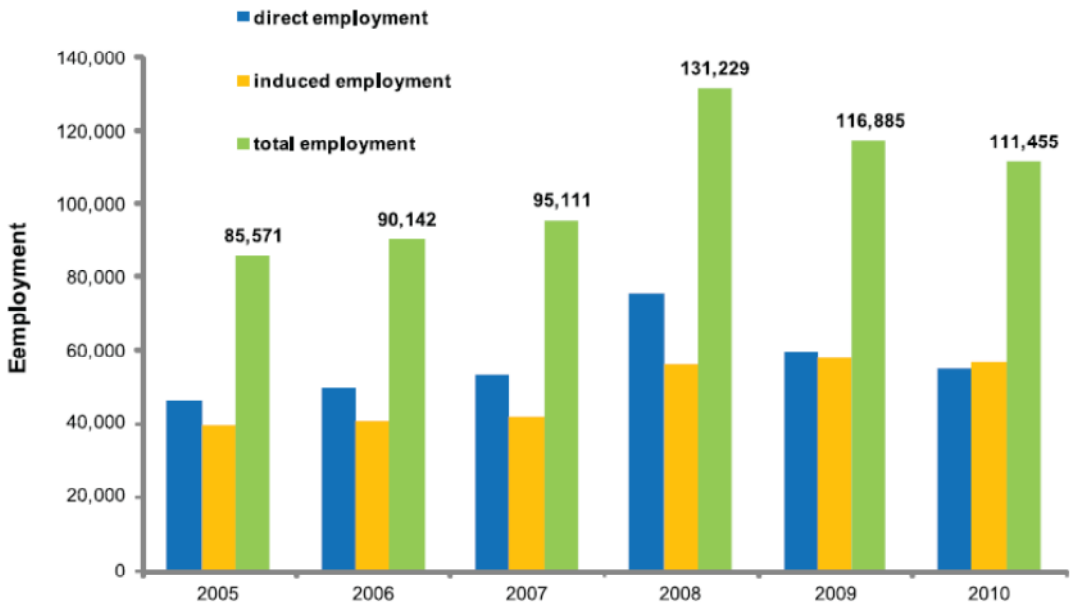
Natural biomass is the basis of energy consumption in the villages on the development way. When population and energy demand increases, the pressure exerted on natural ecosystems increases, sometimes reaching an overconsumption, creating situations of desertification.

Residual biomass

Is generated as a result of any process that consumes biomass. It occurs in agricultural, forestry or livestock, as well as from organic waste generated by industries and urban areas. The use of residual biomass is in principle attractive, but limited: in general, is more important decontamination occurs by eliminating the waste that energy can be generated with its use.

EMPLOYMENT OPPORTUNITIES

In Spain, the employment prospects for the biomass sector are very promising towards the horizon 2010-2020. Regulatory measures such as developing multi-year plan or forest harvesting agricultural energy use of products, creating a record of solid recovered fuels, the implementation of energy reforestation on forest land and agricultural land unproductive or regulation and standardization of biomass fuels, among others, encourage the use of biomass for energy production during this decade. On the other hand, the measures planned for the development of electricity infrastructure, which is consider the installation of small networks with less than 5 MW power, favor the appearance of small production facilities over large biomass facilities, which makes the biomass sector one of the largest sources of employment with future prospects for rural areas.



According to the study by ISTAS (Institute of Work, Environment and Greet), it is

estimated, providing a conservative scenario in which growth is achieved the EU target of 20% renewable energy sector that employment by 2020 representing an increase of more than 100% of sector indirect employment for the next 10 years.

	Direct	Indirect	Total	Direct	Indirect	Total	Increase
Employees	88.209	60.185	148.394	180.175	122.691	302.866	104%

Employment in the Spanish renewable energy sector. Source: Renewable Energy Plan 2011-2020

Source: Ministry of Industry, Tourism and Trade /IDAE (A)

CONCLUSION

According to forecasts by the Ministry of Industry, Tourism and Trade /IDAE, expressed in the White Paper on Renewable Energy, the employment input due to biomass, estimated of direct and indirect effect at employment with increase of 80% in indirect employment in ten years.

The highest potencial of consumption will occurs in *Andalucía, Extremadura Galicia and Castilla y León*, mainly due to the presence in them of possibilities of consume large amounts of biomass, the existence of a forestry sector development and dissemination of the population makes use of the domestic biomass.

3. PROFESSIONAL PROFILES REQUIRED IN THE BIOMASS SECTOR

INTRODUCCTION

The fact that the renewable energy sector, remains a growth industry, difficult to identify specific professional profile may define the profiles of professional currently employed in the industry as "polyvalent profiles capable of absorbing methodologies, organizational skills, economic cooperation and relationship with the environment. "

The renewable energy sector mainly requires workers with higher levels of training, well above the average of the qualification and training requirements of the whole Spanish green economy, and well above the national economy as a whole.
However, in Spain there is still some gap training in the field of renewable energy, and therefore in the biomass sector, especially in regard to formal education. Generally professionals with university degrees come from the field of engineering, chemistry or biology who complete their training with the experience gained in the course of their work or through training.

For this reason, it is interesting to identify the profiles of the biomass sector, identify

key tasks and skills required for each of them, and thus provide information for planning training to help meet the training needs of professionals based the new demands of the sector.

Below is a breakdown and analysis of occupational profiles that are demanded in the field of biomass sector. The definition of these profiles is particularly important to meet the training needs of workers, and thus provide a reference tool for planning of training activities in rural areas aimed at training new professionals in the field of biomass.

- Chief of Forestry
- Agent forest
- Operator collector
- Head of farming
- Sales of farm
- Technical systems using biomass
- Waste Management Technical
- Renewable Energy Technician
- Operator of plant biomass use
- Sales biomass plant
- Plant maintenance operator
- Installer of biomass boilers
- Design Engineer Equipment and Components
- Distributor
- Promoter commercial installation and / or energy services
- Commercial equipment and components
- Project Consultant
- Energy Auditor
- Trainer

STUDY CASE: INSTALLER BIOMASS BOILERS PROFESSIONAL PROFILES

What they do?

The person responsible for the installation, maintenance and conservation of biomass boilers for both domestic and industrial uses. He works for both domestic and professional use. Considering that most installers are also responsible for maintenance, both professions have joined into one.
Functions

He is responsible for assembly, installation, testing, to explain the operation and maintenance.
Changes in the short / medium term: Depending on technological innovations.

Tasks

Organization and process planning, material control, performance measurement, boiler installation, commissioning, networking, maintenance and repair of the boiler, etc.

Changes in the short / medium term: Depending on technological innovations.

Degree of responsibility

Degree of responsibility and autonomy high, since they depend on the proper functioning of the facility.

Skills / Abilities

Organizational capacity, experience, versatility, ability to learn and adapt to new technologies, manual dexterity, control time.

Type of training

. Professional license installer of heating of buildings.
. Intermediate Vocational Training:
- Technical installation and maintenance of cooling installations, air conditioning and heat production.
. Higher Level Training Cycles:
- Project development facilities and thermal fluids.
- Senior Technician in maintenance of heating and fluid.
- Energy efficiency and solar thermal energy.
. Training for Employment:
- Installation of renewable energy in buildings.
. Training Workshops / Workshops Employment:
- Installer of renewable energy equipment.

General Knowledge

Interpretation of building plans, regulations and technical standards and safety in buildings, welding, computer, mechanical.

Specific knowledge

Boilers, machinery, maintenance, hydraulics, safety and occupational hazards.

Equipment / supplies / equipment

Biomass boilers, pipes, radiators, biofuels.

Occupational hazards associated

Falls from height, explosion and fire, treading disordered materials, cutting materials, overexertion during transport and installation of heavy ...

Development opportunities

The replacement of coal-fired boilers for biomass boilers will increase the volume of employment of these workers.

Mainstreaming

You can work in positions requiring industrial maintenance and heating.

Brief description of training gaps

There is hardly any sector-specific training. The workers usually come from other sectors and there is a recycling process. It is often common to find significant gaps in knowledge of the rules in force relating to the activities of boiler installers.

Traditional occupation of origin:

1. Plumber
2. Electrician
3. Installers of heating / hot water

EXAMPLE OF COURSE OF BIOMASS BOILERS INSTALLER

Technical installation and maintenance of air conditioning and heating

Number of Hours: 300

OBJECTIVES
To train students with the skills to be able to design and install biomass boilers in the residential and services.

CONTENTS
1. Climate change and the role of renewable energy
2. Components of a biomass boiler
3. Design of heating systems with biomass boilers
3.1 Facilities detached
3.2 Facilities of neighborhood
4. Foundations prior to the installation of biomass boilers
5. Installation and commissioning of biomass boilers
6. Maintenance of biomass boilers

7. Legislative and strategic
8. Grants and subsidies
9. Application of biomass boilers in the service sector
10. Application of biomass boilers in the industrial sector

4. BARRIERS TO THE DEVELOPMENT OF BIOMASS SECTOR IN THE COUNTRY OF ORIGIN

INTRODUCCTION

Often, positive employment impacts of strategies are noted with reference to the need for skills responses to exploit potential, but no overarching skills strategies are integrated.

Skills strategies that address systemic weaknesses in the labour market are being updated and will benefit green jobs. A sector approach for identifying and anticipating skills needs for a low carbon economy is not sufficient – and may miss the innovation and job growth potential in exploiting new markets for green technologies. In Spain, national and regional governments need to play a proactive role in ensuring first-mover advantage in low-carbon technology (wind energy in Denmark) is used systemically to stimulate job creation through coordinated employment, skills upgrading and innovation policy. They should also be aware of the implications of removing support such as subsidies and feed-in tariffs, as illustrated by the recent collapse of the solar photovoltaic industry in Spain.

Regional governments lead the way in providing comprehensive and organized skills responses, developing successful public-private initiatives that achieved impressive results and could be considered best practices. Creating networks of regional training centres, coordinated nationally to create synergies and disseminate such best practices, would improve input for course design and mobility of workers between regions.

In the future, every job will be a green job, contributing to varying degrees to continuous improvement of resource efficiency. Understanding the environmental impact of an occupation needs to be mainstreamed into education and training systems. Integrating sustainable development and environmental issues into existing qualifications is much more effective than creating new training standards. Every new apprenticeship ought to have a low-carbon element.

Diversifying the range of training tools used needs to be encouraged.

The number of trainers and teachers able to teach new techniques and aware of environmental issues is not sufficient, and shortages are particularly acute in agriculture and the construction sectors – more emphasis needs to be placed on training the trainers.

Improving the image of low-carbon occupations is also crucial and efforts should be made by both governments and industry to improve the attractiveness of taking up a career in such occupations.

BARRIERS TO THE DEVELOPMENT OF BIOMASS

The main obstacles to the application of biomass are not technological in nature but of mentality and organizational capacity in all sectors of society involved.

Even the biofuels subsector, that is probably the least developed, have sufficient scientific and technical resources in Spain.

Could also be considered as obstacles to the development of biomass energy:
- Planning for collection of raw materials, in the case of energy crops and crop residues as well as forest waste.

- The spatial dispersion of the resource.

- Seasonality.

- The variability of production.

- The difficulty of planning pruning, cleaning, mowing, and coordinate human staff needed for these activities.

Proper management of these issues is the key to maximizing the most abundant resources.

The competence of the energy use of biomass for other purposes, causing uncertainty of supply and price swing raw materials.
This is particularly critical for power plants, when providers are not operating to stop the project.

- The difficulty of storage and handling plant, is to transform raw materials into other products such as for direct consumption.
- The need for large spaces and proper planning to automate operations.

These obstacles are responsible for reaching only viable projects with good coordination of these three sectors: agriculture, energy and production equipment.

The help lines often do not take into consideration the need to integrate multiple sectors in a single initiative to achieve viability.
Other problems could be:

- Insufficient demonstration projects and support to projects of this type in all your applications.
- Lack of information on available resources and technologies.
- Lack of awareness of the environmental and social interest of biomass as an energy source.
- Lack of effort required to overcome all previous barriers.

5. RULES AND REGULATIONS RELATED TO THE SECTOR OF THERMAL APPLICATIONS OF BIOMASS: NATIONAL AND REGIONAL REGULATIONS AND TECHNICAL RULES AND STANDARDS ABOUT THE FACILITIES AND INSTALLATIONS

There is no certification and accreditation scheme for installers of small-scale RES in Spain. There is a vocational education scheme managed by the National Ministry of Industry and Energy and/or Regional Ministry of Industry and Energy. The trainings cover the different RE technologies: solar thermal, photovoltaic, biomass, heat pumps and ground source installations.

The training standards are developed by national and regional governments and are accredited by the Regional governments. The training institutes in each region should have technical equipment adapted. The trainers should have basic knowledge in the related field and relevant experience. The duration of the training is about 200 hours. The trainees have to pass a final examination.

The Regulations of Thermal Building Installations (RITE for Reglamento de Instalaciones Térmicas en los Edificios) set up the necessary requirements for installers to be able to perform their profession (and obtain the RITE card). The installer:

- Should be older than 18 years old
- Should have the necessary practical and theoretical knowledge in the area of building thermal installations. The former installers have only to show their former title related to these skills.
- OR the applicant may prove that he has attended and passed theoretical and practical training about basic and specific knowledge in thermal building installations.
- OR accredit at least 3 years of experience in an installation or maintenance company
- And should have successfully passed the exam (about RITE) before the Relevant Agency of the Region Government.

•

SPECIFIC REGULATION

- Regulation of Thermal Installations in buildings and their supplementary technical instructions (RITE).
- Building Technical Code (CTE).
- On the other hand, the electrical installation of biomass system must meet the Low Voltage Regulation (REBT).

6. LEVEL OF QUALIFICATION REQUIRED BY THE REGULATIONS

LEVELS

Intermediate Vocational Training:

- Technical installation and maintenance of cooling installations, air conditioning and heat production.

Higher Level Training Cycles:

- Project development facilities and thermal fluids.
- Senior Technician in maintenance of heating and fluid.
- Energy efficiency and solar thermal energy.

Training for Employment:

- Installation of renewable energy in buildings.

Training Workshops / Workshops Employment:

- Installer of renewable energy equipment.

GENERAL KNOWLEDGE

Interpretation of building plans, regulations and technical standards and safety in buildings, welding, computer, mechanical.

SPECIFIC KNOWLEDGE

Boilers, machinery, maintenance, hydraulics, safety and occupational hazards.

MANDATORY TRAINING OF INSTALLERS (Regulation of Thermal Installations in buildings and their supplementary technical instructions [RITE])

1. Basic Course thermal installations in buildings:

180 hours (120 hours of theoretical issues + 60 hours of practical issues).

CONTENTS

1. Basic knowledge.
2. Facilities and equipment for heating and domestic hot water production.
3. Facilities and air conditioning equipment and ventilation.
4. Use of renewable energy in thermal plants.
5. Fluid transport network carriers.
6. Terminal equipment and air handling.
7. Regulation, control, measurement and consumption accounting for thermal plants.
8. Basic knowledge of electricity for heating systems.

2. Specific course of heating in buildings:

270 hours (150 hours of theoretical issues + 120 hours of practical issues).

CONTENTS

1. Execution of assembly processes of heating.
2. Maintenance of heating.

3. Energy exploitation of the facilities.
4. Measurement techniques in heating systems.
5. Testing and commissioning of heating installations.
6. Safety in the assembly and maintenance of equipment and facilities.
7. Quality maintenance and installation of equipment and heating systems.
8. Technical documentation from thermal plants: Technical report.
9. Regulation of heating in buildings

RECOGNITION OF EXPERIENCE (Regulation of Thermal Installations in buildings and their supplementary technical instructions [RITE])

1. Installer's license validation.

Minimum number of course hours: 120 hours (80 hours of theoretical issues + 40 hours of practical issues).

CONTENTS

1. Facilities and air conditioning equipment (for product A);
2. Facilities and equipment for heating and domestic hot water production (for product B);
3. Use of renewable energy in thermal plants;
4. Testing and commissioning of thermal plants;
5. Maintenance of thermal plants;
6. Quality and Safety in the maintenance of thermal equipment and facilities;
7. Farm energy from thermal plants;
8. Regulation of heating in buildings

2. Maintainer's license validation

Minimum number of course hours: 80 hours (55 hours of theoretical issues + 25 hours of practical issues).

CONTENTS

1. Facilities and air conditioning equipment (for product A);
2. Facilities and equipment for heating and domestic hot water production (for product B);
3. Use of renewable energy in thermal plants;
4. Quality and Safety in the installation of thermal plants;
5. Farm energy from thermal plants;
6. Regulation of heating in buildings.

7. REQUIRED PROFESSIONAL LICENSES RELATED TO THE RULES.

PROFESSIONAL LICENSE INSTALLER OF HEATING OF BUILDINGS

Another of the objectives pursued by Directive 2009/28/EC is the implementation the Member States of certification systems or standardized qualification systems for installers of small-scale boilers, biomass stoves, solar thermal and photovoltaic systems, shallow geothermal systems and heat pumps. Also, these certification systems should be implemented in each of the Member Countries before 31 December 2012.

At national level in Spain, installers of these systems can be classified into two groups: professionally qualified installers and authorized installers.

PROFESSIONALLY QUALIFIED INSTALLERS

Professionally qualified installers are those who have accredited professional installation skills acquired through vocational and continuing training, training and employment programmers and apprenticeship contracts. The occupation of professionally qualified installer is regulated by a *proficiency certificate* under Royal Decree 34/2008 of 18 January 2008 regulating proficiency certificates. Today, proficiency certificates are the direct responsibility of the Ministry of Labour and Social Affairs, the Ministry of Education and analogous bodies at regional level.

In Spain, qualifications and vocational training are regulated by Organic Law 5/2002 of 19 June 2002. The object of this Law is to set up an integrated training system where training actions are programmed and carried out within the framework of the National Qualification and Vocational Training System (Sp. acronym SNCFP).

The SNCFP is a set of instruments and actions designed to promote and integrate vocational training courses in the National Professional Qualifications Catalogue. It also seeks to promote and develop evaluation and accreditation of the corresponding professional competences so as to encourage personal professional and social development while covering the needs of the productive system. This catalogue includes the professional qualifications required of installers of renewable energy installations.

Law 1/1986 of 7 January 1986 created the General Vocational Training Council (Sp. acronym CGFP) to draft SNCFP guidelines. This Council was conceived as a tripartite advisory body with the participation of employer organisations, trade unions and the Public Administrations. The CGFP is attached to the Ministry of Labour and Social Affairs and is a specialized body that advises the Government in the area of Vocational Training.

In addition, in order to support the General Vocational Training Council in its endeavour to achieve the objectives of the National Qualifications and Vocational Training System, Royal Decree 375/1999 of 5 March 1999 created the National Qualifications Institute (Sp. acronym INCUAL) as a technical instrument with power to act and independence of criteria. Also, under Organic Law 5/2002 on Qualifications and Vocational Training, INCUAL is responsible for defining, drawing up and updating the National Professional Qualifications Catalogue and the corresponding Modular Vocational Training Catalogue. The General Council for Vocational Training is the governing body of INICUAL, although organisationally it is attached to the Secretariat-General of Education (Ministry of Education and Science) pursuant to Royal Decree 1553/2004 of 20 June 2004.

Each professional qualification under the CNCP now comes with a list of professional skills needed for employment which can be acquired through modular training, other types of training and through on-the-job experience.

Some of these professional qualifications serve as credentials allowing these professionals to work as installers within the scope of the 2011-2020 NREAP. In this connection, eight professional qualifications have been identified for persons working as installers of small-scale biomass boilers and stoves, solar thermal and photovoltaic systems, shallow geothermal systems and heat pumps.

It is important to note that with the exception of installers of solar thermal and photovoltaic systems, the CNCP does not provide for a specific professional qualification for small-scale biomass boilers and stoves, shallow geothermal systems or heat pumps. However, other more general qualifications which totally or partially cover the skills needed to work as an installer are laid down in Article 14(3) of Directive 2009/28/EC.

The CNCP thus specifies the following professional qualifications for professionals with recognised skills to work as installers within the framework established by Directive 2009/28/EC.

Article 14 of Royal Decree 34/2008 of 18 January 2008 provides that students wishing to be examined shall do so on a module-by-module basis, and where appropriate on a training unit-by-training unit basis, systematically and continuously, in order to verify that they have learned and acquired the requisite professional skills.

The trainers in charge of the training actions evaluate the students. To earn the training unit accreditation, the student must receive a positive evaluation (grades are awarded as "acceptable" or "not acceptable") in the training modules associated with each one of them.

The learning centres where the training modules leading to professional certificates are taught must, within a period not to exceed three months, submit the evaluation bulletin and the documents showing the results of the evaluation to the Labour

Administration Register.

INSTALLATION COMPANIES

An installation company is any natural or legal person who, on the basis of theoretical-practical knowledge and in accordance with applicable law, is authorized to render services and perform works in a specific sector (electricity, climate control, plumbing, etc.). The professional activities required for certain industrial installations are recognised by installer licenses issued by the regional authority competent in matters of industry. An authorized installer's license is an administrative authorization that is required for anyone to install, and in some cases design, certain industrial installations.

Within the groups of installers referred to in the 2011-2020 NREAP and pursuant to regulations currently in force, authorized companies can be divided into two groups:
a) Qualified installation companies whose professional scope is governed by the Regulation on Thermal Installations in Buildings and its Technical Instructions approved by Royal Decree 1027/2007 of 20 July 2007. The installation of small-scale biomass boilers and stoves, solar thermal systems, shallow geothermal systems and heat pumps is included in this group of qualified installers. This whole set of renewable energy systems are considered thermal systems in buildings within the meaning of Royal Decree 1027/2007 of 20 July 2007.

b) Installation companies whose professional scope is governed by the low voltage electro-technical Regulation and its Technical Instructions approved by Royal Decree 842/2002 of 2 August 2002. Photovoltaic systems are included in this group of authorized installers.

Within the group of ***thermal installations*** (small-scale biomass boilers and stoves, solar thermal systems, shallow geothermal systems and heat pumps), the functions discharged by the authorized installer may vary according to the size of the installation.

For the purpose of the administrative processing of a thermal installation, three different cases are possible depending on its size:

1) Submission of documentation is not compulsory and therefore no administrative authorization is needed when:
- the total nominal thermal rating of the installation is below 5 kW.
- the nominal technical rating of each hot water installation (instantaneous heaters, tank heaters, electrical heaters) or their sum is less than 70 kW.
- solar systems are comprised of a single pre-fabricated element.

2) When the thermal rating is between 5 and 70 kW, the installation must be designed, calculated, installed and tested by an authorized installer or competent technician who will then have to draft a technical report for official authorization, which must be

drawn up in accordance with the procedure stipulated by the Autonomous Community in question and filed once the installation is complete.

3) Installations whose thermal rating exceeds 70 kW must also be performed by authorized installers, but these require a preliminary project and must be supervised by a competent technician (engineer or technical engineer).

With regard to thermal installations, Royal Decree 1027/2007 of 20 July 2007 sets up the Advisory Committee for Thermal Installations in Buildings as the permanent competent national and collegiate body organisationally attached to the Secretariat-General of Energy of the Ministry of Industry, Tourism and Trade. The RITE Advisory Committee is likewise responsible for advising the competent Ministries regarding thermal installations in buildings.

The Ministry of Industry of Industry, Tourism and Trade is also the competent national body in matters of electrical installations.
The professional license certification alone does not authorize the installer to perform that professional activity; work must be performed within the context of a legally established ***installation company*** registered in the official Register of Companies of the Autonomous Communities. An installation company authorized to install small-scale biomass boilers and stoves, solar thermal systems, shallow geothermal systems and heat pumps shall mean a natural or legal person who assembles, repairs and maintains thermal installations within the scope of the RITE, while an installation company authorized to install photovoltaic systems shall mean a natural or legal person who assembles, repairs and maintains electrical installations within the scope of the REBT.

Once companies have met the requirements, the competent body of the Autonomous Community will issue the attendant registration certificate to the authorized installation company. Also, any European Union company which meets the established requirements to engage in this professional activity may apply for registration in the ***Register of installation companies*** or in the ***Register of authorized maintenance companies*** of thermal installations in buildings. This application must be submitted to the competent body of the Autonomous Community where the company plans to carry on its activity.