2012

PUBLIC FUNDING FOR GREEN ENERGY IN A CONTEXT OF CRISIS

Country report (Spain)

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1. Introduction

This report aims at analyzing the impact on support schemes to renewable energies caused by the economic crisis that currently affects Europe and more specifically Spain.

The Spanish case study is very illustrative to understand how financial and economic crisis in Europe has affected to national support schemes to renewable energies, and how these changes are threatening 2020 targets.

Renewable energies were considered so far, even in this period of crisis, as a key sector for the Spanish economy, and particularly for the energy sector, since they reduce dependence on oil imports and the emission of greenhouse gases. This sector is regarded as a promoter of green jobs and the growth of jobs during the last decade confirms that assumption. The sector also makes significant contributions to Spanish GDP and exports, improving the country's balance of trade.

However, in the last years some branches of energy sector and the Spanish administration promoted a number of cutbacks to support schemes that occurs simultaneously with the worsening of the Spanish economic crisis.

Several regulatory changes introduced recently that affect directly support schemes are detailed and analyzed in this report. It has to be mentioned that not all these changes are introduced because of the economic crisis but other factors have also affected.

Personal interviews for this report allowed us to describe the position of the different stakeholders, which include government agencies, employers' organizations and trade unions, on specific issues like the current state of affairs of the renewable energy sector, its support schemes and perspectives of future development.

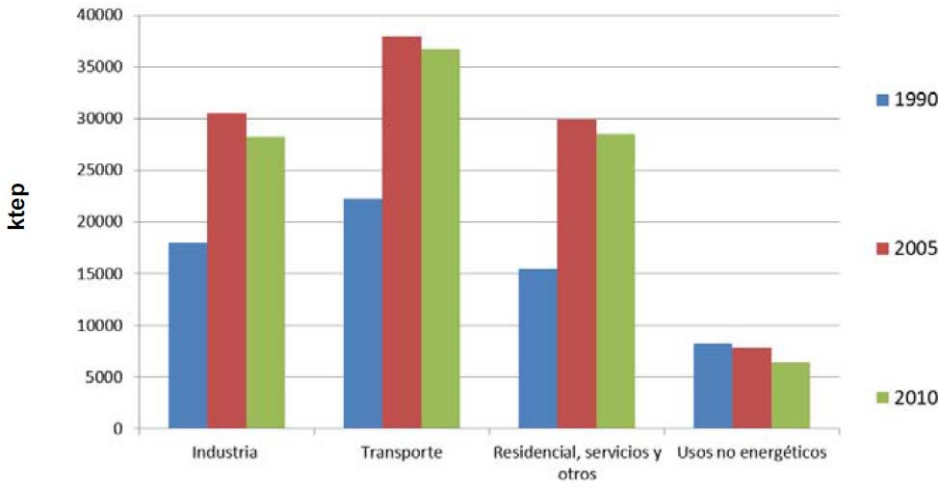
2. Renewable energy deployment in Spain

Spain's total primary energy consumption was around 132 Mtoe in 2010 (See annexes). Oil makes up the largest share of total primary energy supply (47.2%), followed by natural gas (23.4%), nuclear (12.2%), renewable energies (11.4%) and coal (6.4%).

The final energy demand was 100 Mtoe in 2010; the growth for the period 2000-2010 was 10.5%. In 2010, 54.5% of final energy consumption was from oil, followed by natural gas (16.8%), no renewable electricity (14%), renewable electricity (7,4%), renewable heat (5.6%) and coal (1.7%). The share of electricity in the total final consumption continues increasing at an average rate of almost 2% per year.

The transport sector showed strong growth of 3.7% annually between 1990 and 2005 and at the present is the most energy intensive activity. In 2010 transport sector consumes 36.8% of the final energy, industry 28.3%, domestic, services and others 28.5% and non-energy uses 6.4% (See annexes).

Gross final energy consumption (ktoe) by sectors: industry, transport, residencial/services/other and non-energy uses

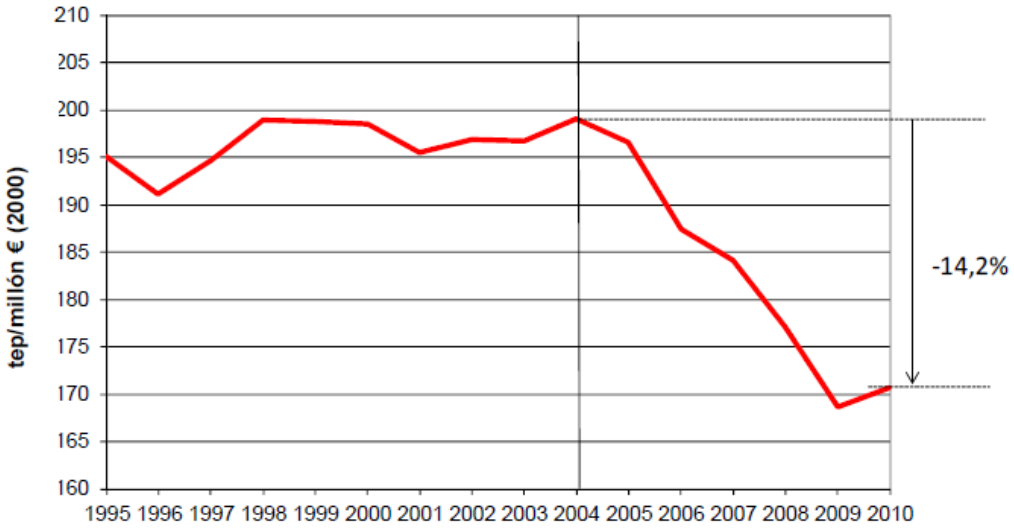


Source: Energy Secretary for the State, 2011.

Between 1990 and 2004, primary and final energy intensity had an upward trend, in contrast to European countries in our area, where the evolution of these indicators was decreasing.

In the period 2004-2010, primary energy intensity dropped by 14.2%. Although the economic crisis has contributed significantly to falling energy demand in 2008 and 2009, the turnaround began three years earlier as a result of the implementation of conservation and efficiency policies and the renewable energy and cogeneration promotion and their effects on primary energy intensity. In fact, the primary energy intensity decreased by 7.5% from 2004 to 2007. Similarly, final energy intensity dropped by 11.3% in the period 2004-2010 (see annexes).

Primary energy intensity 1995-2010



Source: Energy Secretary for the State, 2011.

Latest data available show that primary energy intensity is 0.118 toe/1000Euros and final energy intensity is 0.169 toe/1000Euros (IDAE, July 11-August 12)

Energy dependence and grid interconnection

Energy consumption in Spain is characterized by petroleum products consumption almost entirely imported, which, together with a lower contribution of indigenous resources (such as renewable energies and coal), has contributed to a high energy dependence, close to 80%, higher than the European average (54%).

Spain has commercial exchange capacity of the interconnection with France, Portugal, Andorra and Morocco. In 2011, the electricity exchange with other countries was 18,363 GWh. 66.6% of this energy operations were exports. So, the balance of international exchanges was as an exporter, with 6,105 GWh, 27% less than in 2010.

Renewable energies in electricity, heating and transport

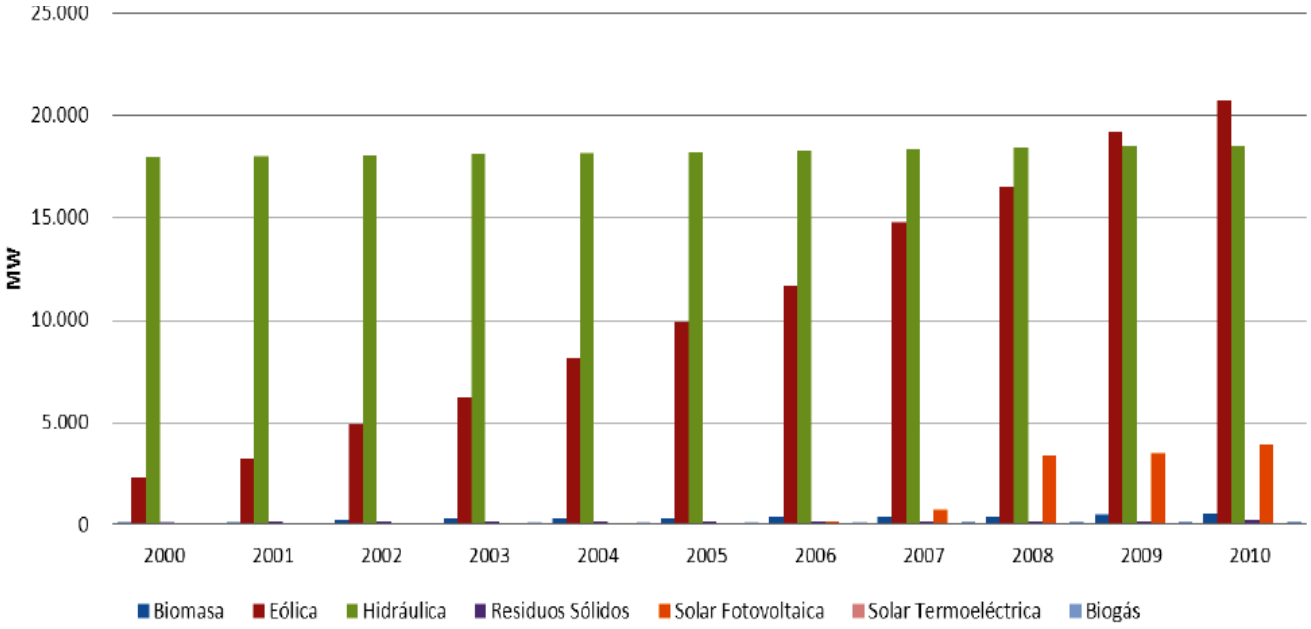
In 1900, renewable energies represented 6.3% of primary energy demand. Ten years later, the renewable contribution to the total primary energy supply is 11.4% (3.6%, biomass, 2.9% wind energy, 2.7% hydro, 0.8% solar) and represent 13.1% of gross final energy consumption.

Electricity

In 2010 90,825 GWh on electricity were generated in Spain. The production share by sources was: 32,4% from renewable energies, 31,7% natural gas, 20.7% nuclear energy, 8.6% coal and 5.7% fuel. The renewable energy contribution to the total electricity by techologies was: 14.1% from hydro, 14.7% wind energy, 2.1% solar photovoltaic, 0.2% solar thermoelectric and 0.8% from biomass.

The total renewable energy power installed in 2010 is 44,877 MW (20,512MW in 2000 and 28,839MW in 2005); it shows a growth of 56% in the period 2005-2010. The most important technologies at the present are: wind energy (20,759MW), followed by hydro power (18,535MW), solar PV (3,944MW), solar thermoelectric (682MW) and biomass (545MW).

Renewable energy power capacity 2000-2010



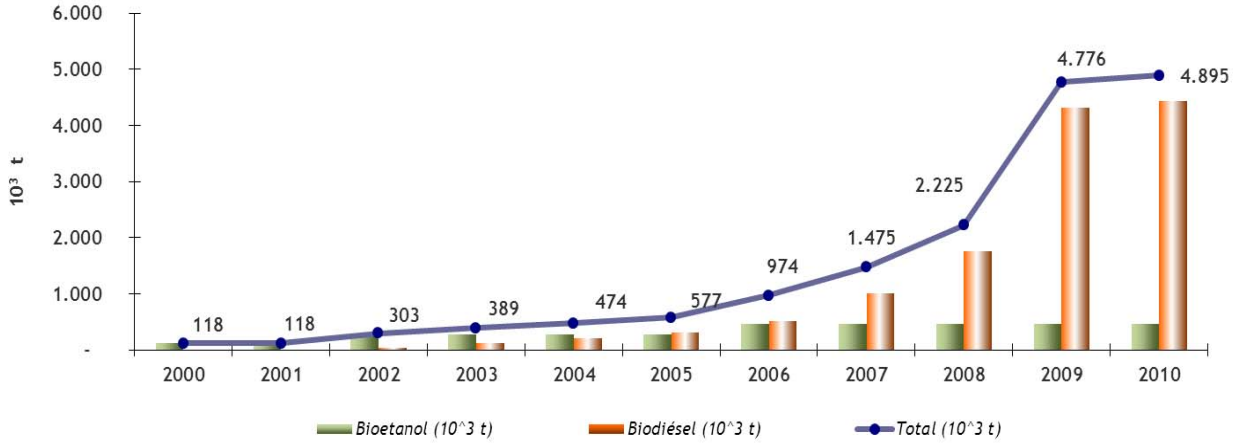
Heating

The total thermal renewable energy capacity installed in 2010 is 24,012 MWth (21,295 MWth in 2000 and 21,731MW in 2005), it shows a growth of 10% in the period 2005-2010. Since 2010, the biomass is the most important technology in terms of renewable heating. However, the solar thermal energy shows the largest growth 198% (1,655 MWth in 2010, 556 MWth in 2005, 284 MWth in 2000), followed by geothermal energy (79 MWth in 2010, 36 MWth in 2005 and 27 MWth in 2000).

Biofuels in transport

In 2010, total biofuels consumption in transport sector was 1,436 ktoe, 33.7% up to 2009. Biodiesel accounted for 4.6% of fossil diesel (1206ktoe) and bioethanol 0.79% of gasolines in Spain (231 Ktoe). The combined contribution of liquid biofuels for transport was 4.95%. The total biofuels production capacity in 2010 is 4,271 ktoe (76 ktoe in 2000 and 448 ktoe in 2005), it shows a growth of 854% in the period 2005-2010. In 2010, the production capacity for biodiesel is 3,975 ktoe and for bioethanol 274 ktoe (See Annexes).

Biofuels production capacity



Source: IDAE, 2011.

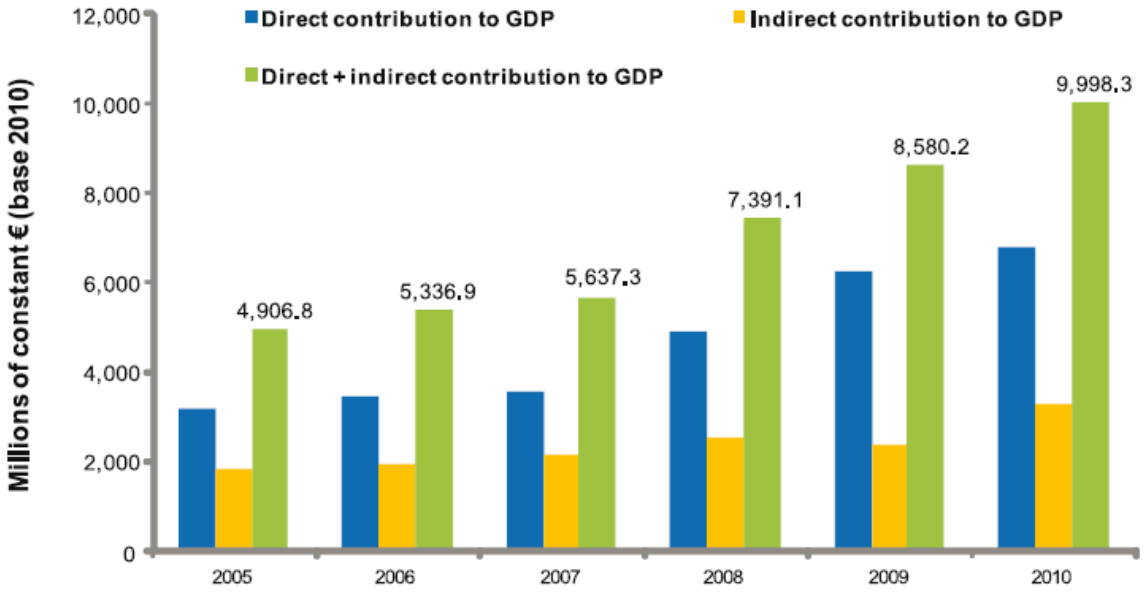
3. Renewable energy sector

ECONOMICS ASPECTS

The activities of the different subsectors have placed Spain as one of the references worldwide, and its effects are very important both economically and socially. This growth has made that many of the Spanish companies of the sector enjoy a leadership position internationally and our professionals are recognized for their high qualifications. In terms of direct presence abroad, 143 companies with direct activity in other countries have been identified, with an active volume of more than 28 billion € (Deloitte, 2011).

In 2010, the total contribution[1] of the Renewable Energy Sector to the GDP of Spain has been approximately ten billion Euro, representing 0.94% of Spain's GDP.

Direct, induced and total contribution to Spain's GDP of the Renewable Energy Sector (2005-2010)



Source: Deloitte, 2011.

The development of the renewable energy sector, particularly wind industry, has been very important in all phases of the production chain: promotion of projects, manufacturing of equipment and components, provision of specific services,… However, the weight of the energy production in the contribution to GDP remains high, approximately 64.88% of the total contribution of the sector.

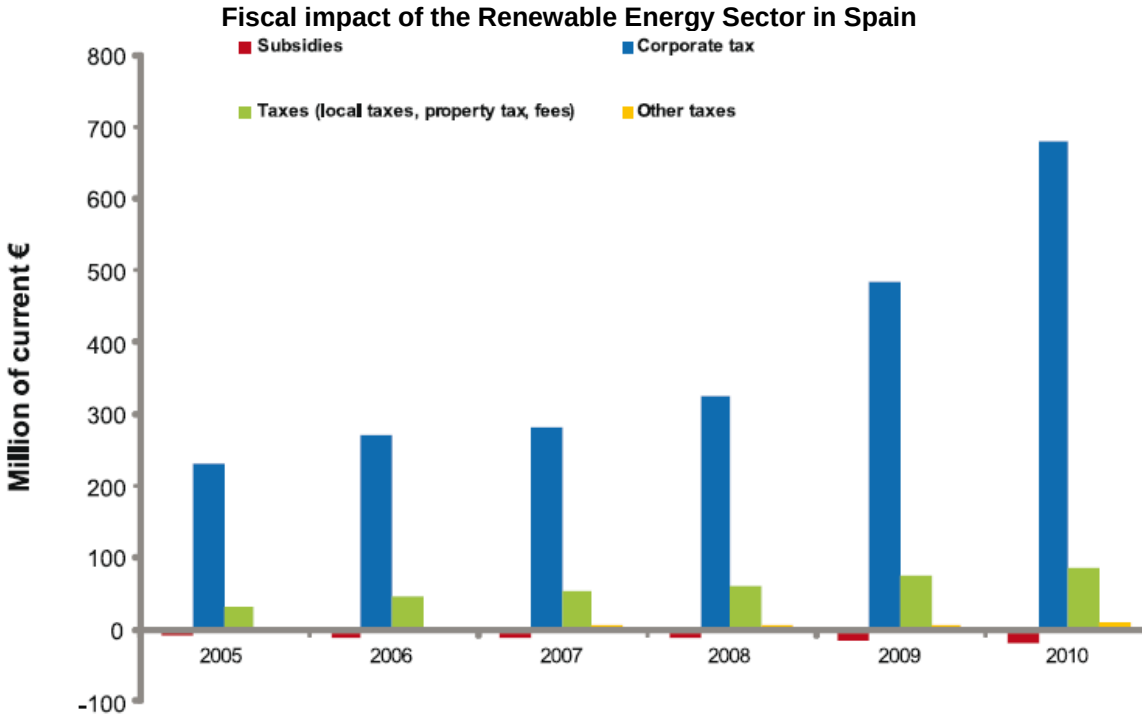
The industry is a reference in terms of technological development since the amount spent on R&D&i in relation to its contribution to GDP (5.32% of the GDP in 2009 and 4.5% in 2010) is much higher than the average of Spain (1.38% of the GDP in 2009). Investment in R&D&I was approximately 302.8 million € in 2010 in the RE sector.

The wind energy contribution to the GDP is the most relevant together the hydroelectric energy and solar photovoltaic. Concentrated solar power increased its contribution to GDP in 2010, mainly as a result of the installation of new plants than of the sale of

[1] The direct contribution, that includes the activities of promoters of facilities, energy producers, equipment and components manufacturers, and renewable energy services providers, to GDP of Spain's Renewable Energy Sector in 2010 amounted to 6,744.0 million €, 0.63% of Spain's GDP in 2010. There have been also calculated induced impact coefficients (by using of input-output models) in order to represent the spillover effect of the RE sector in the other branches of the economy.

energy. Likewise, technologies less developed in Spain, such as geothermal, marine power and small wind power, continue with development activities and the introduction of technology, although their contribution to GDP remains low in comparative terms.

In 2010, the difference between the taxes paid and subsidies received in the renewable energy sector has been of 747.6 million €.



Source: Deloitte, 2011.

On the other hand, the exports of the Renewable Energy Sector still exceed the imports and consequently the sector shows a positive trade balance.

The effect of reducing the electricity market price of renewable energies by displacing generation units with a higher production cost, generated an effect to the entire energy matched in the market: a cheapening was of 4847.2 million € (€21.92/MWh) in 2010.

EMPLOYMENT ASPECTS

The Renewable Energy Sector employed a total of 148,394 people in 2010 of which 88,209 correspond to direct employment and 60,185 to indirect employment (IDAE-ISTAS, 2011).

Wind power, solar photovoltaic, concentrated solar power, biomass and solar thermal registered the major employment in the sector.

Employment in the renewable energy sector by technology in 2010

Sub-sector	Direct jobs	Indirect jobs	Total jobs	%
Wind energy	30,651	24,521	55,172	37.2%
Solar Photovoltaic	19,552	8,798	28,350	19.1%
Concentrated Solar Power	9,346	5,608	14,954	10.2%
Biomass for electricity use	7,172	6,789	13,961	9.4%
Biomass for heating	5,754	5,640	11,394	7.7%
Solar thermal	6,757	3,041	9,798	6.6%
Waste incineration	1,415	637	2,052	1.4%
Biuofuels	964	988	1,952	1.3%
Hydro and mini-hydropower	1,078	485	1,563	1,1%
Biogas for electricity	664	681	1,345	0.9%
Biogas for heating	55	56	11	0.1%
Geothermal	415	162	577	0.4%
Marine energies	74	38	112	0.1%
Urban and industrial waste for heating	50	23	73	0.05%
Common activities	4,262	2,718	6,980	4.7%
TOTAL	**88,209**	**60,185**	**148,394**	**100%**

Source: IDEA/ISTAS, 2011.

Employment in the renewable energy sector by activity in 2010

Sector	Direct jobs %
Equipment manufacturing	37.6%
Project and services development	18.3%
Construction and installation	16.9%
Operation and maintenance	12%
Marketing, equipment sales	10.3%
R&D&D	4.5%
TOTAL	**100%**

Source: IDEA/ISTAS, 2011.

The amounts satisfied in terms of salaries and wages to workers in the sector have been reduced by 3.2% due to staff reductions experienced in 2010 (Deloitte, 2011).

ENVIRONMENTAL ASPECTS

CO2 emissions avoided

According to Deloitte, in accumulated terms, during the period 2005-2010 the emission of more than 145 million tonnes of CO2 was avoided, roughly 2483.5 million of constant € (2010 base)[2]. Electricity production from renewable energies has avoided the emission of more than 32,3 million tonnes of CO2 equivalent into the atmosphere in 2010, representing a saving in respect of emission allowances of more than 467 million of euro. Moreover, the use of biofuels for transport prevented 3.8 million tons of CO2 emissions in 2010.

In 2015 and 2020, due to the penetration of renewable energy capacity of the special regime foreseen in the draft PER 2011-2020, annual savings of 43.8 million and 59.1 million tons of CO2, respectively would be produced (See figures in annexes).

[2] Considering a price of 14.47 € per ton of CO2.

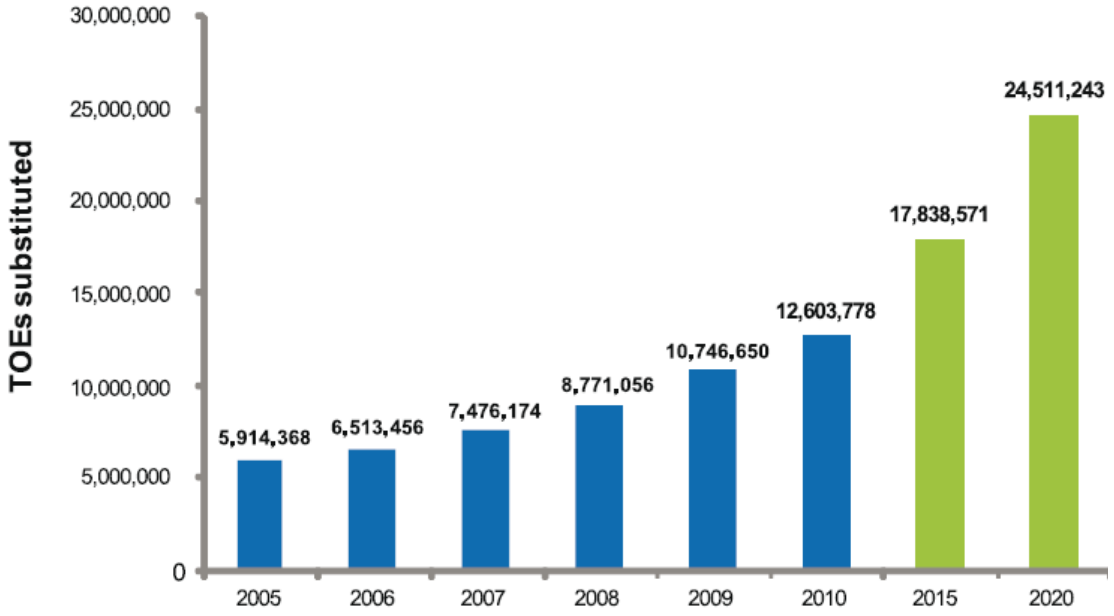
Estimates provided by IDAE are higher. According to this associated organism to the Minister for Industry, the total contribution of renewable energy generation avoided 50.6 million tonnes of CO2 emissions in 2010, 9.3% more than in 2009: 34.3 million of tonnes of CO2 were reduced in the electricity sector, 11.9 million in the heating sector and 4.3 million in the transport sector (IDAE, 2011). (See figures in annexes).

However, the increase in generation from coal and the lower production by other energy sources (hydroelectric, wind power and nuclear) in 2011 have given rise to an upturn in CO2 emissions from the electricity sector that has been estimated at 73 million tonnes, 25% more than in 2010. This fact has worsened the evolution of the emissions factor associated to electricity generation on the peninsula (tonne CO2/MWh). (REE, 2012). (See figures in annexes).

Substitution of fossil fuel imports

The generation of electricity using renewable energy avoided imports of over 12.6 million tonnes of oil equivalent (toe) in 2010. Savings by replacing fossil fuel imports amounted to 2302.2 million €, about 0.22% of GDP in Spain that year. In 2020 this figure would exceed 24.5 million toe. The cumulative savings for the period 2005-2010 amount to 11,168.3 million of constant € (2010 base).

Evolution of the substitution of fossil fuel imports (tons of oil equivalent)



Source: Deloitte, 2011.

4. Overview of available renewable energy support instruments before the crisis

4.1 Support schemes and legal framework

Spain has traditionally opted for a feed-in tariff (FIT) system as a support scheme to renewable energy generators.

The feed-in-tariff system in Spain comprises the implementation of a regime by which each kWh produced with renewable energies is paid to the producer at a higher price than the market one.

In Spain there are two types of FIT payment:

- Fixed tariff, which effectively ensures that project revenues will remain within a sufficient profitability.
- Feed-in premium: “Premium” that exceeds spot market prices (variable payment). Policymakers use this option to increase market integration of RE sources, because electricity is sold directly on the spot market and receives an additional FIT payment. This market integration may become more significant as the share of RE sources increases.

In addition, RES-E producers receive preferential treatment and can sell all their RE electricity to the grid at agreed prices. Funding for these additional costs is covered directly by electricity rates (final consumer).

This is the system that, with a few variations, is being applied in the Spanish electricity sector. The current tariff system came into force in 1997, through the Electric Power Act (Jefatura de Estado, 1997), Royal Decree 2818/1998 (Ministry of Industry and Energy, 1998), Royal Decree 436/2004 (Ministry of Economy, 2004) and was modified by Royal Decree 661/2007 (Ministry of Industry, Tourism and Commerce, 2007). The tariff system aims at achieving the national goal of 12 % of total energy consumption and 29% of electricity from RES by 2010. These targets were defined in the Plan for the Promotion of Renewable Energy Sector (Spanish acronym: PER; IDAE, 1999).

Feed- in Tariff System (Royal Decree 661/2007)

The RD establishes a premium for renewable generators, cogeneration and co-combustion facilities of biomass and / or biogas with an output over 50 MW (excluding hydro).

The producer can choose between a fixed price and a “premium” added to the price negotiated on the electricity market. The choice is valid for one year; after that the producer can decide to maintain the formula or swap to the alternative. This premium should reflect the social and ecological benefits of renewable energy sources, allows an adequate return on generating installations in special regimes and reduce the uncertainty regarding the economic viability of generation projects using renewable energy sources.

The main modifications to former feed-in tariff were:

- Introduction of cap and floor prices
- Changes affecting biomass tariffs
- General increase of biomass tariffs

Higher desegregation of tariff categories for biomass

Introduction of a generation control centre for large-scale installations (> 10 MW)
- Repowering bonus

The payment framework enabled a boost renewable energy in Spain. However, in the case of solar PV, fixed payment was excessive in relation to the evolution of production costs and this caused an unsustainable growth in this sector. 2661 MW of this technology were installed in just one year (2008), representing a growth of 385%, when the national goal was achieving 371 MW in 2010.

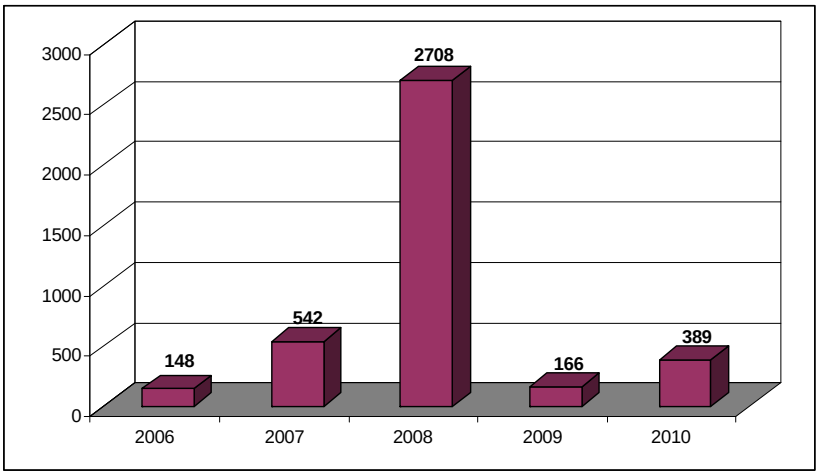
According to the Spanish photovoltaic employers' organization (ASIF), the most significant causes for this unsustainable growth included the following factors: Royal Decree 661/07 did not mark any power limit until September 2008, due to the high price of silicon until then, remuneration was set without a progressive reduction that resulted too high when the costs of that technology were reduced; most part of photovoltaic power was installed on ground arrays, installation of roof arrays would result in a slower growth; also as a result of the global housing crisis and specifically the burst of the Spanish housing bubble, investors found in the Spanish photovoltaic industry a long-term, safe and profitable industry to protect themselves from the instability of capital markets. There are obviously more factors behind the rapid growth of the PV industry but they are less significant.

Quota system of maximum installed power by PV sector (RD 1578/2008)

Because of this difference between planned and real installed power in the PV sector, the government approved in 2008 the RD 1578/08 which reduced the PV tariff by 29% and attempted to reorient new power installation towards roof arrays instead of ground installations.

However, this regulation also introduced a quota system of maximum installed power each year, approximately 500 MW until 2011. The growth of quotas in subsequent years will be determined by reduction rates in an inversely proportional order. This quota system was defined by employers' associations in the sector as one of the mains obstacles to PV sector.

Yearly PV power installed (MW)



Source: IDAE

Maximum power quota system installed by RE technologies (Law Decree 6/2009)

Following the same principle of the regulation described above, a Law Decree was adopted in 2009. It affected all renewable energies generators (not only photovoltaic) and introduced a quota system of maximum installed power each year for each technology.

A pre-assignment register is established in which new renewable energy installations must register in order to obtain the premium tariff.

The pre-assignment register will be grant new power only to cover national targets for each technology. These maximum quotas for renewable technologies were justified by the government as means to prevent uncontrolled growth of the sector.

Heating and cooling sector

Renewable energy sources for heating and cooling systems have been supported mostly by investment, subsidies and regulatory measures. Feed-in tariff system has not been used until now and a lot of experts declare that it is the cause of lower deployment of renewable energies for heating (and cooling) systems[3].

Investment subsidies have been implemented by regional administrations, even if budgets came from central administration. It is focused to installation of solar thermal, geothermal and biomass for heating and cooling where it is not compulsory its installation, mostly at residential sector.

Tax exemptions at housing sector are also available when there are investments on installing renewable energies at the residence.

Regarding the regulatory measures, the most important one are the obligations introduced at the Spanish Technical Building Code (CTE in Spanish acronyms). It is adopted in 2006 and includes an obligation to cover 30-70% of the Domestic Hot Water (DHW) demand with solar thermal energy on all new and renovated buildings; the share percentage depends on which region the power is installed. It can be covered by other renewable energy technology instead of solar thermal (even if this technology is the recommended one).

Spain was the first European country to make the implementation of solar thermal energy obligatory in new and refurbished buildings. The CTE has great importance not only for the market actors active in the Spanish heating market but also for the current debate on effective support policies for solar thermal and other renewable energy technologies in the heating and cooling sector.

Also CTE introduced that new non-residential buildings, such as shopping centers and hospitals, have to have photovoltaic panels to generate a proportion of their electricity.

Other measures in the building code enforce the use of better insulation, improve the maintenance of heating and cooling systems and increase the use of natural light.

This measure has not been as effective as it was expected because of the crisis of Spanish construction sector from 2007 until nowadays. However, solar obligations became a driver in the Spanish solar thermal market since estimates show that over 80 % of installations were motivated by CTE or municipal ordinances.

Transport sector

[3] The possible introduction of a Feed in Tariff system for RES-heat is planned in the Renewable Energy Plan, 2011-2020. This system would be called “ICAREN” and would be managed by Energy Services Companies (ESCOS). But this system has never been developed.

In Spain support schemes to biofuels are implemented via tax exemptions and quota obligations.

First time Spain had biofuels consume compulsory targets was in 2007 (Law 12/2007). The compulsory targets for years 2009 and 2010 were, respectively, 3.4% and 5.83% of the overall energy content of petrol and diesel at transport sector. In 2011 the compulsory targets were increase to 6.2% overall, 6% for biodiesel and 3.9% for bioethanol.

Since year 2002 there is a tax exemption on all biofuels which are used for transport sector. Both directly used and mixed with conventional fuels.

4.2 Expenditures

Before the economic crisis period funding to renewable energies had been important and mostly done by feed-in tariffs, in year 2010 FIT expenditures have reached 5,785,430 thousand euros. Solar photovoltaic and wind energy expenditures were the highest ones. As we have already explained it is paid by electricity rate by final consumers.

FiT expenditures by technologies 2009-2010

Year	TECHNOLOGY	Total retribution Thousands of euros	Average Price Total retribution cent €/KWh	Equivalent premium ([3]) Thousands of euros
2009	Solar	2,867,861	46.24	2,633,824
	Wind	3,061,797	8.01	1,619,140
	Hydro	439,371	8.07	233,995
	Biomass	338,517	11.20	224,456
	Waste	198,404	6.78	87,955
	Waste treatment	471,768	12.02	323,646
TOTAL 2009		**7,377,718**		**5,123,016**
2010	Solar photovoltaic	2,896,089	45.27	2,652,355
	Solar thermal	211,195	30.54	184,848
	Wind	3,252,112	7.54	1,964,848
	Hydro	512,818	7.63	296,125
	Biomass	359,235	11.43	243,878
	Waste	205,339	6.59	92,857
	Waste treatment	505,619	11.80	350,520
	TOTAL 2010	**7,942,405**		**5,785,430**
Variation 2010/2009		**7.65 %**		**12.93 %**

Source: CNE, IDAE, 2011.

Public expenditures reached 756,967 € in 2010; 651,041 by tax exemption for biofuels and 105,926 by public subsidies. Renewable energy funding in years 2009 and 2010 by technology is detailed in the next table:

FISCAL INCENTIVES TO BIOFUELS

Year	Biofuel	Detaxation €/m^3	Fiscal incentives Thousands of euros
	Biodiesel	307	343,880
	Bioethanol	372 (first semester 2009) 401 (second semester 2009)	115,639
Total 2009			459,519
	Biodiesel	372 (first semester 2009)	468,862
	Bioethanol	401 (second semester 2009)	182,179
Total 2010			651,041
Variation 2010/2009			41.27 %

PUBLIC INVESTMENT AND SUBSIDIES

Year	Public investment and subsidies Thousands of euros
2009	98,776
2010	105,926
Variation 2010/2009	7.24%

Source: IDAE

TOTAL PUBLIC SUPPORT

Year	Premiums Thousands of euros	Fiscal incentives Thousands of euros	Public investment and subsidies Thousands of euros	TOTAL Thousands of euros
2009	5,123,016	459,519	98,776	5,681,311
2010	5,785,430	651,041	105,926	6,542,398
Variation 2010/2009	14.40%	42.30%	7.24%	15.16%

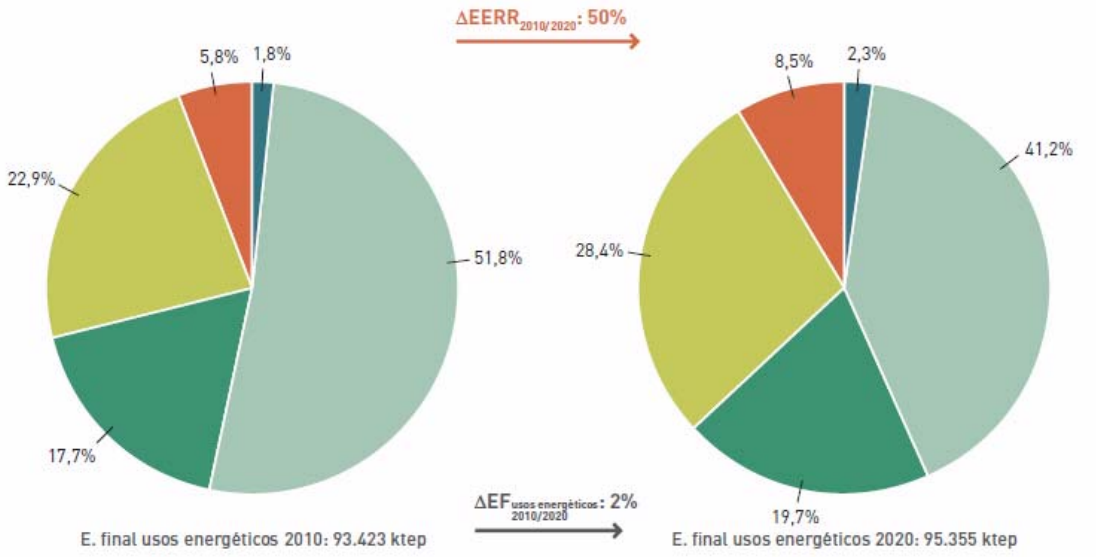
Source: IDAE

4.3. Assessment of effectiveness in terms of meeting renewable energy goals for 2020

Spanish renewable energies support schemes have been effective until year 2010 so there were good previsions to fulfil 2020 energy target: 20.8% share of renewable energy at final energy consumption.

According to Renewable Energy Plan 2011-2020 (PER in Spanish acronym) final energy consumption in 2020 will be:

Final energy consumption 2010-2020



Note: Final energy consumption is expected to increase 2% in this period (2020-2010).

Renewable energy's share in "electricity" is expected to be 38.1%. This was a realistic goal for the sector since support schemes were working well.

5. The economic crisis effects on the financing of renewable energies

5.1. General description of the effect of the economic crisis on the national economy

The current financial crisis that started with the collapse of international credit markets in 2007 has caused deep effect on the Spanish economy whose dependence on foreign funds increased over the last decade offering as many possibilities as accumulated risks.

In spite of the balanced financial performance by the Spanish administration in the years prior to the crisis, the unbalanced economic growth model implemented in Spain in the last years, which relied mostly on construction, shrinking industrial networks and growing foreign deficit, was unable to sustain sudden and almost complete financial restrictions.

To these factors it must be added a general deleveraging and the implementation of procyclical government policies by Spain and the EU that have extended the crisis and increased its intensity making it reach all economic sectors.

As a result Spain's GDP is one of the most affected by the crisis, going from one of the fastest growing economies to one with the deepest recession. This has a direct effect on the labor market which made unemployment in Spain rise to 25.1% in August 2012, exceeding by 15% the EU-27 average figure. Unemployment continues to increase Spain after five successive years (2007-2012).

The production and supply of electricity is among the top three sectors of Spanish economy more sensitive to variations in demand[4], only second to construction and transport. The main reason for this high response to demand is that the sector has significant interconnections as provider for all economic activities and for households. The consequences of the economic crisis were felt swiftly and in a very intense way on the electricity generation due to the fall of electricity consumption.

The peak of electricity demand was reached in 2008[5], and began to shrink since then. 2008 levels have not been recovered so far. The sharp reduction of activity in construction affected electricity demand particularly, not only due to the plummeting of direct activity but also to the collapse of auxiliary sectors, especially cement manufacture. Available data indicate that the decrease in activity implied a 23.9% reduction of electricity consumption[6] in 2009 compared to the previous year. Non-ferrous metallurgy was another sector with significant reduction energy demand (20.58%). Along with the drop of electricity demands by different sectors, it must be taken into account the fall of household consumption, with a rather smaller but significant and permanent effect.

The decline of economic activity aggravates the effects of excess production capacity in the sector. Installed power exceeds 100,000 Mw while current peaks of demand hardly reach 40,000 Mw. This situation implies huge fixed costs even though some have already paid off (nuclear and hydro power generators). These factors have an obvious repercussion on the economic results of the electricity sector and prove the

[4] Measured with multipliers of uniform expansion of demand whose value for the electricity sector is 3.47 (the value for construction is 4.08 and for land transport 3.62).
[5] El sistema eléctrico español 2011, REE. (*The Spanish electricity system*; page 25).
[6] CNE, National Energy Commission : *Información básica de los sectores de la energía 2011* (Basic information on energy sectors, 2011. Vol. 1, page 29). Available in Spanish at http://www.cne.es/cne/Publicaciones?accion=3&id=3086&id_nodo=32

need for a reform of the existing tariff system negotiated by the Spanish administration and sector managers in 1996.

See annexes “The price of electricity in Spain and the tariff deficit”

5.2. The impact of the crisis in the RE sector between 2008-2012

The following section centres on the main changes in the renewable energy support schemes between 2008 and 2012 and due to the economic crisis and the Spanish tariff deficit.

The most significant reforms include:
- cutbacks of solar photovoltaic subsidies in November-December 2010 (RD 1565/2010 and RD-L 14/2010),
- cutbacks of wind energy and solar thermoelectric subsidies in December 2010 (RD 1614/2010),
- Renewable Energy Plan for the period 2011-2020 in November 2011,
- the Feed in tariff moratorium for new renewable energy installations in January 2012 (RD-L 1/2012) and
- Fiscal reform bill to ensure the sustainability of the energy system (in Parliamentary procedure).

5.2.1. Cutbacks on Solar PV Subsidies (RD 1565/2010 and RD-Law 14/2010)

In November 2010, the Spanish government adopted the Royal Decree 1565/2010 on the regulation and modification of certain aspects of electricity production under Special Regime. A month later it was adopted the law 14/2010 on the adoption of urgent measures to correct the tariff deficit in the electricity sector. Both regulations aimed at reducing subsidies to solar photovoltaic energy in a context of economic crisis and soaring tariff deficit.

The sector that still suffered the consequences of the reforms assumed in 2008 after the photovoltaic bubble, had to face a new set of measures that increased its legal and financial instability.

Among other measures RD 1565/2010 included:

- Elimination of premiums to photovoltaic facilities since the year number 26 (retroactive measure)
- 5% reduction of photovoltaic tariff for low ceiling facilities, 25% for medium ceiling facilities and 45% for ground facilities.
- Greenhouses and irrigation ponds considered as ground (Type II) and not as cover facilities
- Harder conditions for control centers, reactive energy values and shorter deadlines for adaptation to voltage dips and remote measurement modules.

Law 14/2010 establishes 30% retroactive cutbacks for solar photovoltaic energy. Among the main measures were the 10% elimination of premiums for all existing solar facilities during their useful life cycle and 90% suppression of premiums for existing solar facilities until 2014.

The law also limits the number of premium hours for photovoltaic facilities until December 31st 2013, restricting the equivalent operational hours of photovoltaic facilities regardless of their location. Therefore if a installation is located in southern climate areas with more hours of sun exposure (IV or V zones), the consequences of

cutbacks will affect the facilities even sooner. Hour limitations are based on nominal power by investor and not on panel power, so facilities that use evacuation lines more efficiently will be penalized.

Reactions

Decree 1565/2010 reduced the period of perception of photovoltaic tariffs to 25 years and introduced the obligation to install new procedures and equipment that the Photovoltaic Industry Association find impossible to comply with and that must be fully paid by generators. According to this association the estimated costs of complying with the new regulation amount to €122 million that add to the € 2 billion that generators will not receive for the reduction of special tariff period.

According to the Platform *Solar Defense,* the new regulation implied sudden losses of Spanish photovoltaic assets values estimated in € 3 billion[7]. Among other issues is the fact that the model of photovoltaic installation, with renovation of the most vulnerable equipment could last up to 35 years (ten years of premiums would be cut back).

According to ASIF, the implementation of both regulations (RD 1565/2010 and RD-Law 14/2010) had a massive impact on the Spanish photovoltaic sector that had already gone through two years of reduced activity and regulatory uncertainty due to the measures adopted in September 2008. From 2008 to 2010 the association estimated losses of 90% of temporary jobs and 30% of permanent jobs, totaling 30,000 jobs lost.

Furthermore since two thirds of existing photovoltaic facilities are in the hands of private owners and families scattered across Spain, over 200,000 people would be affected by these cutbacks.

The analysis of the impact caused by cutbacks, carried out by the Renewable Energies Companies Cluster, the Canary Islands environmental and water resources agency, and the Canary Islands Renewables Association[8], estimate the total losses for photovoltaic generators in the Canary Islands will amount to €118 million, threatening 4,527 direct jobs in the sector in 2009. The Canary Islands (classified as Zone V) is the region of Spain most affected with 30% losses, exceeding by 14 points the national average. The fall of tax revenues in the region exceeds €14 million.

The reduction of equivalent hours severely penalizes promoters and investors that made a serious bid for high efficiency facilities and high quality units. Economic efficiency and quality will be affected to achieve minimal profitability.

5.2.2. Cutbacks on Wind Energy and Solar Thermoelectric subsidies

In December 2010, the socialist government adopted the decree RD 1614/2010 to modify the retribution system for electricity production of wind and solar thermoelectric technology.

The new regulation previously negotiated with representatives of the wind and thermosolar sector sought to promote saving and benefit customers. It was also aimed at harmonizing the goals of renewable energy promotion with costs limitations of of electricity production in order to grant the sustainability of the sector.

[7] http://www.defensasolar.es/index.php?option=com_content&view=article&id=15%3Aicuanto-ha-perdido-el-parque-fotovoltaico-espanol-con-el-rd-15652010&catid=2%3Anoticias&Itemid=5&lang=es
[8] http://www.clusterricam.org/index.php?option=com_content&task=view&id=40&Itemid=42

The adopted measures included the reduction of premiums for wind energy by 35% until 2012[9]. The measure established that those facilities would recover their premium values from 2013 (estimated year for the start of economic recovery), but later on the newly elected government approved in January 2012 an indefinite moratorium for premiums.

The regulation also limited operating hours benefited by premiums or equivalent premiums[10] for wind and thermosolar facilities and established that during the first year of operation regulated tariff will be mandatory thermosolar facilities, without possibility of choosing a premium system.

The decree also delayed the starting of thermosolar plants expected to take place according the schedule of registration for pre-allocated projects. The objective of this delay was to defer payments beyond 2013 expecting an improvement of the economic situation in Spain.

The regulation expected total savings for the system of €1.1 billion by 2013.

Reactions

Both wind (AEE) and thermosolar (PROTERMOSOLAR) associations reached an agreement on the new regulation since they regarded that it would have a stabilizing effect and envisioned a step forward in the elimination of uncertainties.

The **Association of Wind Energy Employers (AEE)** considered that the decree summarized the consensus reached with the Ministry of Industry that eliminated the possibility of retroactive measures in the future. According to this association the decree RD1614 was the result of "*cooperation efforts*" to "*contribute to the economic sustainability of the system*". The sector "*accepted exceptional, temporary cutbacks to the retribution of operating wind energy facilities in exchange for the resolution of certain aspects pending since the publication of decree RD 6/2009, and a greater regulatory stability*". However representatives of the sector were not satisfied with the limitation of premiums to 2,589 hours per year since the measure imposes a penalty on technical efficiency. The AEE also expressed its concerns about negotiating with the government the regulatory framework for wind energy facilities to meet the European objectives for 2020 and grant reasonable profitability for new projects.

The Spanish Asociation of Solar Thermoelectric Companies (Protermosolar) expressed its satisfaction with the decree, since it met the expectations of the sector that avoided the generalization of photovoltaic energy with the rest of solar technologies. As a result energy premiums for solar thermoelectric technology were not reduced, an essential requirement for a sector still in process of development which requires financial support until it reaches full development. The situation of solar thermoelectric energy differs greatly from the photovoltaic bubble that has developed in Spain over the last few years. The representatives of the solar thermoelectric sector already expect drawbacks and difficulties even after 2013.

[9] For facilities benefited by Royal Decree 661/2007 and for special energy status facilities whose power exceeds 50MW.

[10] In thermosolar energy the limitation of the number of equivalent operating hours benefited by premiums goes from 2,350 equivalent hours/year for Stirling dish technologies to 6,450 equivalent hours/year in central receptors' plants with 15-hour storing capability.

5.2.3. The Spanish Renewable Energy Plan 2011-2020

On 11th November the new Renewable Energy Plan (REP 2011-2020) was approved by the Spanish Government for the years 2011 to 2020, establishing the development framework for the renewable energy sector in the next 10 years.

This plan aims to be the main tool for fulfilling and going beyond the objectives set up by the European Union of reaching 20% of the total energy consumption covered by renewable sources by 2020. The REP 2011-2020 establishes the Spanish objectives and suggests the measures to be implemented in order to reach the 20% goal in 2020 and includes the Spanish perspective on the evolution of the renewable energy sector regarding each of the types of renewable energy available in the coming years.

According to this Plan, renewable energy will cover **20.8%** of the energy consumption, with a contribution of the renewable energy sources of 11.3% to the energy consumption in the transport sector.

This gross final energy consumption target turned out to be lower than the initial estimates of **22.7%** by 2020 that were notified by the Government in the preliminary report to the European Commission[11] on July of the same year, as required by the Renewable Energies Directive. The downward revision of the total renewable energy showed that the energy system is heavily affected by the economic crisis, the reduction of electricity demand and the increase of the tariff deficit.

Regarding the support schemes, the REP also included three important elements:

1. Feed-in tariff (FIT) for electricity production based on renewable energy, as the main incentive for renewables, adapting tariffs to costs.
2. A new supporting frame for the retribution of thermal energy production based on renewable energy to be introduced.
3. Net-metering system, by which renewable energy production will be connected with the power grid, such that excess of on-site generated power is fed back into the grid, while grid power supplies the on-site demand when the on-site generation is either absent or insufficient.

The first one, the FIT for renewable electricity, -as will be seen later- was blocked by the temporal moratorium approved by the new government at the beginning of 2012. The second and the third measures have still not been developed so far (Sept 2012), although they are now the unique instruments to boost the renewable energies.

5.2.4. Temporary Feed in Tariff Moratorium for New Renewable Energy Installations

In January 2012, the Government temporarily suspended renewable energy premiums paid to newly-built plants (wind, solar, biomass and hydro technologies) in an attempt to reduce electricity costs and thus the electricity tariff deficit.

The Spanish government considered that the measure was fully justified by the economic situation and the growing tariff deficit which threatened the sustainability of the electric system.

The suspension affects all technologies classified within the Special energy Regime (wind, solar, PV, thermosolar, biomass, biogass, mini-hydro, cogeneration and waste), as well as ordinary facilities that fall within the regular status of assimilable technologies. The measure dos not have retroactive effect and therefore it does not

[11] Plan de Acción Nacional de Energías Renovables (PANER) 2011-2020, Spain's National Renewable Energy Action Plan (NREAP) 2011-2020.

affect operating facilities or those already registered for pre-allocation when the regulation was adopted.

The government estimates that the moratorium will not affect compliance with EU goals of renewable energy production.

The measures were announced as temporary, though with indefinite character, while the government considers a full reform of the electricity sector to avoid the generation of tariff deficit.

Reactions

Some regional governments fully opposed the measure. In the case of Andalusia, regional authorities considered that it would seriously affect the leadership of the region in renewable energy production (renewables represent 14% of primary energy consumption exceeding by 2.3 % the Spanish average).

The government of Extremadura argued that the moratorium would affect the forecast of total renewable energy generation for 2015 (906 MW), alter a € 5.4 billion investment and compromise 16,360 construction jobs, 4,026 operation jobs and € 327 million in municipal income.

The government of the Canary Islands demanded, though unsuccessfully, the lifting of the moratorium in the region since one kilowatt-hour produced with photovoltaic energy may cost half as much as one produced with fossil fuel. One kilowatt-hour produced with wind technology could cost one third of one produced with fossil fuels.

The Bioenergy Alliance which represents six different associations from the energy and forestry sectors estimates that the implementation measure would cause the loss of investments for the value of €2.6 and destroy 9,000 jobs.

The Spanish Photovoltaic Union (UNEF) estimates that 44% of the yearly savings expected by the government with this moratorium (some €70 million of a total of €160 million) will come from photovoltaic facilities, the technology most affected by retroactive cutbacks.

Spanish wind energy sector representatives also relieve that the moratorium will imply a significant risk for the wind sector and threaten 30,000 jobs. Lack of demand for wind generators already caused a deep restructuring in the sector and employers anticipate the relocation of manufacturing facilities in other countries

According to Spanish manufacturers only 10% of their production reaches the national market. Installed power in Spain in 2011 (1.050 MW) is actually base on wind generators purchased years ago. The prolonged development of wind energy projects (an average of 7 years) requires orders to be made one and a half / two years in advance.

2012 is the final year of the pre-allocation register in which 1,903 MW are listed and expect to become operational. The construction of facilities to produce 970 MW face difficulties to be completed before the deadline set in registration, due mostly to delays in the planning of transport networks and distribution lines, as well as management problems, all reasons that cannot be ascribed to project developers. Those 970 MW represent half of the registered power to be installed in 2012.

Wind energy sector representatives asked the government to start a round of negotiations to discuss the sector's regulatory framework from 2013 on.

Citizens' organizations, among them over 40 representatives of environmental associations, trade unions' and employers' organizations expressed their rejection to the moratorium in a joint statement. [12]

The document signed by a number of associations openly states that the decree RDL 1/2012 represents exactly the opposite of Spain's needs for a sustainable way out of the economic crisis. It supports an energy model based on bigger consumption of energy sources with prices determined by foreign markets with high levels of CO2 emissions instead of promoting technical innovation and efficiency provided by renewable technologies that also allow more consumers' participation through distributed generation and self-consumption.

The decree RDL 1/2012 contravenes EU Directive 2009/28/EC on renewable energies and EU energy efficiency Directive 2010/31/CE which intend to eliminate the barriers to the development of renewable energies (regulatory instability, bureaucratic restrictions and grid access difficulties).

Given its temporary nature, the measure adopted by the Spanish government maintains regulatory risk and legal uncertainty for new investments and obstructs the connection to the electric grid of new renewable projects. This reform will continue to destroy jobs in the renewable energy sector and eventually cut down 300,000 potential jobs estimated for this sector by 2012 and almost one million jobs in energy services as a whole.

From the economic point of view many observers regard that the measure will have little effect in terms of maintaining the system's sustainability. The cost of renewable energies for consumers to 2.6 ¢ / kWh and renewables represent nowadays 17% of the total costs in the electricity system with a decreasing trend due to its degree of technology innovation. Gas, oil and uranium imports exceed €40 billion whereas the Spanish energy intensity represents 1.5% of Spanish GDP.

5.2.5. Fiscal Reform Bill to ensure the Sustainability of the Energy System[13]

In September 2012, the Spanish Council of Ministers submitted the Fiscal Reform Bill to ensure the Sustainability of the Energy System[14], which intends to cope with the biggest problem of the electricity sector in the country: the so called tariff deficit that in December 2011 amounted to €24 billion. Failure to act would continue to increase the accumulated deficit every year and the figure might double by 2015.

The bill is still pending on approval by the Spanish parliament, where it might undergo certain modifications, although given the supermajority of the government in parliament it is expected to pass without major changes. The bill introduces seven new types of energy taxes:

- Two taxes over generation and storage of nuclear waste
- A tax on the generation of hydropower
- A tax on natural gas (2.79 ¢ /m3)
- A tax on coal (€14.97/tonne)
- Taxes on fuel-oil and diesel (€12/tonne of fuel-oil and €29.15 per litre of diesel)

[12] http://www.fundacionrenovables.org/2012/01/no-a-moratoria-de-renovables/
[13] http://www.thespanisheconomy.com/SiteCollectionDocuments/en-gb/Economic%20Policy%20Measures/120919%20sustainability%20of%20the%20energy%20system.pdf
[14] http://www.lamoncloa.gob.es/ConsejodeMinistros/Referencias/_2012/refc20120914.htm#SostenibilidadEnerg

- 6% taxation over the sale of electric energy which will also affect renewable technologies

In the case of renewable energies the taxable income will be calculated over the total income (market price + premium) by sold energy in each installation.

Reactions

The European Commission is still waiting for the draft legislative proposal to be published before expressing its view. Nevertheless, a Commission working paper published in May urged Spain to increase revenues from environmental taxes and criticised its "overcompensation" of nuclear, large hydro-power generators and subsidies to coal mines.

According to estimates of the Spanish wind power association **(AEE)**, in the case of the wind sector the 6% taxation on electricity production an impact of €241 million in 2013. It must be taken into account that the wind sector bears the heaviest fiscal burden since some regions of Spain charge specific regional taxes to this technology.

The AEE expects to have access to the full text to make an in-depth analysis and considers that the measures should have been previously negotiated with representatives of the sector.

The Spanish photovoltaic sector (UNEF) considers that with this new measure photovoltaic solar energy will accumulate 36% of cutbacks since 2010 when the decree RD 14/2010 came into force. This situation renders the sector practically bankrupt since it is no longer capable of maintaining its projects' profitability.

For the photovoltaic sector the objective of fiscal reform is purely collecting taxes from the sector and not promoting the sustainability of the electric system. Although a 6% tax is imposed on all technologies of electricity production, the promoters of photovoltaic projects will suffer the most serious effects compared to conventional electricity producers since they will not be able to charge on the tax to users because they have a fixed price. The burden of this tax will fall heavily on renewable industries and final consumers since major conventional and big energy companies will charge the tax on final energy prices.

The view that the new taxes will be charged on final consumers is shared by most observers and analysts. The consultant agency ***Santander Global Banking & Markets*** estimates that this reform will increase electricity prices between 6.4% and 16.5% depending on the consumer profile.

5.3. The future of the RE sector by 2020 in Spain

On a European scale, the **European Commission**[15] warned that suspending support for renewables discourages investment in the sector and will make it hard to achieve Spain's 2020 energy and climate goals. Furthermore, with less renewable energy in the mix, Spain's dependence on imported energy would increase from the current 79 % (which is already higher than the EU average of 54%). According to this institution, streamlining complex authorisation and planning procedures, and removing other barriers to the growth of renewable energy could be better measures to reduce the cost of renewables, which remains an issue for Spain.

[15] SWD(2012) 310 final. Assessment of the 2012 national reform programme and stability programme for SPAIN, pg 23-24. http://ec.europa.eu/europe2020/pdf/nd/swd2012_spain_en.pdf

The impact of adjustment measures was also assessed by national experts, particularly regarding the effect of the moratorium on the future of renewable energies.

The **National Energy Commission (CNE),** the regulatory body of energy systems in Spain, defined the moratorium as *"a downgrading of estimates on power to install by Special Regime sectors for the period 2011-2015"* [16], which implies that some 4,315 MW from renewable would not be installed during that period. CNE estimates indicate that in 2012 Spain would only install 97MW of photovoltaic energy, 474 wind MW and 970 thermosolar MW. No new facilities for any renewable technology are planned for the following 3-year period (2013-2015).

The halting of new installed power projects to start in 2013 will reduce the percentage of energy production by Special Regime technologies in total production for 2014 and 2015. The production peak of renewable energy would be reached in 2013 and then the figure would drop for two consecutive years to achieve 39.4% in 2015 (instead of 44.2% expected before the moratorium).

Estimated evolution of installed power for Special Regime energies for the period 2011-2015 (before the entry into force of the moratorium RD-L1/2012)

Installed power (MW)	2012	2013	2014	2015
Cogeneration	6,285	6,432	6,582	6,731
Solar photovoltaic	4,172	4,560	4,948	5,333
Solar thermoelectric	1,501	2,281	2,521	2,771
Wind	22,470	23,969	24,944	25,919
Hydraulic	2,082	2,119	2,158	2,198
Biomass and Biogas	807	863	925	985
Waste	510	515	520	525
Waste treatment	658	658	658	658
Total	**38,485**	**41,398**	**43,256**	**45,120**

Source: National Energy Commission

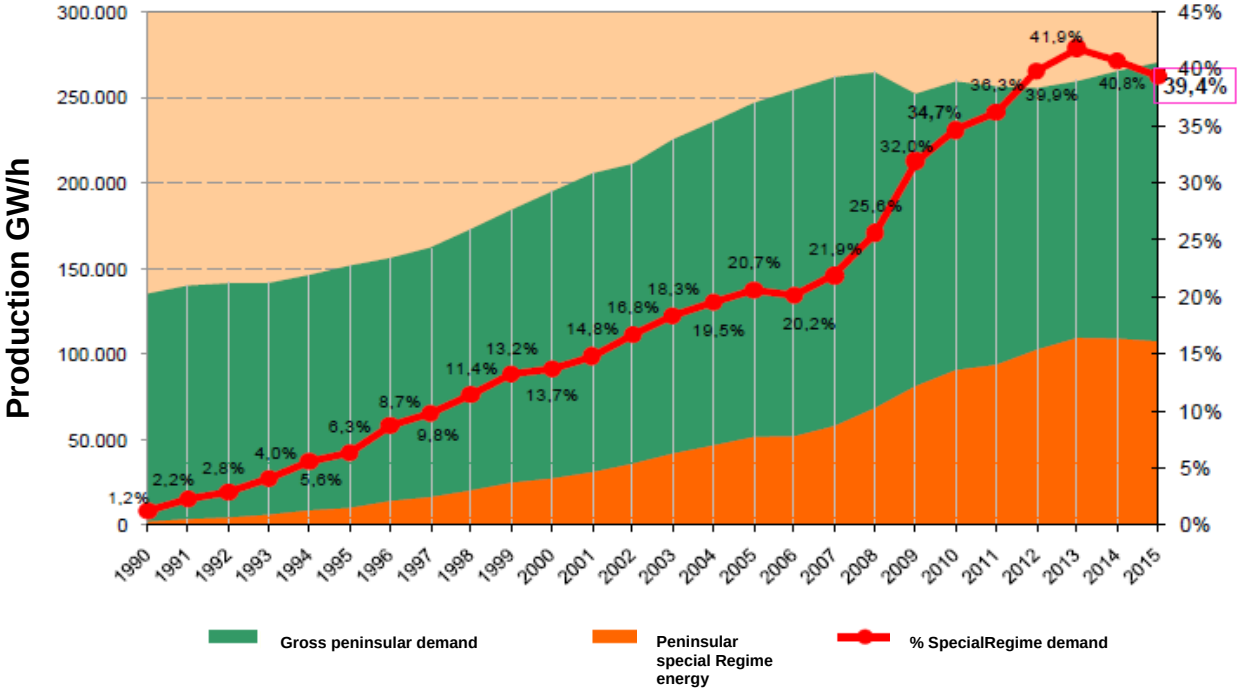
Estimated evolution of installed power for Special Regime energies for the period 2011-2015 (after the entry into force of the moratorium RD-L1/2012)

Installed power (MW)	2012	2013	2014	2015
Cogeneration	6,211	6,211	6,211	6,211
Solar photovoltaic	4,080	4,177	4,177	4,177
Solar thermoelectric	1,551	2,521	2,521	2,521
Wind	22,470	23,944	23,944	23,944
Hydraulic	2,063	2,063	2,063	2,063
Biomass and Biogas	775	775	775	775
Waste	456	456	456	456
Waste treatment	658	658	658	658
Total	**38,264**	**40,805**	**40,805**	**40,805**

Source: *National Energy Commission*

[16] "*Informe Marco Sobre la Demanda de Energía Eléctrica y Gas Natural y su Cobertura. Año 2011*". Comisión Nacional de la Energía, 2012. Pg. 306-310. http://www.cne.es/cne/doc/publicaciones/PA006_11.pdf

Real and estimated evolution of production in the Special Regime system for facilities located in the Iberian Peninsula



Source: National Energy Commission, Spanish Electric Network and planning documents

The Association of Renewable Energy Producers **(APPA)** considers that the moratorium implies bringing renewable energy development to a sudden standstill which threatens the achievement of renewable goals for 2020 in Spain. In fact the association reminds that national goals for 2010 were not met (it was only achieved 11.3 of primary renewable, instead of the expected 12.1%) despite the spectacular growth of renewable technologies during the last decade. That is why associations of renewable energy companies demand from the government a solid legal framework to sustain Spain's credibility in the international context regarding the conditions, circumstances and guarantees upon which investments were made.

The association of photovoltaic industries **(UNEF)** estimates the losses caused by the moratorium in €1.4 billion, and other €5.5 billion between 2014 and 2016 if the moratorium is maintained. It also estimates the loss of 4,500 direct and other 9,570 full-time indirect jobs.

The lack of activity by the photovoltaic sector will represent losses for some 230 million in concept of repayments (taxes). The costs of oil imports and CO2 emissions rights will raise to €35 million provided that there will be no increase of current prices.

In practical terms, this means that each euro "saved" in solar photovoltaic energy, will imply a decrease of income of 3.3 euros and an additional expense of 50 cents in fossil fuels imports.

Spain leaves the renewable energy attractiveness "top ten" indexes

The pessimistic effects of the moratorium were immediately felt. Ernst & Young's (E&Y)[17] periodic index of countries attractiveness to investment in renewable energies, showed that Spain descended from post 9 to 11 after the government announced the moratorium on renewables in early 2012.

Spain had been among the top ten countries attracted to investment in renewables for the past 5 years until November 2011, when the sector of renewable energy seemed to have a successful future projection and most electricity companies were forced to invest in clean energies which turned Spain into a clear international reference in this field.

Since the adoption of the moratorium the ranking of Spain among the top 10 plummeted and in August the country ranked in the world's top 14. (See Annex)

The new measures for the electricity sector announced by the Ministry of Energy and the deepening of the economic crisis do not allow us to make optimistic forecasts for 2020.

[17] http://www.ey.com/GL/en/Industries/Cleantech/Renewable-energy-attractiveness-indices---August-2012

6. Social debate on renewable energies in Spain

Personal interviews were carried out with trade union organizations, employers organizations and administration in energy issues representatives:

Trade Union: Carlos Martínez CCOO and Iago Xavier Reimudez Rodríguez CCOO-Gamesa.

Employers Organizations: Jaume Margarit from APPA (renewable energies association), Luis Crespo from PROTERMOSOLAR (thermoelectric solar energy) and Jorge Barredo, UNEF (photovoltaic solar energy).

Administration: María Sicilia Salvadores, General Deputy Director of Energy Planning.

Renewable energy situation

There is broad consensus among participants on the essential nature of renewable to reduce energy dependence and to combat climate change, both on European and national scale. Spain's negative energy balance exceeded €211 billion in the last six years. Furthermore, both employers' organizations and trade unions recognize that future energy supplies can only be covered by renewable technologies.

Opinions of different parties begin to diverge when talking about the assessment on the evolution and development renewable, especially regarding the coexistence of recent cutbacks in subsidies and their future consequences. It can only be reached an agreement on the positive assessment of the sector's evolution.

The Ministry of Energy considers that "despite the current economic conditions, renewables will continue to increase their contribution to energy supply in the next years. The temporary suspensions of premiums for new facilities under special status adopted in early 2012 are only aimed at allowing an organized entry of these technologies into the system and are part of the measures conditioned by the solution to the structural tariff deficit in the Spanish electricity sector". The sector's companies, however, strongly criticized the administration and judge that government decisions multiplied the difficulties brought about by the crisis: "the economic crisis has been particularly harsh on renewables for two main reasons: the first one is that the Spanish government identifies renewable with excess expenditure for the energy system and not with a serious economic bid. This view led the government to force a stand still on renewables in clear opposition to global trends. The international market of renewable energies represents annual revenues that exceed $257 billion and this global bid is focused on future perspectives. The second reason has to do with the fact that renewables face most of their cost during the construction period. Except for some specific cases like bio-energy, renewables do not imply fuel costs, and most of the investment is completed in the initial year. Current financial difficulties will complicate the viability of projects even without the moratorium. In a few years we could even find ourselves in the paradox of purchasing abroad the technology we sell today." There are also doubts on the legal uncertainties for this sector. These views are mostly shared by trade unions that denounce serious job losses caused by the cutbacks.

Parties agree upon the possibilities of meeting RE goals due partly to the reduction of energy demand caused by the economic crisis. There are, however, uncertainties regarding thermal and biofuel use in transport and electricity contribution as an energy vector for transport, a sector that has been often overlooked. Sector organizations also stress the shift in administrative priorities and the lack of definition for a future energy model.

Support schemes and funding

Taking as a starting point the successful agreement that allowed the initial development of the sector, there is a notable difference regarding the moratorium decision. According to the Ministry of Energy, sector and trade union organizations *feed-in tariffs* and variable premiums depending on market prices (included in regulations RD 436/2004 and RD 661/2006) proved efficient in the first stages of development of RE. They eliminated market and technology risks and allowed a significant penetration and development of RE technologies in Spain, especially wind and photovoltaic.

However the ministry considers that "beyond any doubts we are in a new phase in which renewable energies are already cardinal sources of electricity generation in our country, since other high technologies are in condition to enter market competition. Future priority must therefore grant technical and economic efficiency of support mechanisms in a way that the massive integration of renewable energies does not create market distortions and grants higher efficiency or lower costs for customers as it is expected from renewables in the next years."

Sector organizations complain about the lack of a wider set of policies to recognize and promote the internalization of costs by companies, and the absence of a fiscal energy policy that stimulate energy saving and efficiency, the use of renewable sources, and penalize energy waste and pollution. That would be a more equitable framework for our energy system.

The debate on the effectiveness and efficiency of promotion mechanisms and their validity is quite extensive in the case of Spain. The Ministry of Energy regards the recent measures as efforts to promote the adaptation of support mechanisms to the full development of renewables when it states that: "support schemes must be withdrawn progressively and maintained only for those technologies whose insufficient development requires such mechanisms. Permanent subsidies must be avoided, instead incentives must be granted to industry in search of economic efficiency and full competitiveness in the renewable sector." Sector organizations complained about the progressive and complete reduction of support: "the point is that the regulation that defines support schemes is quite unstable. In five years the administration has adopted eight royal decrees to regulate renewables and this had a devastating effect on investors. Furthermore, new laws introduced retroactive measures that limit the amount of premium hours in contravention of the general conditions established by official government communications that paved the way for investments. If an instrument is wrongly implemented, with constant changes in regulation, without a long-term perspective or predictability for investment returns, it simply fails to meet its purpose."

These factors will become even more visible in the light of the discussion about how support instruments and public funding have been affected by the economic crisis.

The Ministry of Energy points out the continuity in a context of budget restrictions: "of all the support schemes to operating or pre –registered facilities renewable capacity is maintained and new renewable facilities became operational under the so called special status generators, therefore, considering the projects that currently running, we expect that support to such facilities will continue to grow in the future". Employers' organizations argued that the moratorium in support to the renewable sector was brought about by concerns about the tariff deficit and excess installed power and consider that "there can hardly be power excess if electricity and energy goals for 2010 have not been met."

Regarding future expectations views concur again though moderately and with specific remarks. Parties agree upon maintaining support schemes and upon the dynamic nature of such measures. Representatives of the sector emphasized the convenience

of a long term definition for such mechanisms in order to achieve certain predictability and security of investments.

Employment

The differences in views on the sector have an impact on the evolution of employment. For the Spanish administration the sector of renewable energies will continue to export technologies and generate a drag-effect on other industrial and service activities; APPA on the contrary considers that "if the moratorium is not lifted there will be two direct effects on jobs. First there will be a reduction in the number jobs in the construction of new projects, especially in wind and solar thermoelectric, the only two technologies with projects to develop. Without new projects those employees that cannot be relocated in operation and maintenance jobs of wind farms and thermosolar generators will be unemployed. The second effect is even more worrying. In an idle market, manufacturers will shut down their companies and take production to areas with business opportunities and this will lead to the relocation of Spanish companies abroad which will have a serious effect on domestic economy.

Even in the context of the crisis there is growing international market that Spain could benefit from to generate profit and jobs, but if the domestic market disappears our companies will be force to relocate somewhere else. "Renewable energies generate more jobs and profits in our country; that is fact to consider regardless of favourable cost evolution. A recent study commissioned to Ernst & Young shows that the cost of production of 1 Mwh with wind power generates a 56 € gross added value for the country, to the difference of the 16 € of gross added value produced if generated by a gas-powered station. If we add to this fact that wind energy generates twice as many jobs, the choice becomes clear."

For trade union organizations current job losses could predict a worse outcome: "there is a massive loss of direct and indirect jobs but the worst is still to come. To this factor we must add the effect of protectionist policies in countries that build more facilities and impose the nationalization of a significant share of the final product and are even requesting the opening of technology design centres in their territories, so in a few years we witness the migration of technology centres from companies like GAMESA or ACCIONA with the subsequent effect on jobs it implies".

Collective bargain

Union representatives have the following impressions about collective bargain.

The level of union membership among renewable energy workers varies. In centres with massive direct labour force the number of unionized workers is fairly high. In centres where labour force is indirect it is lower. This situation is changing due to the current economic context and the high level of insecurity caused by successive labour reforms.

The quality of jobs is higher in centres with union representation (mostly production facilities). In more qualified groups there is a significant fragmentation of salaries due to the individual nature of negotiations and the lack of union representatives that started to emerge recently.

Currently there are no specific agreements in the renewable energy sector due to the lack of employers' representation to negotiate such issues. Metal sector agreements are used in this sector although in highly qualified staffs of GAMESA non-compliance with such agreements was denounced before the National Court of Justice. The court pronounced a sentence favourable to workers that the company appealed against.

7. Conclusions and key messages

Spain is currently at the turning point in terms of policies to promote and support renewable energies.

A series of reasonably effective support schemes to renewable energies has been defined and adopted since the late 1990's, which significantly increased their share in the energy mix, especially in the electricity sector, although renewable grew at a slower rate than other energy sources as natural gas.

The renewable energy sector became a significant economic driver in terms of GDP contributions, exports, number of jobs and Spanish companies involved.

The most successful support schemes implemented so far include:

- FIT in the electricity sector.
- Obligation of installation and subsidies for investments in the thermal sector.
- Tax exemptions and mandatory quotas for the transport sector.

This context leads to setting realistic goals for 2020 in order to achieve a global share by renewables of 20.8% of final energy consumption. The electricity generation sector is expected to make the biggest contribution to achieve this goal.

Cutbacks in support mechanisms to renewable energy started just before the outbreak financial crisis, due largely to deficient planning that that did not take into account cost reductions in some technologies.

The financial and economic turmoil fully affected the Spanish economy in 2008 and the energy sector was affected in the initial years of the crisis due to its high reaction to variations in demands and to serious imbalance in the electric tariff system.

Cutback in support schemes started in 2010 and affected primarily photovoltaic energy although it quickly extended to the all the other technologies.

In 2012 it was adopted a moratorium to FIT in the electricity sector for all renewable technologies. This measure resulted in a major blow for the sector. Some planned subsidies for the thermal sector were also restricted and eventually were never implemented.

There are no official estimates on job losses since the beginning of the crisis, however employers' organizations estimate some 20,000 jobs lost out of 150,000 jobs in 2010 and this figure is expected to increase in the next future due to the moratorium on premiums in the electricity sector that implies shutting down new renewable power facilities at least until 2015.

Stakeholders agree upon the renewable sector situation and on support schemes when they underline the significance and convenience of 2020 objectives. Stakeholders also hold a common view on successful support schemes implemented in the last decade.

However there is a divergence on the assessment of changes to support schemes and their consequences. Trade unions and employers' organizations consider that the administration is multiplying the difficulties generated by the crisis: regulatory instability and insecurity are hindering new investments in the sector which has serious consequences. The moratorium in the electricity sector might bring about the relocation of industry and significant job losses.

The administration regards the measures as adequate since they allow a regular growth and renewable share will continue increasing in the energy mix and considers that support schemes must disappear to avoid market distortions.

Regarding the goals for 2020 assumed by Spain, the administration considers that they can be met, although the rest of stakeholders assure that they are hardly achievable unless the moratorium on the electricity sector is lifted. To this regard the European Commission warned in one of its communications that Spain will not be able to comply with its 2020 goals if the moratorium remains in force.

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ANNEXES

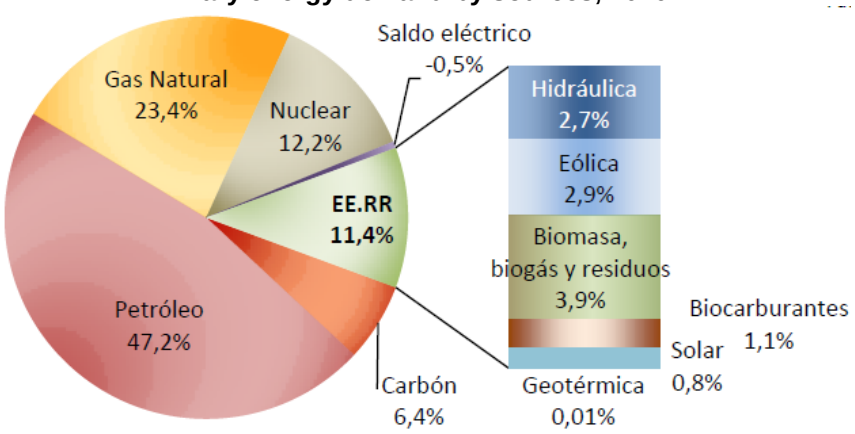
Annex to chapter 2

Primary energy consumption by sources (ktoe)

Sources	2004	2007	2008	2009	2010
Coal	20,921	20,354	13,983	10,509	8,271
Oil	71,054	70,848	68,182	63,684	6,358
Natural Gas	24,671	31,601	34,782	31,096	31,003
Nuclear	16,576	14,360	15,368	13,750	16,102
Renewable Energies	8,854	9,976	10,942	12,165	14,910
Elect. Balance (Imp.-Exp.)	-260	-494	-949	-697	-717
Total	**141,817**	**146,645**	**142,308**	**130,507**	**131,927**

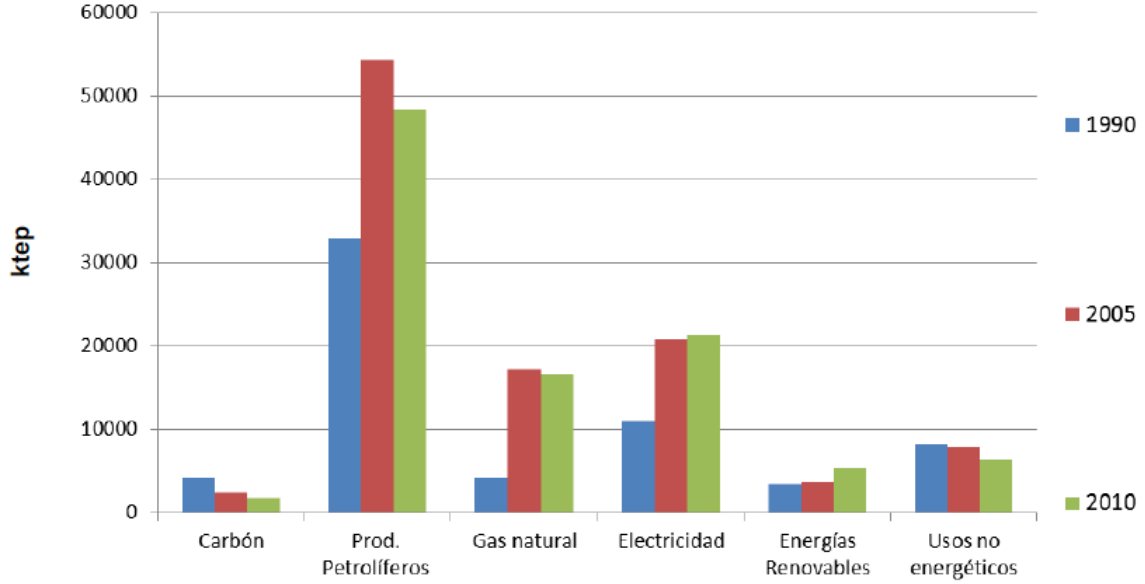
Source: IDAE, 2011.

Primary energy demand by sources, 2010.

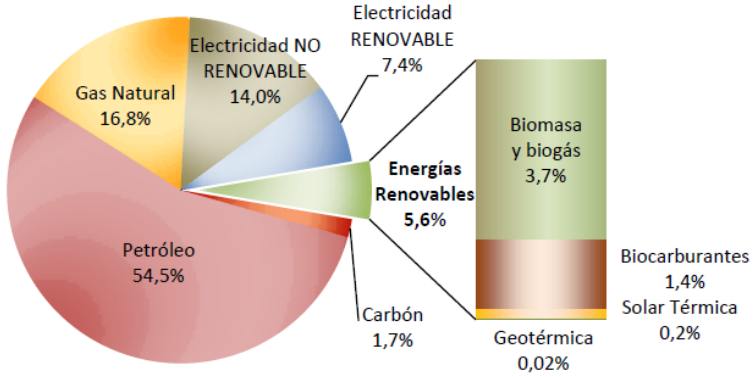


Source: IDAE, 2011.

Final energy consumption by sources (ktoe)

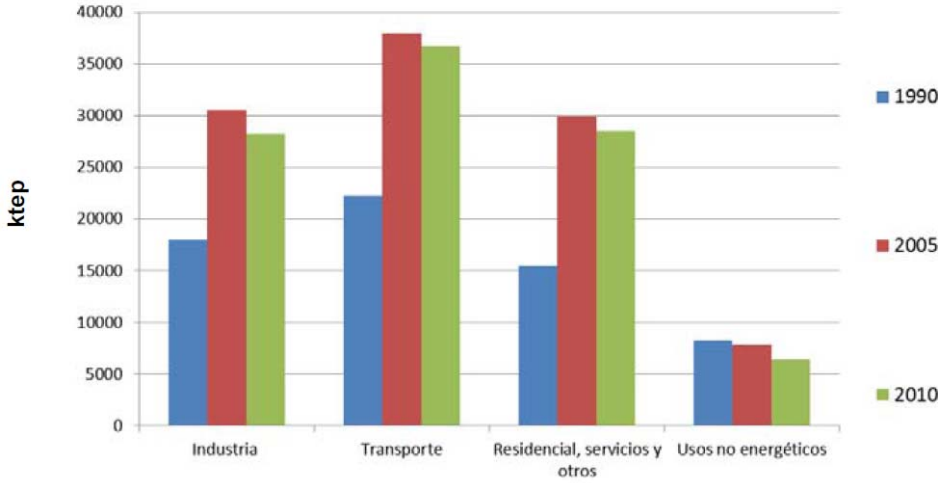


Final energy demand by sources, 2010.



Source: IDAE, 2011.

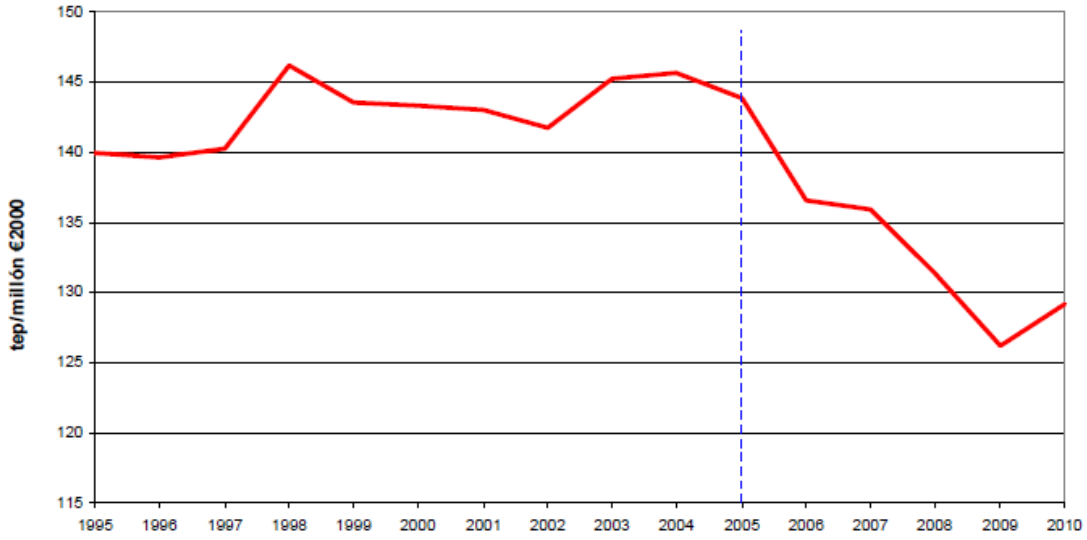
Gross final energy consumption by sectors 1990-2005-2010 (ktoe)



ktep	1990	Estr. (%)	2005	Estr. (%)	2010	Estr. (%)	% var anual 2005/1990
Industria	18041	28,2	30994	29,2	28209	28,3	3,7%
Transporte	22246	34,7	38100	35,8	36744	36,8	3,7%
Residencial, servicios y otros	15495	24,2	29365	27,6	28470	28,5	4,4%
Total usos energéticos	**55782**	**87,0**	**98459**	**92,6**	**93423**	**93,6**	**3,9%**
Usos no energéticos:	8306	13,0	7842	7,4	6416	6,4	-0,4%
Total usos finales	**64088**	**100,0**	**106301**	**100,0**	**99838**	**100,0**	**3,4%**

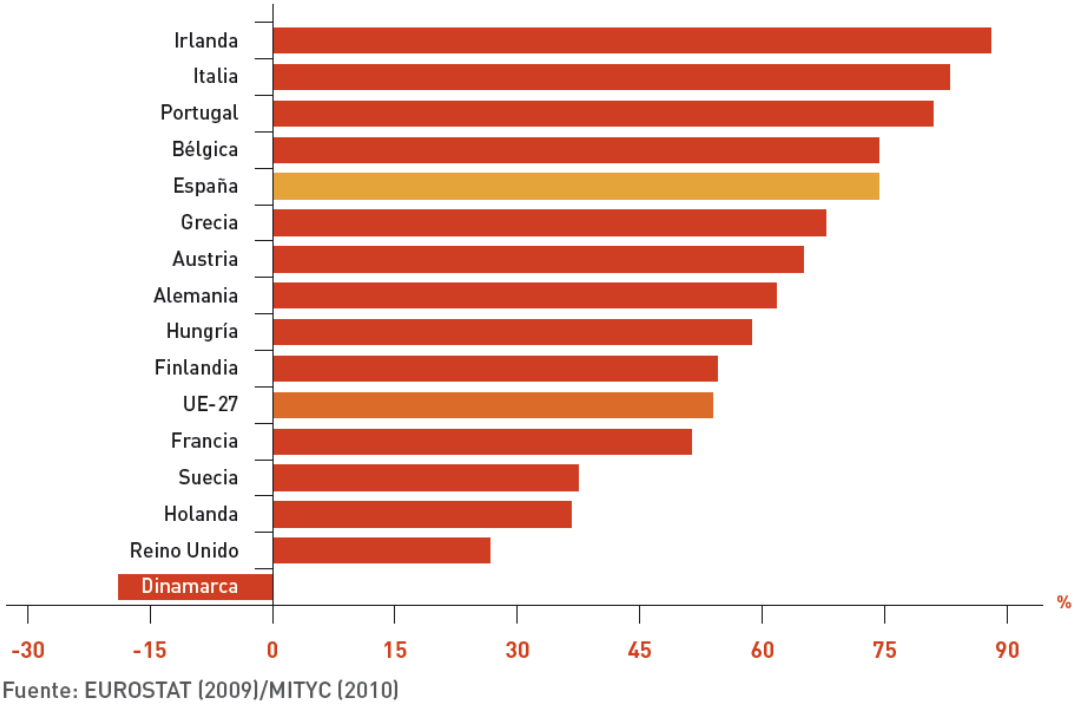
Source: Energy Secretary for the State, 2011.

Final energy intensity 1995-2010 (toe/million Euros$_{2000}$)



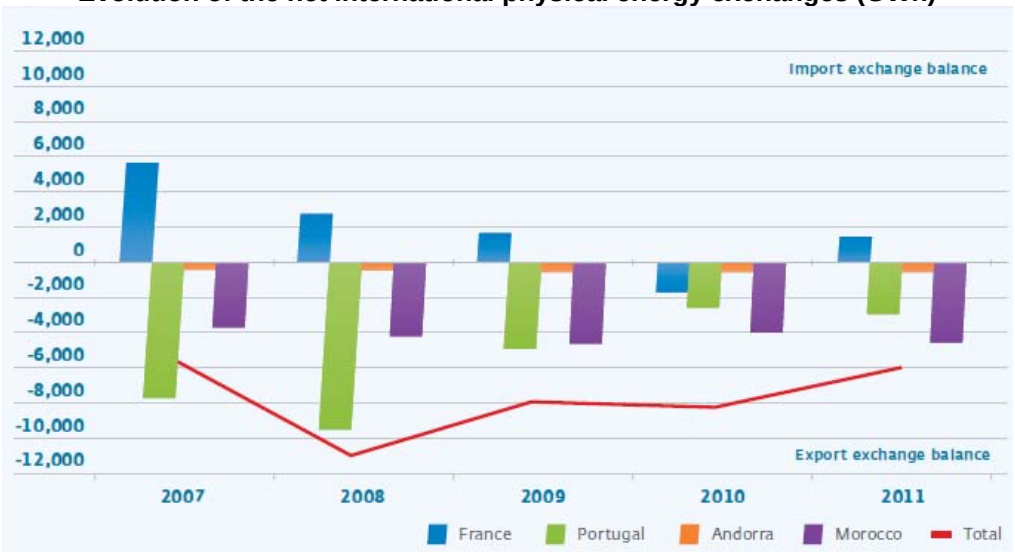
Source: Energy Secretary for the State, 2011

Energy dependence in Spain and EU-27



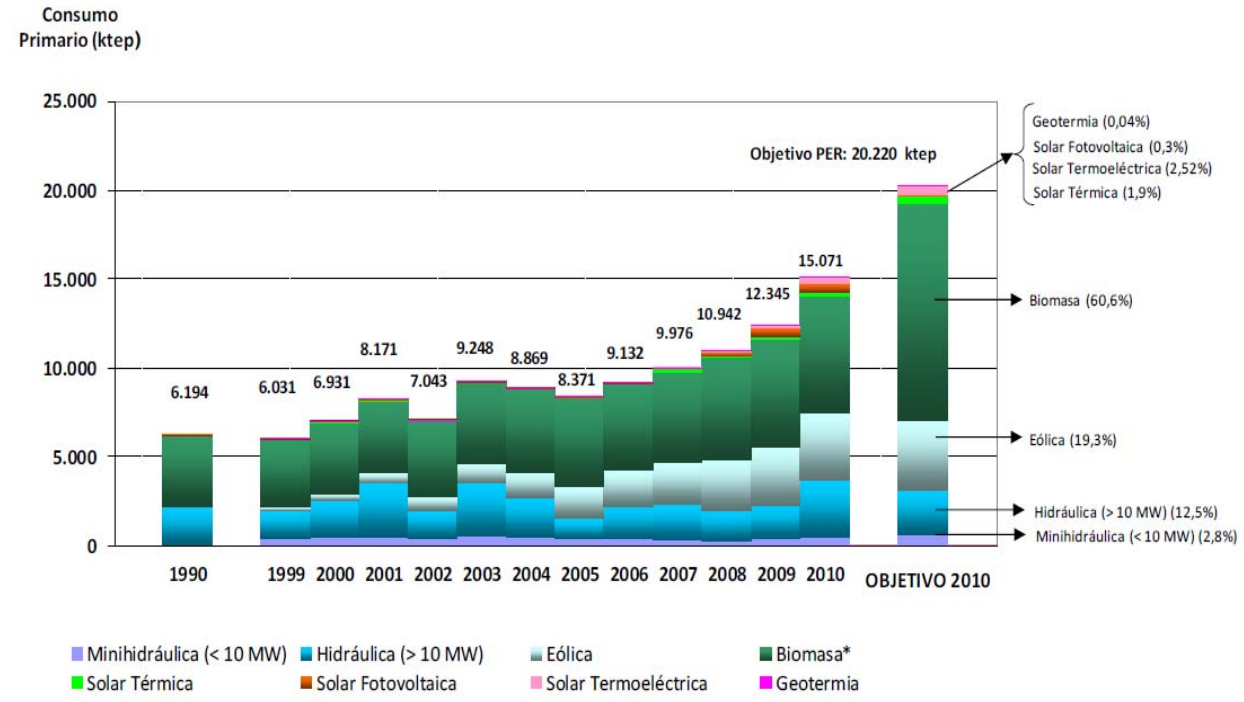
Source: Eurostat (2009), MITYC (2010).

Evolution of the net international physical energy exchanges (GWh)



Source: REE, 2012.

Primary energy consumption of renewable energies 1990-2010



*Incluye R.S.U., biogás y biocarburantes

Fuente: IDAE/MITYC, 2011

Electricity production by sources in 2010

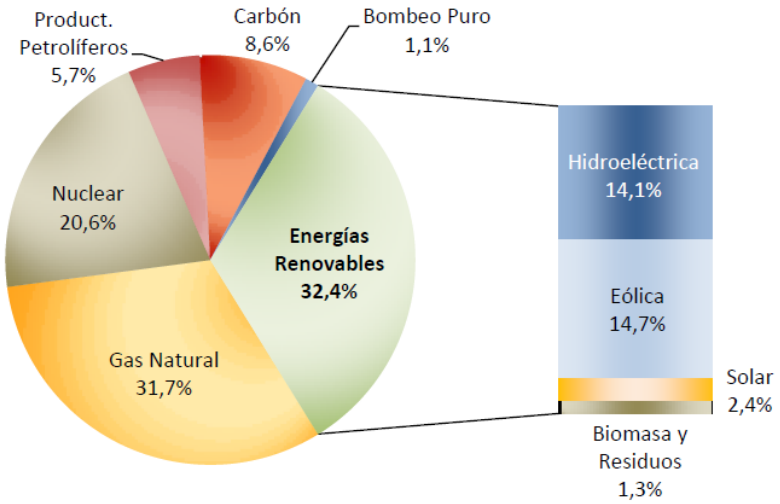


Figura 3. Estructura de la producción eléctrica. Año 2010

Fuente: IDAE-MITYC, 2011.

Biofuels consumption 2010/2009

	2009		2010		Variación 2010/2009
	ktep	*Estructura ([2])*	*ktep*	*Estructura ([2])*	
Biodiésel	922	*3,09%*	1.206	*4,16%*	*30,7%*
Bioetanol	151	*0,51%*	231	*0,79%*	*52,6%*
CONSUMO TOTAL	**1.073**	*3,60%*	**1.436**	*4,95%*	*33,7%*

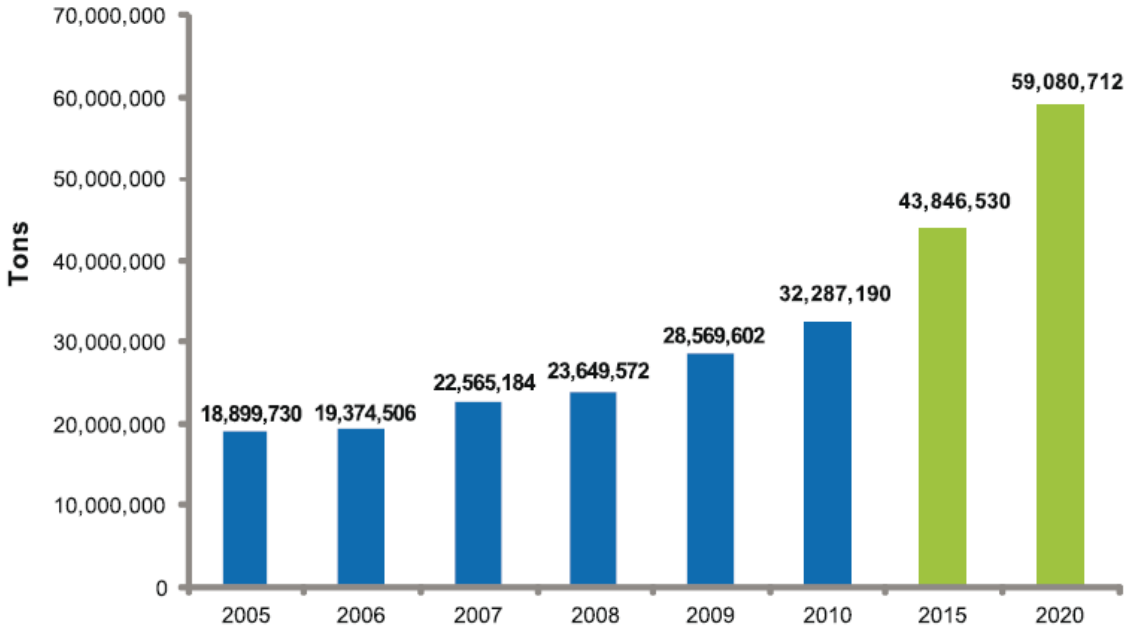
Fuentes: IDAE/CORES

([2]) *% Biocarburantes (Biodiesel + Bioetanol) calculado sobre el total de combustibles de automoción (Gasóleo A + Gasolina)*

Source: IDAE, 2011.

Annex to chapter 3

CO2 Emissions equivalent avoided by renewable energy production



Source: Deloitte, 2011.

Total CO2 emissions saved by renewable energies by sector (electricity, heating and cooling and transport)

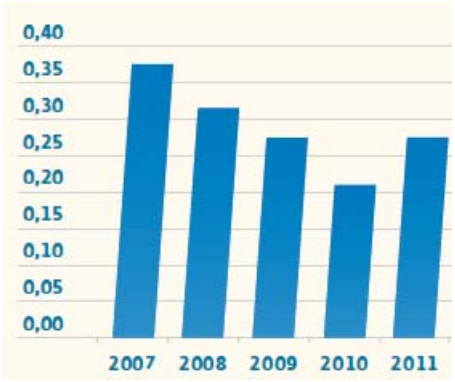
ENERGÍAS RENOVABLES	2009	2010	Variación 10/09
	tCO_2 evitadas/año	tCO_2 evitadas/año	
GENERACIÓN ELECTRICIDAD ([4])	**31.620.334**	**34.338.198**	***8,6%***
Hidroeléctrica	12.310.789	12.749.188	*3,6%*
Eólica	15.309.888	17.073.163	*11,5%*
Solar termoeléctrica	41.537	278.661	*570,9%*
Solar fotovoltaica	2.395.036	2.532.149	*5,7%*
Biomasa y Residuos	1.563.085	1.705.037	*9,1%*
CALEFACCIÓN/REFRIGERACIÓN	**11.448.047**	**11.932.177**	***4,2%***
Biomasa	10.797.047	11.166.319	*3,4%*
Biogás	79.751	91.646	*14,9%*
Geotérmica	61.520	69.640	*13,2%*
Solar térmica	509.728	604.572	*18,6%*
TRANSPORTE	**3.257.487**	**4.372.093**	***34,2%***
Biodiesel	2.819.438	3.718.194	*31,9%*
Bioetanol	438.049	653.899	*49,3%*
TOTAL tCO_2 evitadas/año	**46.325.868**	**50.642.468**	***9,3%***

Fuente: IDAE

([4]) *Emisiones evitadas frente a centrales de ciclo combinado de gas natural en generación eléctrica con rendimiento del 50%.*

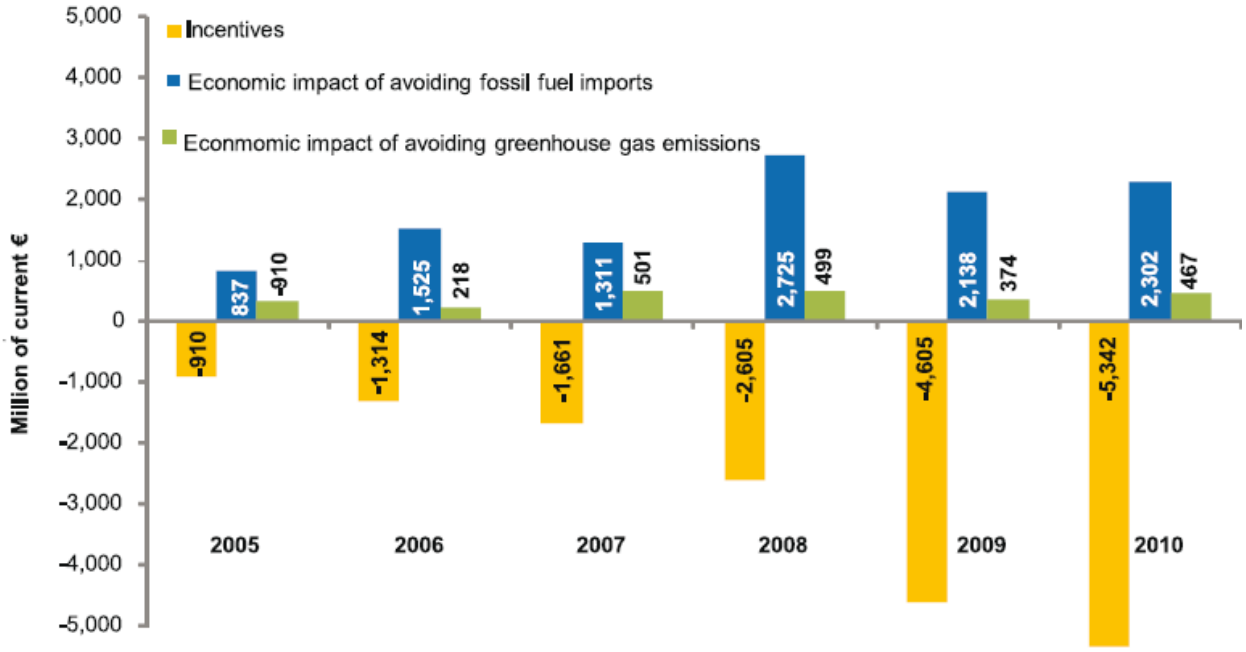
Source: IDAE,2011.

CO2 emissions intensity in the electricity sector in 2011 (tonne CO2/MWh)



Source: REE,2012.

Comparison between the economic impact derived from avoided CO2 emissions and reduction in energy dependence, and of the feed-in tariffs received by the Renewable Energy Sector



Annex to chapters 4 and 5

Landmarks of energy reforms with impact on renewable energies

		Year	Reform	Regulation
PSOE	BEFORE THE ECONOMIC CRISIS	2007	Establishment of premiums for Special Regime	Royal Decree 661/2007, of 26 May that regulates the activity of electric energy production for Special Regime.
		2008	Changes in retribution of photovoltaic energy. Register of preliminary allocation for photovoltaic energy	Royal Decree 1578/2008, of 26 de September on the retribution for electricity production through solar photovoltaic technology for facilities that started operation after the deadline period established by Royal Decree 661/2007 of 25 May.
		2009	Register of preliminary allocation for the rest of energies	Royal Decree-Law 6/2009, of 30 April, on the adoption of specific measures for the energy sector, the approval of the social bonus and temporary provisions 4 and 5. Pre-allocation register for the retribution of facilities and compliance with installed power goals.
	DURING THE ECONOMIC CRISIS	Jul. 2010	22.7% renewable energies	Spain's National Renewable Energy Action Plan (NREAP) 2011-2020
		Nov. 2010	Photovoltaic tariff limitation to 25 years	Royal Decree 1565/2010, of 19 November, on the regulation and modification of certain aspects related to electricity production by Special Regime.
		Dec. 2010	Reduction of retribution to thermoelectric and wind (production hours)	Royal Decree 1614/2010, of 7 December, on the regulation and modification of certain aspects related to electricity production based on solar thermoelectric and wind technologies.
		Dec. 2010	Reduction of retribution to photovoltaic energy (production hours)	Royal Decree-Law 14/2010, of December 23 on the adoption of urgent measures to correct the tariff deficit in the electricity sector.
		Mar. 2011	National renewable objectives; indicative energy planning	Law 2/2011, of March 4, on Sustainable Economy.
		Nov. 2011	20.8% renewable energies	Renewable Energies Plan (PER) 2011-2020
		Elections and new government		
PP		Jan. 2012	Moratorium of premiums for new renewable energy facilities	Royal Decree-Law 1/2012, of 27 January, on the suspension of pre-allocation retribution procedures and the suspension of economic incentives for new electricity production facilities based on co-generation, renewable energy sources and waste treatment.
		Sep. 2012	6% taxation over electricity sales	Fiscal reform bill to ensure the sustainability of the energy system

Annex to chapter 5.1.
The price of electricity in Spain and the tariff deficit

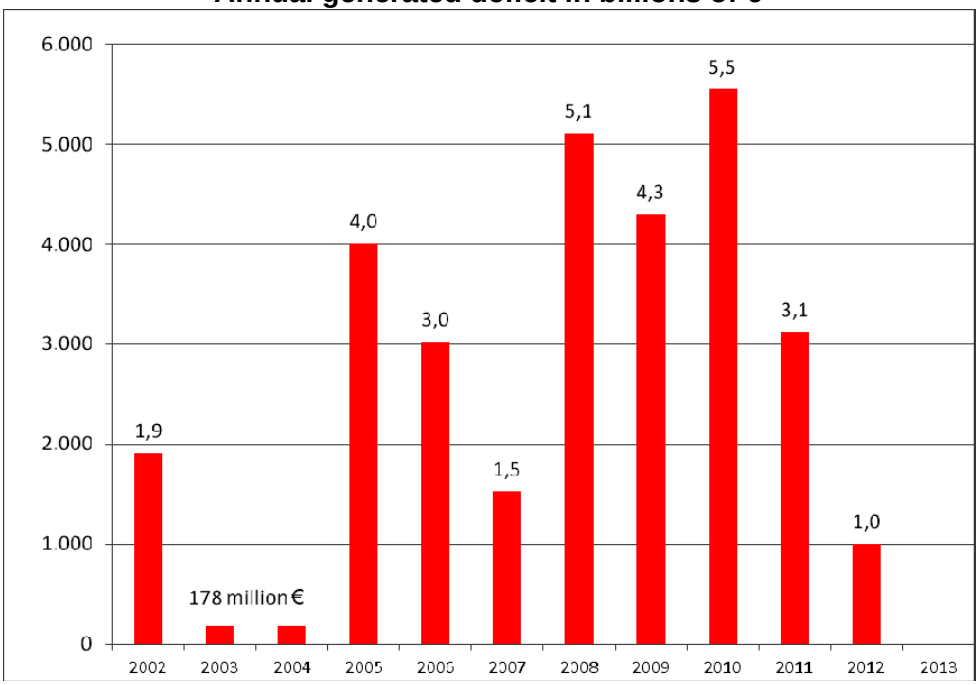
The current management of the Spanish electricity sector, except for some minor adjustments, is mostly based on the 1997 Electricity Law that implied beginning of deregulation for the sector. The law established a negotiated tariff system based on a pseudo-market mechanism in which the price of electricity generation is reached through auction and completed by adding the so called *access costs that* include regulated costs of transport, distribution, marketing, capacity warranties, annual tariff deficit costs and bonuses (premiums) to renewables. This system has led to lack of transparency in the setting of prices, extra compensation for certain technologies and eventually generates a *tariff deficit*.

The so called "tariff deficit" is created by the difference between applied tariffs and certain costs granted to companies by the regulation system. This has led to a paradoxical situation of keeping the most expensive electricity tariffs in the EU[18], with an accumulation of additional postponed costs which are the basis of such unsteadiness. This deficit is not an exceptional case in the Spanish electricity sector but its extension and persistence turn it into a specific cause of concern and eventually into higher costs for users.

The figures that explain this problem are represented by:

- A growing tariff deficit, even though it is partially paid off, that amounted to €24 billion by early 2012.
- Tariffs that despite being insufficient to cover the costs increased by 69% between 2006 and 2011[19].

Annual generated deficit in billions of €



Source: National Energy Commission

[18] According to Eurostat only Cyprus and Ireland had more expensive electricity tariffs by late 2011. Spanish tariffs exceed the EU27 average by 28.5%.

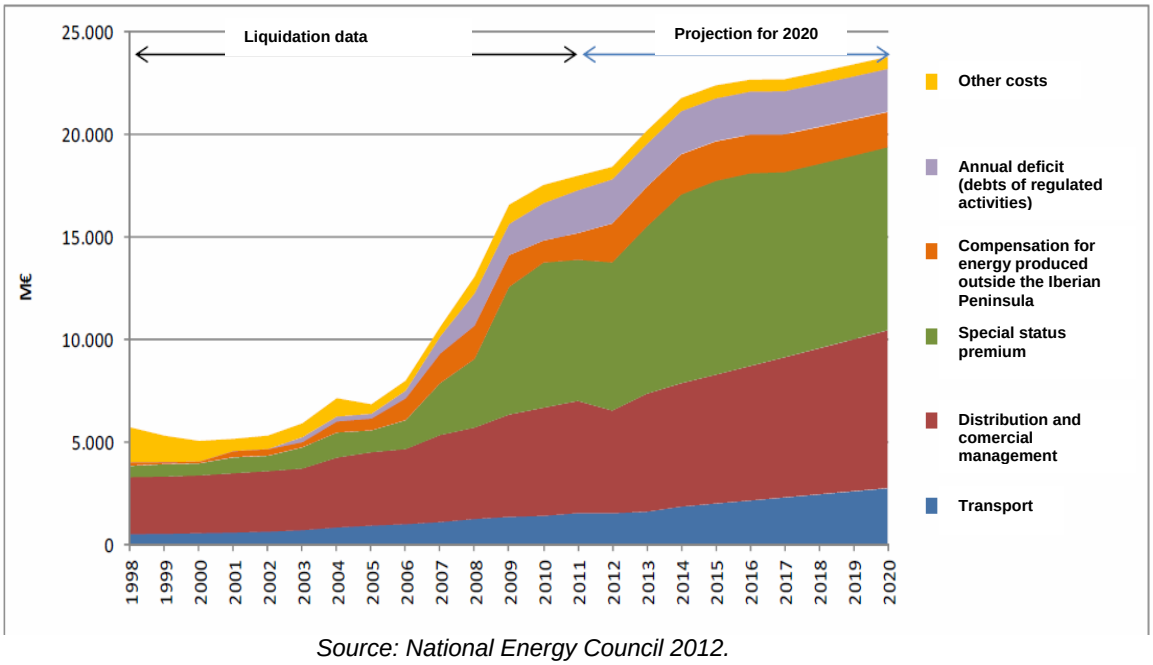
[19] The EU-27 average tariff for the same period increased by 19.9% .The Eurozone average tariff increased by 13.1%.

The tariff deficit has been temporarily financed by electricity companies. Cession (assignment) to third parties was authorized in 2003 and since 2010 the deficit is guaranteed by public funds and negotiated in financial markets exceeding public debt by 0.95 points (currently 6%) which overcharges electricity tariffs with financial costs.

Insufficient regulation of the electricity sector allows such gap between planning and facts, contributes to the growth of tariff deficit and promotes opposition to renewable energies in this sector, when in fact the growth of renewables reduces significantly the price of electricity generation as the sector outperforms more expensive technologies. Therefore the suspension of premiums to the renewable sector has become the main goal of other electricity generators in a sort of oligopolist obstruction to their competitor.

The European Commission in its **Assessment of the 2012 national reform programme and stability programme for Spain**[20] clearly stated that "*weak competition in the energy sector has contributed, at least partly, to building the tariff deficit by favouring overcompensation to certain utilities, such as nuclear and large hydro power generators which have already been paid for, or by sustaining inefficient and environmentally harmful energy subsidies to coal mines*".

Special regimen premium and annual deficit have grown 5 times as much during the period 2006-2010



Source: National Energy Council 2012.

[20] European Commission: "Assessment of the 2012 national reform programme and stability programme for Spain" available at http://ec.europa.eu/europe2020/pdf/nd/swd2012_spain_en.pdf

TARIFF DEFICIT

Government regulated tariffs do not always cover the total costs of the renewable energy sector which implies the generation of a tariff deficit to be paid by the companies. Since generation and regulated costs (transport and distribution) increase at a faster rate than tariffs, the mentioned deficit has brown significantly in the last years reaching an accumulated amount of €24 billion (equivalent to 2% of Spanish GDP) [21]*. Two thirds of that amount (€17 billion) is granted by the government which so far has allowed companies to maintain their coverage.*

Insufficient competition in the energy sector contributed partly to the generation of the tariff deficit due to excessive compensation of certain infrastructures as nuclear and big hydro plants that have already paid off. The maintaining of subsidies to inefficient coal mines also contributes to the increase of tariff deficit.

[21] The gas sector also has a smaller tariff deficit that amounts to €400 million.

Annex to chapter 5.3.
Ernst & Young's renewable energy attractiveness indices

Attractiveness index of renewable energy, November 2011

Rank[1]		Country	All renewables	Wind index	Onshore wind	Offshore wind	Solar index	Solar PV	Solar CSP	Biomass/ other	Geo-thermal	Infra-structure[2]
1	(1)	China	70	76	78	70	61	66	47	58	51	75
2	(2)	USA[3]	66	66	69	55	72	71	74	61	67	61
3	(3)	Germany	65	69	65	78	51	70	0	65	57	70
4	(4)	India	63	63	71	42	64	69	53	59	45	66
5	(5)	Italy	58	59	62	51	58	63	42	53	62	59
6	(5)	UK	57	64	60	78	34	48	0	57	36	65
7	(7)	France	55	58	59	55	48	55	29	57	33	55
8	(8)	Canada	53	60	65	46	32	45	0	49	35	63
9	(9)	Spain	51	50	54	39	58	56	63	46	30	47
10	(11)	Brazil	50	53	57	40	42	46	32	51	23	49
10	(10)	Sweden	50	54	54	53	30	42	0	56	35	55
12	(12)	Australia	47	47	50	37	53	52	54	42	56	45
13	(16)	Romania	46	51	55	38	33	45	0	44	41	45
13	(12)	Poland	46	52	56	41	30	42	0	42	22	47
15	(14)	Ireland	45	53	53	52	22	30	0	44	24	49

Attractiveness index of renewable energy, August 2012

Rank[1]		Country	All renewables	Wind index	Onshore wind	Offshore wind	Solar index	Solar PV	Solar CSP	Biomass/ other	Geo-thermal	Infra-structure[2]
1	(1)	China	70.2	77	78	70	64	66	47	60	51	75
2	(2)	US[3]	66.0	64	66	55	71	71	74	61	67	60
2	(3)	Germany	66.0	69	66	80	61	70	0	69	58	73
4	(4)	India	64.1	64	70	41	66	68	54	61	45	65
5	(6)	UK	55.3	64	60	79	41	47	0	58	36	65
6	(7)	France	55.2	57	58	53	52	56	29	57	33	55
6	(5)	Italy	55.2	56	58	47	56	58	39	50	59	50
8	(8)	Canada	53.4	63	66	46	40	45	0	50	36	66
9	(10)	Japan	50.8	49	50	41	58	63	27	41	48	54
10	(9)	Brazil	50.2	52	55	40	47	49	33	54	24	51
11	(11)	Australia	50.1	49	52	38	53	53	55	43	57	48
12	(12)	Sweden	49.0	55	55	53	37	42	0	58	35	55
13	(14)	Romania	47.7	53	56	39	40	45	0	45	41	46
14	(13)	Spain	47.6	46	49	35	53	52	57	43	26	36
15	(15)	Poland	47.4	54	57	44	38	44	0	44	23	48